A LIFE-CYCLE MODEL OF MANUFACTURING NETWORKS AND CHICAGO'S METALWORKING INDUSTRY

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Submitted to the Department of Urban Studies and Planning
in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
at the
Massachusetts Institute of Technology
June 1996

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ABSTRACT

In this study, I examine the conditions under which manufacturing networks enhance the competitiveness of mature manufacturing industries and the regions in which they are situated. Researchers who have studied such collaborative networks in dynamic manufacturing regions in Italy, Germany, Japan, and California, suggest that such interfirm institutions promote collective learning and increased innovation among the participating firms. Others in this flexible production debate have found that interfirm networks assist only the largest, multinational firms within them, while marginalizing other smaller supplier firms. To determine which perspective in this debate more accurately portrays the potential of manufacturing networks, I track a history of the small-firm-oriented metalworking industry in Chicago--a mature manufacturing region in America's "rustbelt" that experienced significant "deindustrialization" and loss of manufacturing jobs in the 1980s. Chicago's metalworking industry has operated a collaborative interfirm network--in the guise of a trade association, the Tooling and Manufacturing Association--from the mid-1920s to today. By investigating institutional practices within this network over a seventy-year period, I found that a network form of industrial governance neither predicted this industry's success nor its marginalization as a group of small suppliers. Instead, Chicago's small-firm metalworking network experienced a life-cycle of successful organization--when it achieved high returns, greater bargaining power, and high performance for its industry--and subsequent decline when it was challenged by others "outside" its collaborative network. A life-cycle conception shows that such networks operate in highly contested terrains of interfirm and inter-actor relationships in which the ability of network participants to accumulate collective power and experience in strategizing is critical.

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ACKNOWLEDGEMENTS

Having grown up a twin, I appreciated early on how my growth, learning, and maturation has been influenced by my other. This dissertation has been much the same--it benefited throughout its long preparation process from interaction with many others. I am grateful to all who have helped ease my journey along this road. The following deserve special thanks.

First of all are the many mentors who made this process an intellectually exciting one over the years. My committee offered much patience and insight throughout. Bennett Harrison gave constant encouragement, enthusiasm, and good humor while pushing me to expand on my initial "toolroom story." Richard Locke offered an enthusiastic understanding of this project all along, while urging me to look broadly at the "politics" of the situation. Michael Piore's critical perspective has pushed me closer toward a perfect product and taught me the futility of arguing with "straw men." Judith Tendler, my chair--who nurtured this product throughout much of its development with a comprehensive commentary at each stage--taught me to think creatively about theory, to confront my own theoretical biases head-on, and to write about it all in a clear and succinct fashion.

Others have also played an influential role in guiding my research along with my career at MIT. I especially appreciate the support of the following: Gillian Hart, who provided an inspiring model of true interdisciplinary research and taught me that theory is created by us all; Lisa Peattie, who guided my first experience of Chicago field research and taught me how to combine motherhood and scholarship; Karen Polenske, who has offered her support, advice, and friendship throughout, along with extensive knowledge of regional economics, linkages, and clustering; and Charles Sabel, whose class, writings, and discussions on industrial politics introduced me to industrial districts and influenced my choice of metalworking. Richard Lester has also offered critical comments and substantial support of this research project, in addition to providing funding through MIT's Industrial Performance Center and the Sloan Foundation.

Others offered generous financial and administrative support for this research for which I am greatly appreciative. They include MIT's Center for International Studies, in conjunction with the John D. and Catherine T. MacArthur Foundation, and the Economic Policy Institute, which granted a doctoral fellowship. Rolf Engler and Sandy Wellford helped me finagle my finances and other administrative procedures at MIT, while encouraging my efforts. The staff at Hayden's Interlibrary Loan Office creatively worked the archival networks on my behalf to gain me quick access to the papers of the Machinists Union.

I would also like to thank all who agreed to be interviewed for this project and openly share their experiences with me. I talked with many small firm owners, unionists, policymakers, academics, and others who spent numerous hours explaining Chicago's politics and manufacturing history to me. I especially want to thank Bruce Braker, of the Tooling and Manufacturing Association, for agreeing to be interviewed several times for this project, for offering his organization as a case study, and for allowing me open access to TMA's historical files. Others in Chicago have also provided insight and inspiration. I particularly appreciate the experience I gained while on staff at the Center for Urban Economic Development (CUED), at the University of Illinois at Chicago, before coming to MIT. John Betancur, Bill Howard, Dave Ranney, Wim Wiewel, and Pat Wright each taught me much about Chicago's neighborhoods, workers, firms, and industrial politics. CUED also provided an institutional base during my fieldwork in Chicago.

Last, but not least, are the friends and family members who sustained me for the duration of this process. All have been willing to let me talk at length about metalworking, while I figured out the details of this history. All have also lent their friendship, humor, and advice as we talked about much else, for which I am extremely grateful. I thank Rose Batt, Christie Baxter, Kalyn Culler, Meg Gross, Yu Hung Hong, Turid Horgen, Kay Kramer, Peggy Levitt, Marisela Montoliu, Paola Perez-Aleman, and Meenu Tewari for their sustenance. I also want to thank my twin, Wendy, for her "email," stories, and funny guidance; my brother, Scott, for his example and frequent encouragement; my mothers, Maxine and Norma, for their spirit and understanding, and my fathers, Mac and Bob, for teaching me how to argue. Finally, I thank Dick, for it all. He has listened, supported, cajoled, and held all else together while I followed this often solitary path of research. Brenna and Haley have provided the joy.

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CHAPTER 1--THE DYNAMICS OF COLLABORATIVE MANUFACTURING

Introduction: Can Interfirm Networks Revitalize a Mature Manufacturing Region?

Chicago, known colloquially as the "metalworking capital of the world," has long been a major industrial player in the United States. Its prominent metal-related complex of manufacturing industries has grown relatively continuously since the City's founding in the mid-1800s, providing almost one million manufacturing jobs by 1970. Since the beginning, this complex included a sizeable metalworking sector--made up of small, highly skilled, and craft-oriented "supplier" firms--that bought steel from the region's large mills along Lake Michigan and sold metal parts and related services to a myriad of downstream "customer" industries that produced farm machinery, communication equipment, televisions, radios, cars, appliances, and other metal-related durable goods. From the 1970s on, however, this region suffered the fate of much of America's "rustbelt" when it started to experience a trickle of manufacturing plant closings and job losses that grew to flood proportions in the 1980s. In the last decade, the metropolitan Chicago region lost approximately 150,000 industrial jobs[1] due to the decreasing international competitiveness of many of its manufacturers.

Intrigued by these job losses and the apparent undoing of a once dynamic manufacturing center, I began this research to determine what economic development planners could do about the deindustrialization of this region. By analyzing Chicago's recent experience through the lens of its dominant metalworking sector, I wanted to find out whether the lessons from the current debate on flexible production could be applied to stimulate both

[1] Reported in Ranney (1992).

this industry's and region's revitalization as industrial players. Proponents of flexible manufacturing argue that successful manufacturers today should decentralize their operations into--and/or form--collaborative networks of smaller firms that become more innovative competitors through the sharing of information. These theorists hold that increased product and process innovation is a critical strategy today for attracting the highly varied and fluctuating tastes of consumers. Proponents of flexible manufacturing also promise that manufacturers who collaborate will achieve a positive outcome of market dominance and high returns for themselves and their workers.

The critique of this perspective, however, offers a contrasting interpretation. Multinational firms will control interfirm networks and the returns to innovation for their own advantage; at the same time they will marginalize smaller suppliers, such as those that comprise Chicago's metalworking industry, through these new networked relations. Would establishing an interfirm network reinvigorate this region's metalworking industry today or merely provide its multinational customers with a mechanism for its exploitation? Would having had such a network in the past forestalled the recent crisis in this industry and region, or merely facilitated it? Which view of the flexible production debate accurately captures how manufacturing networks operate over time and their potential for economic development in a region?

As I elaborate in this chapter and throughout the dissertation, these puzzling questions cannot be fully answered by the debate on flexible production. We must reorient our thinking about how collaborative manufacturing networks operate. Instead of characterizing such interfirm networks as inherently beneficial and stable--as the proponents of flexible production regimes maintain--or exploitative and perpetually weak--a view held by this literature's critiquers--we need to see how such networks rise and fall due to contests with other actors in their environment. I have found that not only did Chicago's metalworking industry operate an interfirm network for most of this century, but that a network form of industrial governance neither predicted this industry's success nor its marginalization as small suppliers. Instead, as I argue below, Chicago's small-firm metalworking network experienced a life-cycle of successful organization--when it achieved high returns, greater bargaining power, and high performance for its industry--and subsequent challenge by others "outside" its collaborative network. In spite of these frequent challenges, this metalworking network achieved a certain durability over the long run as its small-firm owners learned to become strategic actors and recreate collaborating interfirm relationships after a previous set of alliances fell apart.

I describe the dynamics of a life-cycle model of manufacturing network development in this chapter. First, I will briefly acquaint you with the actors and some details of Chicago's metalworking case. Next, I will discuss the shortcomings of the current flexible production debate in helping us to understand the history of collaborative relationships in this industry. Finally, I will outline my alternative conceptualization for how interfirm networks operate over the long run by introducing the reader to a series of themes that emerge from this study.

I. THE CASE OF CHICAGO'S METALWORKING INDUSTRY

Firms that comprise Chicago's metalworking industry play the unassuming role of small intermediate goods producers in this region's overall metal-related production process. As such, they are sandwiched between the mighty steel producers--firms like U.S. Steel, Inland, and Republic Steel that extend from South Chicago over to Gary in northwestern Indiana--and the region's industrial giants that use metal parts (e.g., Ford, GM, Motorola, Schwinn Bicycle). Furthermore, histories of this region's industrialization and union movement have tended to ignore metalworking and its small producers. In spite of its unassuming position in the production chain, Chicago's metalworking industry has been a constant and sizeable player since this region's industrialization--and an innovator of a critical set of manufacturing institutions, as I argue later on in this chapter. In this section, I will introduce the metalworking industry, other actors that feature in this history, and the data sources I have utilized to chronicle them. Before doing this, however, I will offer a brief description of Chicago's metal-related production chain along with some indicators of its recent performance.

As already mentioned, Chicago has been an important industrial center in this country since the middle of the last century. Both its population and economy escalated sharply in its early years and manufacturing soon became this region's engine of growth. The manufacturing sector provided 636,000 jobs in the metropolitan region just prior to the Great Depression in 1929 (U.S. Census, 1954). During and after World War II, industrial activity continued to expand. At its height in employment, in 1967, Chicago's manufacturing sector provided close to 970,000 jobs which equalled about one-third of the total local job base in the metropolitan region (Weiss and Metzger, 1989).[2] As part of the "heartland" of durable goods production in this post-World War II era, Chicago and the Midwestern region to which it belonged withstood cyclical recessions better and offered their workers a higher standard of living than other regions in the country (Markusen and Carlson, 1989). In large part, this prosperity stemmed from its vibrant and world-class "metal-related"[3] manufacturing complex made up of such prominent industries as steel, autos, machinery production, and metalworking. The metal-related production chain--from steel through the production of discrete metal parts and on into the assembly of final products such as cars and radios--consistently provided about half of all manufacturing employment in this period.

Despite this prosperity, however, Chicago's manufacturing complex--one of the most prominent in the country--ran into trouble from the late 1970s on. Many big name companies with long histories of producing durable and non-durable goods in this region left or closed significant portions of their production facilities. These included International Harvester, USX (formerly U.S. Steel), General Motors, Zenith, Schwinn Bicycle, and Caterpillar, to name a few (Ranney, 1992).[4] Shuttered plants and the outmigration of manufacturers to lower cost regions of the world became commonplace and put thousands of highly-paid

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[2] Even though manufacturing employment in the metropolitan region grew until 1967, such jobs in the city of Chicago began to decline after the World War II years, from the late 1940s on. This reflected the fact that manufacturing firms and jobs were relocating and expanding into the region's outlying counties in the 1950s, 1960s, and 1970s. Suburban manufacturing jobs peaked in 1977, after which they too started to decline (McDonald, 1984; Weiss and Metzger, 1989).

[3] Adapted from Markusen, et.al.'s (1985) name for the Chicago economy--the "steel-related industrial complex."

[4] This list is sizeable and includes many other large manufacturers in this region. See Ranney (1992) for the complete listing and the employment impact of each closure.

production workers out of work. The metropolitan region lost almost one-fifth of its industrial jobs in the 1980s, or almost 152,000 jobs; the city suffered a worse fate, losing about 36% of its manufacturing base, about 129,000 jobs (Ranney, 1992).[5] The big losers, in terms of absolute numbers of jobs lost, were sectors in the metal-related industrial complex: steel and primary metals lost about 26,000 jobs, non-electrical and electrical machinery almost 39,000 and 28,000 jobs respectively, and fabricated metals about 22,000 jobs. (Transportation equipment, also tied into this metal-related complex, lost only about 8,000 jobs but declined 25% in this period).[6] Facing repeated recessions in the 1970s and 1980s and heightened international competition from both lower-cost and higher-quality producers abroad, the large-firm assembly industries experienced trouble first. Ranney (1992) attributes slightly less than half of the city of Chicago's manufacturing employment decline in the 1980s to plant closings, outmigrations, and other actions of multi-plant transnational corporations with business investments abroad. By the end of the decade, this trend worried Chicago's business establishment. "Manufacturing heads south," proclaims Crain's Chicago Business, to Mexico's maquiladoras and other offshore sites with cheaper labor costs (Merrion, 1990).

Chicago's metal-related manufacturing complex, that carries out the production chain alluded to above, has at its hub the locally tied, small-firm metalworking industry (see Graph 1-1). This industry consists of a myriad of shops which take raw or semi-finished steel (or other metals) and turn it into component parts. Metalworking firms tend to be very small; the

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[5] I offer a more complete discussion of this crisis in Chapter 7, along with a full statistical description of its impact.

[6] Rounded off from figures quoted in Ranney (1992) from Where Workers Work.

median firm in Chicago's metalworking industry employs ten workers while two-thirds of all firms in the industry employ no more than twenty workers (Illinois Manufacturers Directory data base, 1995; County Business Patterns, 1990). Metalworking firms produce highly precise and custom-designed tools, dies, and precision-machined parts as well as longer production runs of metal stampings, screw machine products, and other metal parts. They also offer metal grinding, plating, forming, bending, and a variety of other metalworking and machining "services." Because of the diversity of products produced by the metalworking industry, various studies have defined "metalworking" differently. For the purposes of this research, I have broadly defined this industry as including much of SIC 34--fabricated metal products--and SIC 35--machinery and related products.[7] In 1987, these two sectors were the largest job

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[7] By looking within this broad industry definition, I further defined metalworking to include the following three-digit SIC classifications. These sectors primarily produce intermediate goods within the metal-related complex:

342-Cutlery, Handtools, Hardware
343-Plumbing and Heating Equipment
344-Fabricated Structural Metal Products
345-Screw Machine Products
346-Metal Forgings and Stampings
347-Metal Services (e.g., Coating)
348-Ordnance
349-Miscellaneous Fabricated Metal Products
351-Engines
354-Metalworking Machinery
355-Special Industrial Machinery
356-General Industrial Machinery
358-Refrigeration and Service Machinery
359-Industrial Machinery, NEC (including machine shops)

I have excluded other sectors from my definition of the metalworking industry because they are more properly "customer" industries that produce for the final market. These include:

341-Metal Cans and Containers

providers in Illinois among all twenty two-digit manufacturing sectors in the state and equalled 24% of all manufacturing employment.[8]

Both the "backend" (i.e., steel) and "frontend" (i.e., customer industries such as auto) of this region's metal-related complex are comprised of much larger, multinational firms than is metalworking. The steel and primary metals industry, at the "backend" of the production chain, both furnishes semi-finished steel and other metals to the region's metalworking firms and purchases their products. Manufacturers of cars, consumer electronics, appliances, agricultural implements, and other durable goods--at the "frontend" of this production chain--act as the major customers of the metalworking and machining industries by purchasing these metal parts and services. Many of these larger customer firms located themselves in the metropolitan Chicago region over the last century because of its rich assortment of metalworking-service industries. Cyrus McCormick, for example, who invented the reaper in Virginia in the early 1800s, moved his fledgling production facilities to Chicago to take advantage of subcontracting opportunities with the region's skilled blacksmiths and machining shops.

352-Farm and Garden Machinery
353-Construction Machinery
357-Computer and Office Equipment

[8] I have used Illinois as a proxy for the metropolitan Chicago region throughout the dissertation, since the boundaries of the region changed frequently during the lengthy seventy-year period of this history and state statistics allowed me to more easily compare this region to others. Firms in the Chicago region have provided approximately two-thirds or greater of all manufacturing jobs in Illinois throughout the relevant decades.

To determine the extent to which collaborative interfirm relationships could or did exist in this industry, I investigated customer-supplier relationships and other contractual practices throughout this metal-related production chain over most of this century. I looked at subcontracting practices between small metalworking shops and their large firm customers--the manufacturers of durable goods such as autos, farm and construction machinery, radios, televisions, and household appliances. I investigated historical relationships between these small suppliers of metal parts as well. I also documented how labor-management relations appeared over time in both the small metalworking shops and in their large customer-firm factories and the nature of the labor process in various stages of the production chain.

From this investigation, several prominent "actors" appeared, that I feature throughout the dissertation. Within the metalworking industry, the tool-and-diemaking and machine shop sectors played a leading role. They are among the metalworking industry's most technologically advanced, skilled, and numerous subspecialties (totalling about 40% of the industry's approximately 5,500 firms) (U.S. Census of Manufactures, 1987). Owners of tooling and machine shops started Chicago's metalworking trade association in the mid-1920s--today called the Tooling and Manufacturing Association. About 27% of all firms in the region's metalworking industry belong to this trade association. This is the organizational entity that set up a collaborative interfirm network of craft-oriented metalworking producers in this region that I follow throughout this century.

These tooling and machining subspecialties within metalworking employed highly skilled machinists, toolmakers, and metalworking craft workers. Although Chicago's metalworking industry today is largely non-union,[9] in its early days--from the late 1800s to the middle part of this century--many of the craft workers in these small firms were organized by the Machinists Union (formally called the International Association of Machinists, or the IAM). Representatives from the tool-and-die Local #113 of the Machinists Union--and from the Chicago Federation of Labor (the CFL) which was the city's craft union federation and delegate to the American Federation of Labor (AFL) in the early 1900s--also helped to form the metalworking trade association in 1925.

With the advent of industrial organizing and the CIO (the Congress of Industrial Organizations) in the 1930s and 1940s, the Machinists Union and AFL faced competition. The CIO turned its attention to organizing the low- and unskilled workers in the region's large steel mills and "customer firm" assembly plants. Organizing along company lines, rather than by occupation or "craft" as had the Machinists Union and the AFL, the CIO also started to incorporate some of the skilled trades that worked in these large corporate factories. Thus, the CIO became competition for the Machinists Union; certain of its unions--especially the United Auto Workers (UAW), the United Steelworkers (USW), the United Electrical Workers (UE), and the Farm Equipment Workers Organizing Committee (FeWOC)--began to speak for metalworkers as well as for low-skilled production workers. Competition with the CIO pushed the Machinists Union to gradually adopt an industrial un[illegible] multi-occupational) structure (see Newell, 1961; Derber, 1989; and C[illegible]990, for a history of union organizing in the Chicago region). This created a splinter group for a time within the

[9] The Tooling and Manufacturing Association estimates that about 96% of its member firms currently operate non-union shops.

IAM, called the Tool and Die Conference. This group--that many of Chicago's Local #113 machinists helped form--consisted of the highest skilled metalworkers who wanted to retain the higher status and pay accorded them as craft workers.

A final set of actors in the Chicago region consists of its large "customer" firms--prominent corporations such as International Harvester, Ford, GM, Motorola, Western Electric, Stewart Warner, and others--that initially operated assembly plants for consumer durables products. These assembly plants employed low-skilled workers who put together, or assembled, products using metal parts and other inputs supplied by Chicago's small and independently owned metalworking shops. Eventually, these large corporate "customers" of metalworking became its greatest "competition." Increasingly over the post-World War II period, these customer firms expanded their in-house and corporate-owned subsidiary skilled metalworking parts shops, rather than buy such parts from small independently owned firms on the "outside." These corporate-owned metalworking shops are also known as "captive shops". In terms of tool-and-die work, the captive toolroom expansion took off in the 1950s and 1960s. Skilled workers in these captive shops were vied for by both the Machinists and CIO unions.

To undertake an historical-institutional case study that analyzes the actions of these actors within Chicago's metalworking industry, I drew from a variety of data sources. I interviewed approximately 60 relevant firms and other actors, including the owners or operating managers of metalworking and machining subcontractors in the Chicago region, personnel in the customer firms of metalworking (i.e., final goods manufacturers), representatives of unions and trade associations, public sector economic development policymakers, historians, and other staff from other relevant organizations. (See Appendix 1-1 for a listing of these interviews.) I conducted interviews in one-to-two-year increments from 1989 to 1992, which allowed me to document recent changes in the metalworking industry. To carry out the historical portion of this research, I draw from a variety of primary and secondary material, as footnoted throughout. These sources include minutes from Board of Directors meetings and other internal documents of the Tooling and Manufacturing Association--Chicago's metalworking trade association--from 1925 to 1991, historical copies of the American Machinist trade journal, consultant reports and other historical reports about the metalworking industry including those published by the City of Chicago and the Illinois Institute of Technology, papers of the International Association of Machinists held at the Wisconsin State Historical Society Archives, census and other statistical records, and numerous books and journal articles on the history of Chicago.

II. SHORTCOMINGS OF THE FLEXIBLE PRODUCTION DEBATE IN ILLUMINATING THE EXPERIENCE OF CHICAGO'S METALWORKING NETWORK

As I have indicated earlier, by 1990, Chicago's century-long boom in manufacturing appeared at an end. This region was not alone in this predicament. The fortunes of many of America's manufacturing regions and its firms headed into trouble in the late 1970s and 1980s. Detroit, Providence, New York, Cleveland, Pittsburgh, and other manufacturing hubs all experienced a major loss of manufacturing jobs and plants. Many researchers across the country documented the failure of American mass producers to continue providing jobs to this country's workers (Bluestone and Harrison, 1982; Dertouzos, Lester, and Solow, 1988). The big question since this period of deindustrialization has been: what can policymakers do about it? How can this country's mature manufacturing regions like Chicago recapture a "high road" of plentiful manufacturing jobs, a high standard of living, and increased exports and market share in today's qualitatively different global manufacturing environment? The literature on flexible manufacturing--variants of which have also been called "flexible specialization" and "lean" production--offers one answer to these questions. On the other hand, its critique offers a different perspective and set of solutions. In this section, I outline the current thinking that has taken place in the flexible production debate, while also discussing its shortcomings in explaining the Chicago metalworking case. To do this, I have divided the flexible production literature into three groupings: 1) the proponents of flexible production and collaborative manufacturing who describe this system's ability to provide a "high road" of investment in new technology, skills, and innovation along with high returns for all participants, 2) those who critique this model for its "low road" aspects (e.g., increased inequality among industrial actors today due to multinational control over production networks), and 3) researchers who have allowed for variation in outcome that manufacturing networks produce over time and space.

As a way of introducing this literature, I will summarize the main framework of my discussion in the next several paragraphs; I elaborate on this argument in the following pages. Since the mid-1980s, a literature on flexible manufacturing has emerged that describes a new model or regime of production many believe is more suited to today's global market environment. Given the emergence of new manufacturing competitors and economies since the 1970s--notably the newly industrializing countries--and consumer desires for greater product diversity, global markets for manufactured goods have supposedly fragmented significantly since the postwar period, according to this literature. No longer will a few mass production giants from the United States--such as General Motors and Ford--be able to turn out large volumes of a few standardized goods for large and generic markets. These mass production, or "Fordist," corporations must now compete with smaller, leaner, more innovative, and more flexible manufacturers that increasingly come from other countries. I feel the strength of the flexible manufacturing literature has been to detail the mechanisms by which the new flexible producers collaborate to achieve both lower costs and high quality in production today and are gaining global dominance in manufacturing. This literature has been equally adept at painting a stylized picture of the strengths and weaknesses of the mass production model that many American firms pioneered in earlier decades.

Yet, this literature and its critique--which questions the benefits of flexible production arrangements--offer relatively static conceptualizations of production relationships due to their emphasis on developing stylized models of the new, and old, dominant production paradigms. These stylized models cannot help us explain the experience of Chicago's collaborative metalworking network for several reasons. By focusing on dominant patterns and typologizing them and the regions in which they occur, this literature has been less adept at explaining contradictions within reigning production regimes and change from one system into another. This literature freezes the dominant production paradigms in a point in time. As such, it tends to gloss over the contribution that subordinate relationships play in regional production systems and how groups of actors attempt to resist their embeddedness in a structure of dominant production relationships when such relationships do not suit their purpose. The flexible production literature and its critique also offer a dichotomous prediction as to the achievements of networked production systems--networks either lead to prosperity and the high road for all participants or to significant exploitation of smaller firms and "industrial dualism" redux. These shortcomings have meant that this literature--and its critique--cannot fully explain the Chicago experience--where network production coexisted as part of a dominant mass production system, producing benefits for its participants in some decades but not in others. To understand how the outcome for network-forms of production can vary in time and space, I turn to yet a third set of literatures. These provide some guidance in understanding the Chicago case as I indicate here and elaborate upon in the following section. I will now discuss these three literatures in greater detail.

Proponents of Flexible Production and Its Limitations

The flexible production literature would have difficulty predicting the experience of Chicago's metalworking industry in two ways. It would not foresee the ability of small firms in this industry to establish a collaborative interfirm network in the 1920s, during the heyday of mass production. It would also have difficulty explaining the troubles facing this metalworking network today, in an era when collaboration supposedly breeds market success. I discuss these shortcomings here while also offering a synopsis of the main tenants of this view.

First of all, the flexible production literature[10] maintains that certain historical eras and geographic places are conducive to stimulating collaborative and flexible production arrangements among workers, management, and firms--whereas other time periods and regions are not. Let me start with the latter case--its treatment of mass production and today's mature manufacturing regions, like Chicago, where this manufacturing system took root in the United States in earlier decades. This literature offers us a stylized picture of this older, dominant, mass production system that is assumed to be internally consistent, logical, and without contradictions once its pieces became fully developed by the middle of the 1900s. Thus, theorists describe how new technologies like the assembly line and automation, certain macro conditions and institutions (e.g., industrial unions and the agricultural price stabilization program),[11] and the prevalence of large untapped markets in the United States fostered the rise of mass production in this country and kept it operating throughout much of this century.

Mass production both necessitated and spawned large, vertically integrated corporations, hierarchical relations within the firm, and "arms-length," distant, and non-collaborating relations between firms (e.g., see Chandler, 1977; Piore and Sabel, 1984; Best, 1990; Womack, et.al., 1991). Since these large mass producers standardized their product offerings, and deskilled and simplified the labor process, the need to innovate frequently and

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[10] For my understanding of the flexible production literature, as I represent it in this section, I pull from several key works that describe flexible production in general--e.g., Piore and Sabel (1984), Best (1990), Schmitz and Musyck (1993)--or its permutations in specific regions or countries of the world--see Herrigel (1992), Herrigel and Sabel (1994), Saxenian (1994), Locke (1994), Pyke, Beccatini, and Sengenberger (1990), Womack, et.al. (1991), and others who describe the Italian, Japanese, and other cases.

[11] See Piore and Sabel (1984) for a full discussion of these macro-level institutions.

learn from other firms or workers was curtailed. Mass production and its hierarchical set of production relationships also destroyed traditional collaborating relationships that existed earlier between craft producers in this and other countries where mass production came to dominate.[12] These traditional craft relationships were inefficient in manufacturing the standardized, or mass produced, goods. Plus, as Piore and Sabel (1984) have theorized, once firms, governments, and other actors made significant investments in mass production technologies and institutional support structures, they became reluctant to turn back and instead closed off alternate (e.g., flexible) production paths from further consideration. Mass production dominated industrial relations in this country--these theorists maintain--which choked off other options for the structure of production here.

Most histories of Chicago's industrialization process parallel the view that the flexible production literature offers of the dominance of mass production and its hierarchical labor relations in this country during most of this century. For instance, several authors have described how Chicago's economy early on became dominated by very large corporate entities (e.g., U.S. Steel, Pullman, International Harvester) that developed their own company towns and departments of social engineering to control their workers along with their massive assembly lines (Ozanne, 1967; Mayer and Wade, 1969; Cohen, 1990). Many of these firms pioneered mass production techniques, such as Cyrus McCormick's reaper factory (later

[12] While some researchers (e.g., Scranton, 1983; Helper, 1990, 1991) found instances of collaborative interfirm relationships and networks earlier in specific regions of the United States (e.g., Philadelphia's textile industry, Michigan's early auto industry), these instances of flexibly organized, craft economies gave way to the dictates of mass production in this country. See also the description in Piore and Sabel (1984), of how craft relations and networks of producers were eclipsed by mass production.

International Harvester) and the meatpacking plants in the stockyard area (Barrett, 1983; Hounshell, 1984). They set up hierarchical relationships with their workers inside the factory and took a confrontational approach on the outside toward the union movement (Ozanne, 1967; Barrera, 1979; Barrett, 1983; Hounshell, 1984; Gilpin, 1989; Cohen, 1990). No historical accounts of Chicago's industrialization have described interfirm relationships specifically. However, the flexible production literature--with its emphasis on describing the coherent logic of dominant production regimes and systems in certain eras and regions would assume that interfirm relations in Chicago--between its large "customer" firms and outside metalworking suppliers--would be distant if not distrustful. Mass producers wanted to pull all relevant manufacturing operations inside the large, vertically integrated firm and leave only high risk and uncertain market demand for smaller outside producers--such as those in the region's metalworking industry. Mass production stimulated industrial dualism and the marginalization of smaller manufacturers into sweatshops (Piore, 1981).[13]

However, by specifically tracking supplier relations in Chicago's metalworking industry, as I mentioned above, I found a surprising amount of interfirm collaboration, trust, and flexible craft-like production arrangements in the midst of this supposedly mass production era and region. In fact, shop owners in Chicago's precision metalworking industry were not new to the idea of creating interfirm networks--they had organized themselves into such a collaborative institution as early as the mid-1920s. Founded as a trade association, this collaborative small-firm network, throughout several decades, created one of the largest

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[13] See Helper's (1990, 1991) discussion of this marginalization of outside suppliers in the Midwestern auto industry.

metalworking training programs in the region, often took a leadership role in the dissemination of new metalworking technologies, and forged a variety of critical alliances (e.g., with the Machinists Union) to ensure continuing progress in this craft-based industry and a high return for its participants. How were the shop owners in Chicago's precision metalworking industry able to construct a collaborating skill-intensive and craft-oriented network, or "enclave," in the 1920s in the "take-off" period for mass production when manufacturers were supposedly deskilling their processes away from the production of highly varied, craft-like goods? Collaborative, craft-oriented producers should not have been able to survive during the low-skilled, high volume philosophy of mass production, according to those who ascribe to the flexible production logic. The stylized account of mass production offered in this literature does not allow for this outcome.[14]

Secondly, in the same way that the flexible production literature assumed that mass production and its hierarchical and non-collaborative relationships should have dominated the industrial landscape in Chicago in past decades, it would expect all successful manufacturing firms and industries today to be transitioning toward greater collaboration. This literature sprang from researchers' attempts to explain the success of collaborative and decentralized manufacturing systems in other sites around the globe (e.g., in Germany, Italy, and Japan).[15]

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[14] Although some researchers allow a multi-track view, they and others have theorized that the outcome converges into a dominant path once chosen (see Piore and Sabel, 1984; Best, 1990).

[15] Since some of the earlier accounts of the collaborative manufacturing districts in Italy and Japan appeared (e.g., Piore and Sabel, 1981; Brusco, 1982), the literature on industrial districts, flexible manufacturing, and collaborative interfirm relationships has mushroomed. Piore and Sabel's (1984) subsequent and more comprehensive work stimulated in-depth reexamination of the "flexibly specialized," small-firm-based, and decentralized economies of

In these systems, the firm that collaborates is able to innovate new products faster and, by frequently shifting production partners in the manufacturing process, to produce shorter runs of a much more varied product palette (e.g., see Piore and Sabel, 1984; Best, 1990; Womack, et.al., 1991; Sabel, 1993; Saxenian, 1994). The wider the web of egalitarian and collaborative relationships in a region should promote the greater competitiveness of and higher returns to all participants. Saxenian (1994), Locke (1994), and Herrigel (1992), for instance, found evidence of the benefits of wider networks of mutually-supportive interfirm relationships in specific regions in California, Italy, and Germany, respectively. Thus, market conditions (i.e., fragmentation), new computer-based production technologies that favor shorter production runs, and competition from successfully networked, and therefore, highly innovating competitors abroad should be pushing American manufacturers toward flexible and networked production arrangements.

This view describes some current tendencies that I found in the Chicago region. Its large multinational manufacturers are constructing new long-term and highly collaborative relationships both with workers inside the firm and with suppliers externally. For instance, suburban-based Motorola--through its supplier training programs--has led the way in setting

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Europe (e.g., see the comprehensive look at the Italian experience in Pyke, Beccatini, and Sengenberger, 1990; Herrigel's, 1990, study of Germany). Others (see especially Schmitz and Musyck, 1993, and Schmitz, 1993, 1994) have extended the lessons of interconnected small firm districts to developing countries. Still others have studied how large Japanese manufacturers achieve "flexibility" in production by linking up in mutually supportive relationships with smaller suppliers (e.g., Cusamano, 1985; Dore, 1986; Kaplinsky, 1988; Womack, et.al., 1991). Womack, et.al. (1991) derived the model of "lean" production--where corporations reduce costs, in part, by outsourcing and cutting on overhead expenses--from their study of the decentralized operations of Japanese auto companies. Many (e.g., Best, 1990) have joined these various production models together into an overall concept of a flexible manufacturing or production system.

up such networks with an outside set of collaborating supplier firms. Yet, Chicago's metalworking network that has existed among small suppliers in the metal parts and components industry for much of this century is weakening. Many member firms quit the association--while, at the same time, they discontinued collaborating with each other--as competitive conditions in the global manufacturing environment worsened in this time period. Many metalworking shops began to deskill their labor process by substituting semi-skilled specialists for the "all-around" or broadly-trained craft worker. Metalworking shops also began competing fiercely on price and following other cutthroat tactics--at the same time they tried to upgrade customer service and product quality. In some ways, these small firms were "sweating" themselves and their workers to stay alive, although they were also attempting to improve their operations. Over the long run the outcome could go either way--competitive pressures could create world-class metalworking suppliers, or the opposite--a set of marginal, low-profit, and "low tech" players in Chicago's industrial complex. If market conditions are favorable today for small craft-based producers with a history of collaborative practices, as theorists in the flexible production camp argue, why is Chicago's metalworking network struggling today? Both market conditions and new technologies, these theorists say, should be pushing all manufacturers toward greater interfirm collaboration and a high-skill-oriented method of manufacturing--the very features that Chicago's metalworking shop owners appear to be abandoning. The flexible production literature has little to say about this latter trend.

A Critique of Flexible Production and Its Shortcomings in Explaining the Chicago Case

Some researchers--in critique of the flexible production model--offer a different view of today's events that could explain current developments in Chicago.[16] This alternative view holds that "oligopoly is alive and well"[17] in the current period of flexible, collaborative, and decentralized (i.e., vertically "disintegrated") production arrangements. Yet, this view also exhibits shortcomings in explaining the Chicago metalworking case and the ability of firms in this industry to have maintained a network until recently. I discuss this theoretical interpretation and its limitations in this section.

The researchers who critique the flexible production model note that although manufacturing activity itself is becoming increasingly decentralized today--that is, large, vertically integrated corporations are outsourcing a greater proportion of their manufacturing and assembly operations than they had under mass production--other related activities are increasingly centralizing. Today's corporate actors--such as the customers of Chicago's metalworking industry--are thought to be concentrating their economic power into joint ventures and other alliances in order to maintain tight control over markets, sources of finance, and R&D activities. Harrison (1994) has coined the term, "concentration without centralization," for what is happening in manufacturing today. These large multinational

[16] Although many criticisms have been levied against this literature in the past decade (see Gertler, 1988, for a synopsis of many of the major critiques), I focus here on researchers who accept that global manufacturing is changing into decentralized production today, but question the distribution of benefits and market power that come from this trend. This includes the work of Amin and Robins (1991), Martinelli and Schoenberger (1991), and Harrison (1994).

[17] This is the title of an article by Martinelli and Schoenberger (1991).

manufacturers aim to become "lean and mean" by partnering with only a select few suppliers to carry out the manufacturing activity. Other suppliers remain marginal players; they do not innovate nor earn higher returns for their participation. Instead, they absorb a greater share of risks and costs. Industrial dualism again characterizes relationships under flexible production, as it had earlier under mass production, with smaller, locally tied firms and their workers losing out compared with the large manufacturers and their select suppliers (Gertler, 1988; Harrison, 1994).

Although this critique of the flexible production literature accurately describes how many large multinationals are marginalizing small firms in Chicago's metalworking industry today, this literature cannot entirely explain the historical rise and fall of Chicago's collaborative metalworking network either. Marginalization of Chicago's metalworking network is a new phenomenon, not a continuation of the status of these small firms from the period of mass production, as this critique holds. It, too, falls shorts theoretically by producing a stylized or static view of today's production arrangements.

From the foregoing, therefore, we see that the flexible production literature and its critique offer a dichotomous view of the results of collaborative interfirm relationships. The proponents of flexible production describe how this system's egalitarian intra- and interfirm relationships, collaboration, and the sharing of trust lead to the development of collective standards to ensure fair competition and a fair return to all. Those who critique today's flexible production networks cite the unequal power of the large multinational firm that attempts to control interfirm relationships as leading to the exploitation of smaller suppliers, the suppliers' workers, and often the regions in which such small firms are situated. I would argue that the static and stylized picture of such production arrangements that both sides to this debate have offered leads to this dichotomous outcome. Both models describe the Chicago metalworking industry at different times in its history. The firms in this industry at times prospered by establishing a collaborative interfirm network; at times this network did not prevent these firms from exploitation by larger corporate entities and other interests outside the metalworking network.

The flexible production literature and its critique offer us such different views of today's flexible production arrangements because they abstract these views from one point in time. Researchers from both sides "freeze" interfirm, and labor-management, relationships in order to develop an internally consistent and stylized production paradigm. This result--the offering of relatively static models of the new flexible and old mass production paradigms--is curious, given that many of these researchers also describe in detail the dynamic processes by which these systems formed. Nevertheless, once formed, these production paradigms are described as becoming self-sustaining. They endure because institutional practices within each manufacturing region support the requisite arrangements for the system, as does the larger macro market structure. If a region has had networked relations among firms as part of its legacy--they should continue, this literature assumes. If large firms control production arrangements, on the other hand, they will also continue to do so indefinitely (the view of both those looking at America's past structure of mass production and those who see the new flexible production arrangements as controlled by large capital). This stability in production arrangements did not occur in Chicago's metalworking industry. How can we better explain the shifting fortunes of this industry's interfirm network over time and its change from the "high" to the "low road" and back again?

A View of Networking That Allows for Variation in Time and Space

Several other theorists have started to make a contribution in a direction that allows for more variation in the extent of collaborative interfirm relationships and networking across time and space. I have lumped these separate pieces of research together here because, by attempting to explain such variation, they offer some initial theoretical steps in understanding the experience of Chicago's metalworking industry. However, as I also discuss, I feel the work of these researchers has not gone far enough. I carry their inquiry further by describing a life-cycle model of manufacturing network development in the following section.

The first piece of research that I discuss that gets at variation in collaboration is Locke's (1994) comparative study of industrial relations in different regions of Italy. He describes a "hybrid" region of Biella that shows shifting patterns of hierarchy and collaboration occurring among its industrial actors over time. Locke calls the Biellese a "hierarchical" region to distinguish it from the distinct and polar opposite cases of "policentric" versus "polarized" regions. Milan represents the policentric case of dense collaborative associationalism between firms, workers, and residents in this region. By contrast, Turin has hosted a top-down and confrontational set of industrial relationships. (Biella, as a hybrid, is a mix of these two.) In all three cases, Locke contends, historical legacies condition actors' responses to current day crises in manufacturing. Actors in hybrid regions exhibit a history of both collaborating and polarized relationships because they draw on past histories of each of these patterns. Thus, for Locke, "embeddedness"--that is, the past contexts in which actors are placed--is a key explanatory variable in predicting the amount and type of collaboration or networking that occurs in different regions and whether collaboration varies over time.

Schmitz (1995, 1996) found a similarly fluctuating history of collaboration among firm owners, workers, and others associated with Brazil's shoe industry in the Sinos Valley. His explanation for such fluctuations is that the basis of trust changes over time. It expands from a trust that is initially accorded to actors by others who belong to the same social grouping (an "ascribed" trust) to one that is earned among strangers at the global scale. Ascribed trust occurs among actors involved in economic transactions at a relatively local scale--and at the initial stages of industrialization within a region. Earned trust takes on greater significance in a region as industrial clusters of firms grow, prosper, and become more linked to international markets. Thus, variations in past relationships in one case, and the acquisition of new (i.e., global) partners in the next, fosters the rise and fall of collaboration over time in these regions.

Schmitz' work shares a similar concern to the work of Gereffi (1994, 1995) and the critiquers of the flexible specialization literature that I discussed above--all look, to a greater or lessor extent, at how local regions are inserting themselves into the global economy. Gereffi aims to take this concern, however, and develop it into a broad framework that can allow for variations in the types of networks and their outcomes for network participants across both time and space. He calls this a global commodity chain framework (GCCs) because he proposes that researchers can better predict interregional inequality by studying firms, their transactional relationships, and the networks they create across political boundaries rather than specific regions (or nation states). Global commodity chains produce different outcomes for regions due to differences in competition and innovation at various segments of a world-wide production chain. Core regions do well because they host segments of a production chain whose firms rely on innovation in order to compete. These innovators garner a higher rate of return for this constant product and process improvement. Peripheral regions do poorly because their firms are linked into a global commodity chain at the low-skilled, low-cost segment. The flexibly specialized industrial districts that flexible production adherents describe--and that I discussed earlier--are treated in the GCC framework as a special case of firms in certain regions that do well because they exclusively serve the "segmented demand and more discriminating buyers in developed country markets" (Gereffi, 1994: 99).

The GCC framework supposedly does not see any particular interfirm network as superior or dominant. However, Gereffi focuses on describing how transnational actors ("big buyers" or "big producers") control production chains at the global level which grants them greater power than other chain participants. Gereffi's conclusions mirror those who have critiqued flexible production that I have already discussed; his conclusions, therefore, are equally static models of today's interfirm relationships. However, the GCC framework also allows a "window" in our theorizing for how micro actors may mediate the actions of those that operate at the global level. This "theoretical window" grants one some room for explaining the Chicago metalworking case and the instances when these small firm actors resisted the contractual terms of their larger customers. Thus, it is the GCC framework rather than its conclusions that are most helpful to the research I present here.

Many of the features of manufacturing networks that Locke, Schmitz, and Gereffi present occur in the Chicago metalworking case as well, and relate to the rise and fall of collaboration in this region. For instance, the metalworking industry's environment offered varied historical patterns of industrial relationships as in Biella, its metalworking actors occasionally changed partners which modified the basis of continuing collaboration as in the Sinos Valley, and the industry's linkage with globally oriented multinational customers who sought to control contractual relationships as in Gereffi's "producer-driven" networks also contributed to declining collaboration among suppliers in certain time periods. Yet, I feel many of these factors are symptoms of the change endured by Chicago's metalworking network rather than a complete explanation of the process underlying it. I intend to build further on the work of these three theorists in the next section as I describe a life cycle model of network dynamics.

III. COLLABORATIVE MANUFACTURING AS A DYNAMIC PROCESS--A LIFE-CYCLE CONCEPTION OF NETWORK DEVELOPMENT

As I recounted in the last section, two sides to the flexible production debate argue that either interfirm networks and alliances can last over the long run unchanged if they are embedded in a supportive set of institutions, or that such networks survive only a short while before they are exploited by multinational firms and other global players. But, the flexible production literature and its critique fail to explain the Chicago metalworking case because they offer us stylized pictures of such networks at a point in time. These pictures are dependent, therefore, upon the specific set of relationships that occur in the time period each set of researchers focuses upon. In this research, I have alternatively looked at how manufacturing networks develop through time and have found a fluctuating pattern of network formation and decline in the Chicago region that requires explanation. While other researchers (e.g., Locke, Schmitz, Gereffi) offer partially satisfying explanations of how variation in networks and levels of interfirm collaboration occurs, these explanations require more elaboration. In this section, I discuss an alternative life-cycle conception for how manufacturing networks operate. This conception extends the work of these three researchers by highlighting several new themes.

First of all, I found that interfirm networks are often formed as a collective resistance strategy to protect the network's participants against harmful forces in the environment, rather than merely as a mechanism to improve business performance. Chicago's small metalworking firms set up an exclusive enclave to provide support to, and a "shelter" for, the partnering firms and their workers. This network protected the metalworking suppliers against the overly cutthroat and exploitative tactics of their multinational customers that Gereffi, Harrison, and others also mention. At the same time, Chicago's metalworking network excluded these customer firms from the benefits of this network. Therefore, a second key theme I uncovered is that this network conferred a power advantage to its participating firms. This stimulated a challenge by the actors who were excluded--namely these multinational customer firms and their CIO-unionized workers. This challenge took the form of a substitute for the metalworking network. In the postwar period, this substitute was the multinational customer firms' captive, or in-house, metalworking shop. Today, a similar substitute is the corporate-sponsored and controlled supplier network.

A third and final theme speaks to the role of organizing in establishing and maintaining interfirm networks. Not only were Chicago's small-metalworking-shop owners able to rebuild their network after a period of disarray and challenge, but they enhanced the power of their network through several strategic actions. They consciously identified new and critical network participants; they controlled access to metalworking skill and expertise through an exemplary training program; they anticipated the industry's areas of obsolescence through strategic planning and technological activities. In other words, Chicago's small metalworking firms collaborated strategically at the local, or micro, level to mediate a set of disadvantageous environmental conditions and change them into opportunities. Network relations in this industry, thus, take place on a highly contested terrain that stimulates the birth, decline, and rebirth of these same networks.

A life-cycle pattern of network formation and decline exhibited itself several times in the history of Chicago's metalworking industry. (Refer to Graph 1-2.) By tracing these life cycles of network development in Chicago's metalworking industry over time, we see that these small firms both collaborated at times, and also gave into cutthroat behavior and hierarchy. At times, they have been able to produce a high road cycle for the network's participants--that involved sufficient returns for firm owners and workers, high quality products, the skill development of their workforce, and frequent innovation in their industry. Chicago's metalworking firms have also experienced declining profits and prices, the "sweating" of labor, technological stagnation, and their marginalization as small suppliers when their network was contested by others in the regional complex and a low-cost/low-wage path held sway. But the true measure of this network's durability as a critical actor has been the ability of its member firms to reestablish collaborative bonds for new situations and environments. Hence, this case of the Chicago metalworking industry's collaborative enclave grants us a more dynamic view of how network relations operate. I will discuss these themes in greater detail now and indicate how in subsequent chapters I elaborate on them further.

Collective Organization as a Resistance Strategy

Chicago's metalworking shop owners originally founded a collaborative network as a "shelter against risk"[18] and cutthroat bidding practices that large customer firms of metalworking promoted in the mid-1920s. I detail this history in Chapters 2 and 3. Facing their potential exploitation at the hands of the region's large mass producers in this period, Chicago's metalworking shop owners acted strategically by forming a collaborative network of suppliers for protection. It is critical to understand that these shop owners in the newly emerging tool-and-die subspecialty within metalworking were motivated to seek this alternate path as much for protection against outside forces--a goal the flexible production literature ignores or underplays--as well as to improve work performance and product quality--goals this literature recognizes. Facing overcapacity of metalworking shops following World War I

I borrow the terminology developed by Berger and Piore (1980) in their investigation of patterns of dualism, but employ it to describe how small firms rather than large ones have protected themselves. In that volume, Piore describes how large American mass producers also avoided risk by shunting it to small firms in the mid-1900s. This happened briefly in Chicago as well, but the region's small metalworking firms strategically counteracted the mass producers' "shelter" with another one of their own.

and the encouragement of cutthroat behavior by their large "customers" through unscrupulous bidding practices, many shop owners began slashing prices and wages to stay afloat. Several leading shop owners joined with representatives of the Machinists Union Local #113 to develop a way for these small firms to collectively avoid some of the costs and risks inherent in business and the marketplace--especially the low margins they were experiencing which discouraged long term investment in skills and machinery.

To build this collective mechanism for protection, Chicago's metalworking shop owners drew upon alternative models and ideologies to change the rules of the game in their favor within the region at large. These other models of industrial governance included: 1) Chicago's German ethnic enclave, with its own collaborative ethnic institutions to which many shop owners belonged (Holli, 1977; Keil and Jentz, 1983; Hirsch, 1990), and 2) the collaborative labor-management models with which the craft segment of the Chicago labor movement--as represented by the Chicago Federation of Labor (the CFL)--was experimenting (Brown, 1931; Newell, 1961). In this way, through collective action, these shop owners bucked certain constraints that the dominant institutional context presented to them.

Recent debates of the new institutionalists within organizational theory offer insight that helps to interpret this aspect of the Chicago metalworking case. Much of the new institutionalism in sociological and organizational theory has posited that the structure of existing institutional environments shapes the actions of individuals (Granovetter, 1985). Actors do not make choices; instead, they are driven by their contexts (e.g., dominant value system, beliefs, practices) to action. The flexible production literature draws heavily on this notion of institutional "embeddedness" to explain how certain institutions and contexts encourage interfirm, and labor-management, collaboration or, by contrast, its opposite of mass production and hierarchy. But, as DiMaggio and Powell (1991b), Powell (1991), Galaskiewicz (1991), and others[19] point out, the notion of institutional embeddedness clouds the issue of how individual actors might change their environments. How, for instance, could Chicago's metalworking shop owners buck the constraints of the dominant mass production ideology that was present in Chicago in the mid-1900s? The notion of institutional embeddedness clouds the issue. However, as these authors point out, even though existing institutional arrangements constrain what actors (e.g., firm owners, workers) do, actors also confront or resist this existing structure if resistance meets their own goals better. Actors--such as Chicago's metalworking shop owners in league with the Machinists Union--can play on ambiguities or contradictions in the environment to construct new rules of the game that more effectively serve their interests and need for power. As Galaskiewicz (1991: 295) points out in his study of how business leaders in Minneapolis-St. Paul changed the dominant rule systems for corporate giving by forming a new set of alliances among the business community, **the "macro social-order"** of incentive systems, ideologies, and belief systems (i.e., the larger institutional environment or context) **is only "loosely coupled... [with] the micro order**... of [individual] preferences, capacities, expectations" and actions (emphasis added). Therefore, even though Chicago's metalworking shop owners were embedded in a dominant set of institutions that fostered hierarchical interfirm relations and limited

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See the edited volume by DiMaggio and Powell (1991) for the full range of debate on this issue.

collaboration, these actors were able to strategically take actions that resisted this dominant context.

<u>Strategy Begets Counter-Strategy as "Outsiders" Challenge Chicago's Metalworking Network</u>

Because Chicago's initial collaborative metalworking network was successful in achieving a "high road," it was challenged by other actors outside the network. Several theorists in the flexible production debate describe this eclipse of craft-oriented network production, more generally in the United States. These explanations help to illuminate many of the events that occurred in Chicago in the 1950s but are incomplete. A life-cycle model more clearly helps us understand this period of decline of Chicago's metalworking network, as well as its subsequent resurrection that I discuss in the following section.

Whereas the proponents of flexible production correctly interpret the challenge to a craft network like Chicago's in the 1950s as one involving "outsiders" to craft production who wanted to set up an alternative production arrangement, they are incapable of understanding the conflict between multinational customers and their metalworking suppliers today. (This is because this conflict involves two different collaborating networks which these theorists assume should be acting in concert.) Those who critique flexible production and describe the control that multinationals have over global supply relationships today come closer, theoretically, to understanding both the past and current challenge to Chicago's metalworking network. It is a challenge of control over interfirm production relationships that has frequently emerged in the Chicago setting. But because this critique assumes that global actors will gain ultimate control over interfirm relationships, these theorists also provide only part of the story. They cannot understand how Chicago's metalworking network fought back and resurrected itself in spite of these challenges, as I lay out in the next section. For this we need a life-cycle model of network development.

By the 1950s, Chicago's metalworking manufacturers had become high quality producers who invested in the skill training of their workers, paid them a desirable wage while offering an interesting and challenging work environment, upgraded the technological sophistication of the machinery at which these craft workers labored, and, in general, improved the competitive position of the metalworking industry at large. Chicago's skilled machinists and other metalworking craft labor were now among, if not the, highest paid in the country. Its metalworking machinery industry, including the tool-and-diemaking specialty, had grown to become the second largest employer within this industry of any metropolitan region in the country.[20] Yet, this high performing industry was challenged by other actors, outside the boundaries of this network (i.e., the CIO and Chicago's large "customer" firms), who wanted to achieve similar goals for themselves. For example, the region's unskilled workers, newly organized in the industrial unions of the CIO, demanded and obtained favorable contracts from the large corporate manufacturers. As these lower skilled workers succeeded in raising their wages, the skilled craftworkers in Chicago's metalworking shops felt their position deteriorate. These craftworkers employed increasingly aggressive tactics

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In 1954, for instance, the metalworking machinery industry (SIC 354) in the Chicago metropolitan region employed about 20,400 workers; the metalworking machinery industry in the Detroit metropolitan region provided about 41,100 jobs and in Cleveland about 16,200 jobs (U.S. Census of Manufactures, 1954).

against the small-shop owners who, at the same time, saw their work evaporate into their customers' expanding and in-house, or "captive," metalworking shops. Because of this new competition and loss of business, the shop owners abandoned the "high road" of investment and high wages as their collaborative network fell apart. Thus, the past success of this collaborative venture in metalworking brought about its demise because, as I argue in Chapters 4 and 5, outsiders to the network (i.e., the CIO and "customer" firms) sought to replace it with the captive shop.

Flexible production proponents (and the earlier segmentation theorists)[21] would describe the decline of Chicago's craft-oriented metalworking network as an inevitable succumbing to the dictates of mass production in this country in the mid-1900s. As recounted by Piore (1980), Piore and Sabel (1984), and others, lower-skilled mass production workers throughout the country revolted under the banner of the CIO and, acting in concert[22] with their large corporate employers created another shelter against risk. The large mass producers offered their striking workers higher wages and seniority provisions to protect against lay-offs. This made it difficult to downsize in periods of slack demand, so the large manufacturers marginalized outside suppliers by utilizing them as buffers--employing them in upturns and taking in their work during slowdowns. In this way, large firms in this country captured the stable portion of demand for themselves and their unionized workers (Piore,

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[21] For a review of the "segmentation" literature, see Rosenberg (1989).

Piore (1980) describes this as an unintentionally concerted action by industrial labor and the large mass producers to construct a mechanism that would improve their joint fortunes. Others ascribe a greater amount of agreement between the CIO and mass producers in erecting this shelter to meet their needs/goals.

1980). Thus, the conflict in Chicago in the 1950s has been interpreted by this literature as the complete dominance of one regime over another (i.e., mass production's eclipse of traditional and collaborating craft production).

This view might work as an explanation of Chicago in the 1950s; it does not capture the conflict between the small-firm network in metalworking today and its larger multinational customers. For that, we need to look to the critique of flexible production. Were I talking about Chicago's collaborative metalworking network today, the flexible production literature has little to say about interfirm conflict. Those who write about the high performing flexible production regimes today describe how collaborative relationships widely and equally infuse the regions in which such regimes operate (e.g., see Saxenian, 1994). Those who critique this literature, by contrast, discuss how multinational firms utilize their greater global market power to subvert and control small-firm networks. For instance, Martinelli and Schoenberger (1991) and Harrison (1994) describe how as demand for the products of the small, networked firms in northern Italy has fallen off in recent years, a reconcentration of firm ownership and control has resulted, bringing with it a return to more hierarchical relationships in such regions. A large firm is now often "at the head of an increasingly structured tree-like system of quasi-captive suppliers" (Martinelli and Schoenberger, 1991: 124). Even Gereffi--who states his framework is less deterministic in outcome--argues that global transnational firms will control most supply chains (or interfirm networks) worldwide today. This explanation comes closer, I would argue to the Chicago case in both periods of conflict (the 1950s and today). It falls down, however, in that it assumes the demise of collaboration among small-firm actors is permanent--an outcome that also did not occur in the Chicago case as we see next.

The Mark of a Good Organizer--Recreation of the Metalworking Network under Changing Circumstances

By the end of the 1960s, Chicago's collaborating network of independently owned metalworking shop owners had recreated itself, confounding the predictions that the flexible production literature and its critique would have made for this complex. The flexible production literature assumes that mass production eroded most craft-like collaborative networks in the postwar period. The critiquers of flexible production, and even Gereffi, take a similar stance. (Gereffi, for instance, argues that most commodity chain relationships took place within vertically integrated corporations in this period rather than with small suppliers on the outside.) As I discuss in Chapters 6 and 7, however, Chicago's small metalworking firms were able to recreate a collaborative interfirm enclave that could withstand the challenges of this era. I will briefly recount the strategies this network promoted to reconstitute itself as a strong supplier enclave up until the most recent period.

Chicago's metalworking trade association engaged in a series of particular strategies to reconstitute itself in the early 1960s that mirror the strategies it initially employed at the time of its founding in the mid-1920s. These strategies center around a set of organizing tactics that proved critical in rebuilding a collaborative group ethic among many of the participants in this industry. The first strategy involved **recreating a new enclave mentality among a critical set of partners** who could formulate a new set of institutions and practices to encourage collaboration. In the 1920s, this collaborating alliance involved the metalworking industry's shop owners, their workers, and the Machinists Union; this alliance was helped along by the common German and Scandinavian ethnic identity of these participants. In the 1960s, this alliance looked different. It now included the large manufacturers' captive shops along with the contract metalworking shop owners--but did not include the Machinists Union. The ability to recreate itself as an inclusive network became especially important after German ethnics assimilated into American social and political institutions in the postwar period.[23] Metalworking shop owners began to coalesce around new interests: training, a common culture emphasizing the captive shop and the modern manufacturing operation, and an anti-union sentiment. By recruiting the customer-owned captive shops into their association, the independent shops persuaded the captives to adhere to a collaborative production ethic which promoted the sharing of information, technology, and work among the network's participants. This strengthened loyalty to the network over loyalties to others in Chicago's production complex.

A second critical strategy that Chicago's metalworking shop owners employed was to **balance tactics of accommodation with those that increased local network control.** Initially facing the threat of the captive shop in the 1950s, the owners of Chicago's independently owned metalworking shops capitulated. Captive shops were a lower cost alternative at the time and the multinational customers directly pressured the independent

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Although Chicagoans waged a German-assimilationist campaign in the late 1910s, during and following World War I (Holli, 1977), assimilation remained gradual. Chicago's metalworking shop owners continued to meet and do business deals at Chicago's Germania Club until the early 1960s when it ceased this practice for lack of interest (TMA Board Minutes, 1960s).

shops to lower their prices by cutting wages. Yet, if these independent shop owners allowed this situation of low bidding to continue indefinitely, their product quality and labor skill base would also deteriorate along with their profit position. Therefore, these shop owners needed to collectively increase their control over events to again resist their long-term marginalization. However, were Chicago's metalworking trade association and its members to confront the multinational manufacturers with a series of demands (e.g., higher prices for their metal parts), these customers would angrily "exit"[24] the relationship and find supply alternatives for metal parts--much as they did initially by expanding their captive shops in the 1950s and 1960s. To solve their dilemma, Chicago's metalworking shop owners, through their trade association, effectively applied a "freeze-thaw" approach, as Walton (1975) calls it.[25] This meant they developed strategies to both seek increased power vis a vis their much larger customer/captives, while also negotiating greater cooperation between the two groups.

For instance, when confronted with the captive shop challenge in the mid-1950s, the association's leading shop owners at first accommodated to customer demands (i.e., they negotiated in a trusting manner). But, over time they calculated a way to increase their relative power vis a vis the multinational customers, in a non-confrontational way that would not also jeopardize attempts to strengthen cooperation with the large customers. One tactic the shop owners employed was to maintain control over access to metalworking skills in the

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[24]Helper (1990, 1991) develops Albert Hirschman's (1970)"exit-voice" dichotomy more fully to describe customer-supplier relations in the American auto industry.

24 As Walton (1975) hypothesized, actors who face conflicts with another group often try to balance tactics that increase their relative power with those that build trust in order to resolve such conflicts with the other group. He draws from examples of labor-management, international, and community organizing conflicts to illustrate his argument.

region by operating one of the largest and only metalworking training programs through the trade association. This meant that the captive shops would have to come to the association for access to skills and metalworking expertise (i.e., the large customers again became dependent on the knowledge of the independent shops). Many captives joined the association in the 1960s to access its training program. Afterwards, the association's independent shop owners started charging a training fee and increased association dues from the captive shops. This "taxing" of the captive shop members allowed the association to subsidize a host of new services to its smaller and less wealthy members. In other words, these measures increased the relative returns to the independent metalworking shops so they could continue to maintain their long-term investment behavior and avoid marginalization.

A final strategy the metalworking shop owners practiced to rebuild their collaborative network and avoid marginalization of small firms in the industry was **to create a series of institutional mechanisms to confront their possible obsolescence** as craft-like producers. By using challenges to the labor, production, technological, and other practices of these small suppliers as a rallying point, the trade association prompted its member firms to come to terms with changing practices--but in a collective manner that generally retained the high skilled, high quality, and collaborating ideal of this craft community.

One key instance of industry obsolescence came in the early 1960s when large manufacturers adopted numerical control (NC) to computerize the skilled labor process in parts production and replace costly craftworkers with a less expensive and less skilled workforce to operate these new machines. At the time, many observers predicted that the NC revolution would stimulate the "demise of the traditional small [metalworking] job shop" which utilized skilled craft labor to achieve similar precision (IIT/Corplan, 1964: 45). Once the trade association's shop owners recognized how NC rendered the small job shop obsolete, they organized their constituency to group action. They created a Technical Committee within the association. This committee partnered with IITRI (the Illinois Institute of Technology's Research Institute), and other consultants who had predicted the job shop industry's demise, to disseminate knowledge about NC and other new technologies among the smaller suppliers in the metalworking industry; it sponsored an ambitious program of subsidiary activities, such as a series of annually-held technical and management conferences for the metalworking and allied industries; and it began preparing long-range plans for the industry to anticipate how other trends and customer strategies would obsolete supplier practices in the future. Through actions such as these, Chicago's metalworking shop owners did not content themselves with passive reaction to change, but sought to take leadership as to how that change would occur within the region. In this way, they also ensured that their collaborative network and model of production would also remain intact.

What I have argued through this case study of Chicago's collaborating network of firms in metalworking, is that taking a life cycle approach to understanding how manufacturing networks form, mature, and decline more closely captures the reality of flexible production relationships than has the literature up to now. A life cycle approach allows us to model both the rise and fall of collaboration among various actors in regionally based regimes of flexible production. We see how actors create interfirm networks and other collaborative production relationships to meet their specific strategic goals--and how the network's goals may not coincide with those of other actors in the region. Further, we see how establishing partnerships among actors grants them power, while fostering retributional actions on the part of others. Power imbalances among relative groups of actors contribute to the birth and rebirth of manufacturing networks and alliances; they also produce a more dynamic terrain in which such alliances operate.

CHAPTER 2--A STAGE SETTING: THE RESTRUCTURING OF CHICAGO'S METAL-RELATED MANUFACTURING COMPLEX IN THE 1920s AND THE POTENTIAL FOR INDUSTRIAL STRIFE

Introduction

In this chapter, I provide a stage setting for the institutional account of Chicago's collaborative metalworking network that follows in subsequent chapters. This collaborative network of metalworking firms was formalized as a trade association in 1925. Chicago's small craft-oriented tool-and-diemaking shops comprised the core of this association. These highly skilled "tooling" shops--most still employing fewer than twenty workers each even today--evolved out of a long history of metalworking jobbing shops in this region. Chicago's jobbing shops in metalworking--also called machine shops--produced a variety of metal parts and machinery which were often custom-ordered by other manufacturing firms. As Bruce Braker, the current Executive Vice President of the metalworking trade association--now called the Tooling and Manufacturing Association, has explained--everyone knows that Chicago is, and has always been, a "job shop town". What was the environment like that surrounded the founding of Chicago's collaborative network of metalworking job shops?

By the mid-1920s, mass production was just taking off--in Chicago and elsewhere in this country. This prompted a wholesale shift away from the highly skilled craft tradition that the metalworking job shops represented. Since mass production "deskilled" the manufacturing process, it decreased the demand for the skills of highly trained machinists. Facing a loss in status and of their livelihood, machinists in manufacturing regions throughout the United States objected strenuously to these developments, raising the specter of class warfare over this restructuring of manufacturing. At first, employers were divided over how to deal with the increasing aggressiveness of machinists in the country at large. Some, notably the National Civic Federation (NCF), counselled cooperation between labor and management in the 1910s and 1920s. In the main, however, this group remained a minority. Instead, "open shop" advocates led by the National Metal Trades Association (the NMTA) and the National Manufacturers Association (NMA) persuaded employers to take a "hard line" against unions such as the International Association of Machinists (also called the IAM, or the Machinists Union). Keeping unions out of their manufacturing plants, these employers could maintain an open shop and push through the redesign of their labor process without the organized opposition of their workers. It is into this national context of the contested restructuring of American manufacturing--that moved firms away from a dependence on craft knowledge and toward a mature system of mass production--that Chicago's metalworking trade association emerged in the mid-1920s. I will discuss its emergence and the particular local features that gave rise to it in the following chapter.

I. CHICAGO'S MANUFACTURING SECTOR IN THE 1920s

The story of Chicago's small-firm-based metalworking sector begins in 1925, the year the highest-skilled segment of this industry formed a trade association to look after its collective interests. Before laying out this institutional history, it is important to understand the national and local context in which the metalworking industry operated. In this section, I will acquaint you with the region's manufacturing complex in general, and the critical actors and industrial sectors that comprise it. How prominent was manufacturing to the region's livelihood in the mid-1920s? Within manufacturing, what place did metalworking hold?

What were jobs in these manufacturing establishments like and did they pay well? How were such jobs changing given the rise of mass production in large manufacturing plants such as Cyrus McCormick's reaper factory in Chicago? I will answer these questions below.

A Statistical Snapshot of the Region's Manufacturing Industries

To put together a statistical picture of Chicago's manufacturing complex, I draw from the U.S. Census of Manufactures and various historical accounts of the period. I use the state of Illinois as my primary geographic unit throughout the dissertation and as a proxy for the Chicago region, as the data is most consistent for the 1920s through the 1990s at this level and it allows comparisons with other regions (i.e., states).[1] In reality, the Chicago manufacturing region early on spilled over city boundaries into surrounding suburban areas and even into the adjacent state of Indiana (see map of the region in Appendix 2-1). Manufacturing in the Chicago region is equal to approximately two-thirds or greater of all manufacturing activity in the state (in terms of jobs, number of firms, share of value added),

[1] Data difficulties include the fact that census data at the subnational level was spotty in the Depression years of the 1930s. Some state level data was available; no data was released for cities or regions at the substate level then. In the 1920s, data on manufacturing was released for the larger cities in each state. However, this is an artificially small boundary for the Chicago region (i.e., the city proper) because manufacturing activities had already spilled into the outlying suburbs which do not get taken into account. For example, Western Electric's Hawthorne Works plant, a large employer and important industry (communications equipment) for the history of Chicago (see Cohen, 1990), was located just outside city boundaries in the community of Cicero in the 1920s and, thus, does not appear in the city statistics. In the postwar period, starting in 1947, census data was released for metropolitan areas. Chicago's Standard Metropolitan Statistical Area (SMSA) took account of the fact that the city and region spilled over into several adjacent suburban counties, and the Chicago-Northwestern Indiana SMSA added part of northern Indiana to this region. However, the counties that comprise the Chicago SMSA have also been changed over time as the region expanded, making this unit incomparable over time.

so utilizing Illinois as the unit of analysis is not so wide of the mark.[2] At times, I will compare state-level manufacturing activity to that recorded for the Chicago region to fine-tune your understanding of this complex.

In the mid-1920s, then, what was the Chicago region's manufacturing complex like? By this time period, the region had already developed a long manufacturing history. Many of the region's key industries in the early twentieth century had existed for almost a century, since the time of or before the city's founding in 1833 (Pierce, 1937). For instance, slaughtering/meatpacking and railcar repair and manufacturing grew out of the city's early history of servicing trade between Eastern population centers and the West. Meatpacking started in the late 1820s with "'Arch' Clybourne's place up the North Branch [of the Chicago River]" and grew quickly so that by the 1840s the quality of this product was such that "Chicago beef gained a widespread reputation, and was shipped not only to the New York and Boston markets, but also to Montreal and London" (Pierce, 1937: 137, 138). Other industries using the byproducts of meatpacking--for example, leather tanning, soap making, boot and shoemaking--also were founded at this time. The region's first railroad line was completed by 1849, which facilitated trade with the rural interior, and within seven more years, nine other railroad companies joined it to service the city (Pierce, 1937; Mayer and Wade, 1969).

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[2] In 1947, for instance, when the census started keeping statistics for metropolitan areas, and into the 1950s, total manufacturing jobs in the Chicago metropolitan area equalled 72% of all manufacturing jobs in Illinois. The larger Chicago region--including northwestern Indiana--held about 953,000 manufacturing jobs in this year; this is 80% of all such jobs in Illinois (Census of Manufactures, 1958). The Indiana jobs, of course, would not be included in the Illinois state totals. This however, gives the reader a sense of the comparable size of these different geographic units.

Still other industries arose early on in the city's history to service the needs of surrounding rural communities in the wider Midwest. One of these was the making of agricultural implements. As early as 1833, a local blacksmith, Asahel Pierce, started manufacturing "'prairie ploughs' and other agricultural implements" (Pierce, 1937: 142). Others soon joined him, stimulating much experimentation and a host of plows well-known throughout the Midwest--"the 'Chicago Clipper,' 'Naperville Premium Plough,' 'Concave Steel Plough' and the widely used 'Breaking Plough' (Pierce, 1937: 142). The most successful of these early manufacturers was Charles Gray, "whose grain cradles and scythes achieved, by 1845, a wide popularity among farmers of the Northwest" (Pierce, 1937: 143). Gray obtained a contract to produce Cyrus McCormick's "Virginia Reaper" in 1846 and by the following year the two entered a partnership inducing McCormick to move his operations north to Chicago (Pierce, 1937; Hounshell, 1984). The iron (and later steel) industries were also founded early in Chicago's history by local blacksmiths and Pierce's foundry in 1833, "[a]s a natural concomitant of the agricultural implement industry and of the rise of steam transportation on the [Great] lakes" (Pierce, 1937: 143). It later serviced the Midwest's growing auto industry from the early 1900s on (Newell, 1961).

These early industries were still present and dominant in the region almost one hundred years later in the 1920s, but by then they and manufacturing in the Chicago region had grown quite sizeable. The census shows that manufacturers in Illinois provided almost 800,000 manufacturing jobs (Table 2-1). In 1923,[3] railroad car manufacturers and repair

[3] I use 1923 data here instead of 1925, the year Chicago's metalworking industry formed a trade association, because the 1923 Census lists total number of jobs in each industry by state. In 1925 and later years, only the number of wage earners in each state's industries are

shops provided over 71,000 jobs, machine shops and foundries (the successors of the early blacksmith shops) about 57,000 jobs, meatpackers over 43,000 jobs, iron and steel works and blast furnaces about 29,000 jobs, and agricultural implement makers under 17,000 jobs. Other early industries are indicated in Graph 2-1 and Table 2-2. The city itself (which is smaller than the metropolitan region) in this time period offered a home to approximately 60% of all manufacturing jobs in the state (Table 2-1); the composition of its leading industries closely mirrors the state at large (Graph 2-2 and Table 2-3).

Much of the Chicago region's total manufacturing complex in the mid-1920s focused around metal--from the providers of unfinished iron and steel to the small workshops--that produced machinery, metal parts, and metal coating and other metal services--and from them further down the production chain to the users of intermediate metal products. These included firms that produced finished products such as farm machinery, railroad cars, washing machines, stoves and appliances, and so forth. This metal-related complex--from the backend of the production chain (e.g., steel) to the frontend (e.g., auto companies)--comprised about 42% of all manufacturing jobs in Illinois in this time period (see Graph 2-3 and Table 2-4). Furthermore, a significant portion of the metal-related complex consisted of smaller suppliers of metal parts, special machinery and machined components, and specialized metal services. In 1923, for example, this metalworking supplier complex totalled about 15% of both all manufacturing jobs in the state and manufacturing value added, comparable to the size of the region's metal-related "customers" of metalworking (i.e., the durable goods producers at the frontend of the complex).

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recorded.

Many of the Chicago region's metal-related industries in the mid-1920s held a leading position in the country at large. Location quotients are one measure utilized to assess the degree of concentration of an economic activity in a particular region. A value greater than "1" indicates that a particular region--in this case Chicago--houses a greater share of the activity than it should were it to equal the share of that activity in the nation at large.[4] Table 2-5 lists these location quotients for Illinois metal-related industries--in terms of their employment. As can be seen, many industries in the metal-related complex were highly concentrated in the region at that time, including agricultural implements, railcar repair and manufacturing, electrical machinery, and foundries/machine shops--four of the five largest metal-related employers. (Iron and steelworks, also among the top five industries in terms of the number of workers employed, was not more highly concentrated in Illinois than in the country. A different picture might emerge by adding northern Indiana since major Chicago area steel companies moved there at the turn of the century to expand and escape labor turmoil in the city. U.S. Steel, for example, started Gary, Indiana, as a company-town in 1906 (Mayer and Wade, 1969).

The <u>Census of Manufactures</u> provides more details to corroborate these location quotients. In 1923, for instance, agricultural implement producers located in Illinois employed almost 17,000 workers out of more than 37,000 in the country at large. Illinois

[4] Typically, one constructs a location quotient by comparing one ratio--of an industry's employment to employment in the region at large--to the same ratio for the country. Thus, one compares the share of an industry's employment in that region to its share in the country. Should this share be greater in the region than the country, the location quotient will register as larger than "1". I have computed location quotients for Illinois industries using **all manufacturing employment**, instead of **total employment**, as the base in both the regional and national share. However, the outcome should be approximately the same.

was the leading state in manufacturing agricultural implements at that time, followed by Wisconsin and Indiana (whose agricultural implement manufacturers employed approximately 4,000 workers in each state). Illinois companies made plows, planting machinery, harvesting and haying machinery, tractors, and other machinery to prepare crops for market and included such firms as International Harvester (a conglomerate made up of smaller companies such as Cyrus McCormick's reaper factory), Caterpillar, and John Deere. International Harvester alone employed 29,000 workers in all its plants (including Wisconsin Steelworks) in the 1920s (Cohen, 1990: 195).

In regard to railcar manufacturing and repair, which took place in plants owned by the railroads and by independent establishments, Illinois again played a leading role in the country. In steam-railroad repair shops, owned by the railroads, Illinois companies employed about 43,500 workers which placed their industry second after Pennsylvania's, which employed over 77,000. (Ohio ranked third at over 39,000.) Independent electric and steam-railroad car repair shops in Illinois ranked first in the country in terms of their labor force of about 23,500 compared with the second ranking state of Pennsylvania at over 14,000 workers. These companies all built, rebuilt, and repaired railroad cars. The Illinois Central Railroad and Pullman, the railcar manufacturer, were two large and important companies in this industry. Pullman also built a company town for itself in south Chicago--originally outside the city boundaries when it was established--in 1881 (Mayer and Wade, 1969).

The electrical machinery industry--which at that time produced radios, telephone and telegraph apparatus, generators, household cooking and heating appliances, batteries, and other electrical machinery, apparatus, and supplies--was also a major employer in Illinois and the

Chicago area in 1923. Illinois firms employed the greatest number of workers in this industry of all states nationally, at about 54,000 workers, with New York (at about 50,000) and Pennsylvania (at about 46,000 workers) close behind. Western Electric's Hawthorne works, which manufactured telephone equipment in suburban Chicago, alone employed between 25,000 and 30,000 workers; it was the Chicago area's largest employer at that time (Cohen, 1990: 173).

In the industry specified by the Census as "foundries and machine shops," Illinois ranked the fourth largest employer in the country at about 47,000 wage earners (and almost 57,000 total employees in the industry).[5] This compares with Ohio, the leader, at approximately 65,000 wage earners, Pennsylvania at about 65,000, and New York at over 52,000 workers. The industry, "foundries and machine shops," was the second largest manufacturing industry in Illinois in this time period. This industry included foundries that "cast metal into various shapes" and machine shops that operated "machine tools; that is, power-driven tools used in cutting and shaping metals. Some of the establishments which employ foundry and machine-shop processes, however, specialize in the manufacture of specific classes of products... [while others] manufacture a great variety of products" (U.S. Census of Manufactures, 1925: 1023). It is out of this industry that Chicago's precision metalworking trade association arose in 1925. No single company stands out as a leader in this industry; instead the total of 57,000 jobs were dispersed among 820 small foundries and machine shops, having an average size of 69 workers per shop (see Graphs 2-4 and 2-5).

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[5] Summary statistics for the foundry/machine shop industry that compares states cite only the total wage earners (i.e., production workers) for each state. The figures included in this paragraph, thus, understate the total number employed in this industry in each state.

In other metal-related industries, Illinois played an important but less leading role in the country. It ranked the fourth largest employer of any state in iron and steel produced in steelworks and rolling mills. U.S. Steel, Republic Steel, Inland Steel, International Harvester's Wisconsin Steel company, and others were key local players in this industry. Illinois' machine tool industry--which manufactured the machinery utilized by machine shops and others to cut and shape metal--ranked the sixth largest employer of any state. Finally, the Illinois auto industry had long ago been eclipsed by this industry in Michigan and other states; Illinois auto companies employed the eighth largest number of workers of any state (at over 5,000 workers). (Illinois companies making auto parts employed a higher number of workers, at almost 7,700, than its auto companies; Illinois had the sixth largest auto parts industry in the country at that point.) In the 1920s, this "industry was made up almost exclusively of repair and small parts plants"; large auto assembly plants located in the Chicago region later during World War II (Newell, 1961; 205; Mayer and Wade, 1969).

The firms and workers in these metal-related industries--agricultural implements, railcar manufacturing, electrical machinery, machine shops, steel, machine tools, and autos--represent the key economic actors that appear in this history. Agricultural implements, railcar manufacturing, electrical machinery, and autos are some of the important customer industries to metalworking. The precision metalworking industry is comprised of the machine shop and machine tool industries and is linked to a myriad of other small-firm-oriented metalworking supplier industries. Steel provides metal to all the above and, therefore, keeps the complex going. Yet, although these metal-related industries in the Chicago region were linked into a large, mutually-dependent, and prosperous production complex, the pieces of this production chain looked and operated quite differently. The following glimpse of these differences sets the stage for the tale that will be forthcoming in the following chapter.

Mechanization and the Emergence of Mass Production Industries

As hinted already, many of the firms comprising Chicago's metal-related production complex had grown quite large by the 1920s--especially those in the production of agricultural machinery, electrical machinery, autos, engines, railroad cars, and iron and steel (see Graph 2-5). This reflects the increasing mechanization in these industries and a move toward mass production. Yet other firms, such as those comprising Chicago's metalworking supplier industries (e.g., foundries and machine shops, auto parts, stamped metal, metal coating and galvanizing) were quite small. Their size, however, did not necessarily mean that these workshops were antiquated holdovers from an earlier production period. Many of the small-firm industries--such as precision metalworking--played an integral role in fostering the Chicago area's push toward mass production. Let me illustrate this contention by describing in greater detail the labor process inside some of the region's large and small factories.

According to Hounshell (1984), mechanization and the American System of Manufacturing--the precursor to true mass production--came more slowly to the Midwest than to the eastern part of the country. Yet, once there it took off and was perfected by Detroit's Henry Ford in his Highland Park, Michigan, factory with the introduction of the moving assembly line in 1913. What distinguishes the American System of Manufacturing and its later variant--mass production--as production systems compared with the earlier workshop production system? How did the American System of Manufacturing and mass production operate? The mass production model of manufacturing increasingly took root in American industries from the late 1800s through the bulk of the twentieth century. This system of production developed, in part, because manufacturers could create mass markets in this country which allowed them to produce in very large production runs. Mass producers dramatically increased productivity (output per unit of labor employed) and drove unit production costs down with the use of special-purpose machinery. As distinct from the "general-purpose" machinery employed in small craft shops--which were highly adaptable in producing a variety of products on a single machine--"special-purpose" machinery was dedicated to making a single product, or part of a product. A firm manufactured its product by linking several special-purpose machines--each suited to undertaking a single manufacturing operation--together. Unskilled machine operators then moved the parts to be machined from one special machine to another and tested the accuracy of the machined part along the way with a system of specialized gauges. This system of specialized machines and gauges increased the quality and accuracy of metal parts (the gauge, not a skilled "fitter" or machinist as in a craft shop, ensured that each part was made to the same tolerance) so that the manufacturer could freely substitute any part with another similar part in the production process. In this way, the manufacturer standardized its products, rather than building them in a customized manner as workers did in craft shops (Hounshell, 1984; Piore and Sabel, 1984; Gertler, 1988; Best, 1990).

The centrality of jigs, fixtures, and a gauging system to mass production comes through in this passage which I quote extensively because it clearly explains the technical significance of this system...

> It is important to understand what is meant by "a rational jig, fixture, and gauging system" because it was with this system that firearms makers in the antebellum period were able to produce weapons with interchangeable parts. The system was "rational" because it was based on a model, which in one sense can be interpreted as a kind of Platonic model in that armsmakers viewed the model weapon as an ideal form. All production arms were but imperfect imitations of this ideal (but real) model. Jigs and fixtures are devices to fix or mount workpieces in machine tools. How a workpiece is fixed in a machine tool determines (in part) its accuracy, especially when more than one machining operation is involved. If several operations are performed on a workpiece which requires several different fixtures to hold it in a machine tool or a series of machine tools, accuracy becomes problematic unless the fixtures are designed on some common, rational basis. In the nineteenth century, the model provided this basis. All fixtures were designed with reference to the model, thereby ensuring uniformity. In addition, gauges to verify this uniformity were also constructed. Where dimensions and fits were critical, gauges were made based on the model, or ideal form. With such designed gauges and fixtures, parts produced in machine tools approximated comparable parts of the model (Hounshell, 1984: 6).

By adding an assembly line to this manufacturing process, the manufacturer could move each part through a sequential series of machining operations automatically. This significantly increased "throughput," or the speed and volume of production, which meant the manufacturer required fewer workers than previously. Thus, the manufacturer decreased per unit production costs and achieved "economies of scale." Hounshell (1984), Best (1990), and others distinguish the American System of Manufacture with true mass production, which employed the assembly line. The Springfield Armory in Massachusetts in the mid-1800s, developed the American System of interchangeable parts, specialist machines, and precision gauges for producing standardized products. Mass production was achieved later by industries wanting to increase the throughput of manufacturing standardized products with special-purpose machines. Chandler (1977) described how continuous process technologies helped some industries (e.g., refining and distilling) accomplish this task in the late 1800s.

Henry Ford, on the other hand, increased throughput in auto production with an assembly line in the early 1900s.

In the same way that firms used special-purpose machinery to facilitate the production of standardized products, so too did they use specialist workers. Firms that replaced the "all-around," or generally-trained craft worker with specialists--those trained in only one skill required in the production process--cut the cost of their labor force (less completely trained workers commanded lower wages than highly trained craft workers). Training workers in only one task also increased each worker's proficiency at the task and overall efficiency (time was not wasted moving between different activities). By applying "scientific management" to the organization of one's workforce, mass producers separated the "planning" of work from its "doing," and sought to reduce the time spent on each task, which again increased the throughput of work in production. With a finely detailed division of labor such as this, manufacturers reduced each worker to a distinct and specialized cog in their highly-linked mass production assembly line (Piore and Sabel, 1984; Montgomery, 1987; Wood, 1989; Best, 1990).

Hounshell (1984) describes in great detail the process through which Chicago's McCormick Reaper Works underwent to convert from a workshop system of manufacturing agricultural implements to one of mass production. Throughout most of the inventor Cyrus McCormick's life, the reaper works maintained a workshop system of production, Hounshell argues. Although this factory produced a whopping 19,000 reaping and mowing machines in

1879 (Hounshell, 1984: 177), it did not build them in a "mass production" way[6]--using specialized machines, gauges and fixtures to produce duplicate and interchangeable parts that lower-skilled machine operators could make and assemble quickly. Some eastern manufacturers--such as the Wheeler and Wilson sewing machine company--had transitioned to mass production as early as the 1850s. Instead, until around 1880, McCormick's factory "depended primarily on skilled blacksmiths, skilled machinists, and skilled woodworkers to build its reapers"--it had not, in other words, established a division of labor that deskilled the production workers's job and separated "conception from execution" on the shopfloor (Hounshell, 1984: 154). McCormick's Chicago factory, up until about 1890, also relied on specialty metalworking suppliers to provide it with parts. "The Chicago reaper factory brought these various contracted pieces together, drilled and machined some of them, riveted some parts together, welded others, filed and fitted others, and combined these finished metal pieces with the wooden frame that was made by the company's carpenters" (Hounshell, 1984: 157). To do this, the company's workers used general-purpose machine tools such that the factory looked "not unlike a large general machine or jobbing shop" (Hounshell, 1984: 164).

Yet, demand for these hand-crafted implements appeared unlimited, and was helped along significantly by McCormick's constant advertising and marketing abilities. Given his success, the inventor wanted to enlarge his factory even further. He was continually held back from this goal by two factors: 1) his propensity to continually bring out new and improved machinery models (somewhat like the "annual model change" that General Motors

[6] I use the term "mass production" for both the American System of Manufacturing and its later refinement with an assembly line, true Fordist mass production.

introduced later in autos) and the production of which was less suited to mass production techniques because of each model's shorter production runs, and 2) by the resistance of his brother and partner, Leander, who was in charge of the production process on the shop floor. Leander had been a blacksmith, was comfortable with a more traditional craft manufacturing process, and equally fearful of significant expansion. In 1880 after much conflict between the brothers, Cyrus replaced his brother with Lewis Wilkinson who had learned the American System of Manufacturing while employed in the eastern armories and manufacturing firms that had pioneered this system.

Wilkinson introduced the notion of, first, building a "pattern machine" that "became the basis of the entire production system" (Hounshell, 1984: 180). The best machinists worked on this prototype machine so that it "fitted together as perfectly as possible. From this paragon machine, jigs, fixtures, and gauges were made so that production machines would be made like it" (Hounshell, 1984: 180). Wilkinson also added special-purpose machinery to turn out large numbers of the duplicate parts needed for a single model. These machines, and the jig and gauging system, meant that the company could start replacing its highly skilled craftworkers with workers having less training. The inventor's son, Cyrus McCormick, Jr., became assistant superintendent at the factory and learned these early mass production techniques from Wilkinson; Cyrus McCormick, Jr., strove to perfect these techniques in his factory throughout his lifetime. Four years after the decision to replace Leander McCormick with Wilkinson, the factory was turning out more than 50,000 implements; in another five years it expanded to 100,000 (Hounshell, 1984: 179). Thus, in the 1880s, Chicago's McCormick reaper factory started moving quickly in the direction of mass production. Ford's inspiration to add the assembly line--to move the work in process more quickly between stations to be worked on by a special-purpose machine--appeared soon afterward. Ford claimed his idea came from the large firms in another important Chicago industry that was restructuring toward mass production--"from the 'disassembly lines' of the meatpack[ing plants] in Chicago" (Hounshell, 1984: 10)(see Barrett, 1983, regarding the move toward mechanization in Chicago's meatpacking industry).

While firm after firm in Chicago adopted these mass production techniques in the early 20th century and grew quite large in the process, manufacturing in the region's machine shops developed differently. As stated earlier, these firms remained quite small (employing on average about 70 workers per shop in 1923, see Graph 2-5) even though, as a whole, the industry was the region's second largest manufacturing employer and contributed the third largest amount to total manufacturing product value (and second largest amount to value-added) after meatpacking and railcars (or printing, for value-added) compared with any other industry in the region (see Table 2-2). Around this time, the city's foundries and machine shops produced a great variety of metal parts and products as a listing in the 1931 Census of Manufactures indicates (see Appendix 2-2).[7] The largest single category of products is machinery--many of which at this point could be special-purpose machinery custom-built for a range of mass production manufacturers--followed by "other machine shop products" too numerous and of such great variety that they are lumped into a single category. Clearly, the variety of products produced--many of which were components--and the ability to assemble

[7] This listing indicates all products that this sector (foundries and machine shops) made **nationally** in 1931; there is no reason to believe that Chicago's industry--the fourth largest in the country--was much different.

these into finished machinery characterized the output of many of the firms in this industry. This type of product, therefore, necessitated employing highly skilled craft labor to manufacture one, a few, or very short runs of each good. In other words, the foundries/machine shops of the day still operated within the craft framework. This is consistent with the higher wages they paid their production workers (see Graph 2-6).

Yet, increasingly Chicago's machine shops--and those in other regions--began producing the products required by their mass producing customer firms to help them mechanize. That is, they manufactured the custom-built special-purpose machinery, jigs, fixtures, gauges, and other tools and dies required in the highly mechanized mass production process. In recognition of this trend, the U.S. Census started to delineate a new industrial category in 1929, "Machine-tool accessories and small metal-working tools, not elsewhere classified"--products that had been recorded within the foundry/machine shop category earlier and that many machine shops continued to produce as a complement to the other products they offered their customers. Machine-tool accessories included firms "whose principal products are twist-drills, reamers, milling cutters, taps, dies, etc., and those **specializing in the building of dies, jigs, fixtures, and special tools**" required in the mass production of consumer goods (U.S. Census of Manufactures, 1931: 994, emphasis added). Although the census records only 87 such establishments in the entire state of Illinois in this time period (1931),[8] it is important to note that these firms grew out of and were still part of that region's significant machine shop sector. Speaking about the emergence of this precision

[8] These firms employed 1186 wage earners or approximately 14 production workers per shop.

metalworking or "tooling" sector during World War I--the firms of which a few years later created a trade association to protect the craft labor process which was critical to their performance--George Rockwood (n.d.: 2), the association's first staff director said:

> When America entered World War I in 1917... [t]he nation's industries were then given the monumental task of providing overnight the necessary armaments and supplies for equipping and maintaining this great war machine. Industry found its own tooling facilities totally inadequate, and turned to the nation's hundreds of machine shops for help. In Chicago this meant shops of varying size and facilities, largely belt driven and located immediately to the west and north of the loop [downtown], and a few on the near north side [... incidentally, near the old and not far from the newly-built McCormick Reaper Works].
>
> The machine shops responded promptly and were soon hard at work turning out a great variety of tools, dies, gages, and a great variety of component parts. They succeeded in doing their job so well that at the end of the war they had managed to establish themselves as a new industry--becoming in part extensions of their customers own "captive [machine] shops."

I quote another Chicago tooling industry source--Stuart Sinclair, a sales manager in one of these tooling shops (the Federal Tool Corporation)--who explained how Chicago's machine shops were better equipped to manufacture the special-purpose machinery and tooling that mass production required than the existing machine tool industry (which produced machinery for working metal) or individual manufacturers at that time.

> During the first World War, the sudden and enormous demand for skilled help and necessary facilities to properly tool that war program, brought to the attention of Industrial leaders, the need for a tooling industry to design and manufacture the many "non-standard" tooling items needed for mass-production operation. The "standard" [i.e., general-purpose] tools necessary were being produced by a few large [machine tool] firms who operated on a basis similar to mass-production. Industrial leaders found it was impractical to use all "standard tools" and the "standard" tool producers

> found it was not feasible to produce "special" tools. Faced with the problem of getting into production overnight, various industries who were forced to produce their own "special" tools on a most unsatisfactory basis, sought some other source of obtaining the "special" tools necessary for their production.
>
> The recognition of this need for "outside" sources of "special" tools brought about the birth of the Special Tool & Die Industry. It has become an Industry of precision machinery and instruments, employing the highest skilled labor obtainable, to engineer and produce the many intricate "special" tools required by the large manufacturing plants in the production of the materials of War and Peace (White and Sinclair, 1945: 4).

White and Sinclair (1945: 5) further explain how a small and specialized industry, as the tooling industry was at that time, played such a critical role in the efficiency of all of mass production.

> The extent to which the machine tool has contributed to our Nation's industrial pre-eminence is a matter of history. Without machine tools the level of efficiency in mass-production would not be any higher in this country than that attained in others. The progress of the machine tool is so definitely tied in with the progressively higher standards of manufacturing efficiency, that it is easily recognized as a pillar of our economic system.
>
> The base upon which that pillar sets is the Special Tool & Die Industry. It is not generally known or realized that a $2500 machine tool is rendered useless by the absence of a $25 milling cutter. In fact, machine tools themselves cannot be made without tools, dies, fixtures, and gages, all products of the Special Tool & die Industry. So it is, that this Industry with its comparatively insignificant volume of sales is the foundation upon which the entire manufacturing system of this country operates.

Other small-firm-oriented metalworking supplier industries arose in the late 1800s/early 1900s to help along America's restructuring to a mass production system. For instance, Hounshell (1984) reports that Chicago's Western Wheel Works first imported stamped metal from Germany for its bicycles in the 1890s; later the company drew upon the skill of local machinists to develop its own techniques in metal presswork. "[S]heet steel stamping technology--a revolution in metalworking", was later adopted and improved upon by Henry Ford for the mass production of autos (Hounshell, 1984: 209). Meanwhile, a myriad of small metal stamping shops opened in Chicago and were often combined under the same company roof with the toolmaking function, as they are today.

II. THE MOVE TOWARD MASS PRODUCTION STIMULATES INDUSTRIAL STRIFE ACROSS THE COUNTRY

America's restructuring toward a system of mass production created conflicts between workers and managers, and small and large firms, alike. Returning to the McCormick Reaper factory, we see how the changes that were implemented there sparked the single defining crisis for much of Chicago's and America's labor history. Solutions to the country's labor strife in the late 1800s and early 1900s varied. Some pushed for a "high road" of cooperation between management and workers in resolving the move toward mass production, as the National Civic Federation and some in the Machinists Union[9] did. Others, such as the National Metal Trades Association and the National Manufacturers Association advocated taking a "low road" or a policy of non-conciliation, which they put into practice as the "open shop" movement in the early part of this century. This position resulted in more conflict and class warfare on the part of labor and management alike. In this section, I briefly recount

[9] I refer to the International Association of Machinists as the Machinists Union or IAM throughout this account.

how various actors developed, at the national level, the rationale for each of these positions--that of the "high" and "low roads" toward industrial politics.

Continuing with a history of Chicago's McCormick Reaper factory in the 1880s, we see that Cyrus McCormick Jr.'s rapid move to install a system of fixtures, gauges, and special-purpose production machinery (i.e., mass production) did not occur smoothly. In fact, Hounshell (1984) argues that this restructuring inside the plant may have contributed greatly to the "Haymarket riot" which occurred after a strike at the plant in 1886. Among the "costs" of changing from a workshop form of production to one which allowed for the mass production of goods were work stoppages, strikes, and other labor problems. A key result of the changes that Cyrus McCormick, Jr. pushed through in his factory, after he took over from his father, was his ability to wrest "control of work processes from skilled workmen. These workmen, many of whom had spent their careers at the McCormick factory, did not see the 'grand object' of the armory system [i.e., the American System of Manufacturing] in the same way that the Ordnance Department officers had done when they relentlessly pursued the system in the antebellum period", Hounshell (1984: 182) explains. When the molders struck at the Reaper Works in 1885, its machinists and other metalworkers--who usually did not join the molders' actions--also struck. "This series of changes in approach to production between 1880 and 1884, which offered a sharp break with the past, played a fundamental role in the 'prelude to Haymarket'", argues Hounshell (1984: 182, quoting from Ozanne, 1967).

As the single, defining event of much of Chicago's labor history, the Haymarket riot occurred in the year following the molders' strike after conflicts at the McCormick factory continued to heat up. Chicago had become the center of the movement to secure the eight-hour-day in the mid-1880s. This stimulated a strike by workers at the reaper works, who had been locked out of their plant after a dispute with the company about the discharge of union activists. While its workers were on strike, the company hired a new set of workers along with Pinkerton detectives to protect them. As the strikers co-mingled with other workers who were agitating for the eight-hour day outside the factory gates, tensions mounted and the Pinkertons shot into the crowd, wounding several and killing one protester. A political rally called by the city's anarchist labor leaders after this event resulted in a bomb being thrown into the rally's gathering which killed a police officer and sparked the trial, conviction, and subsequent hanging of the Haymarket "martyrs," the anarchist labor leaders (Pierce, 1957; Nelson, 1988; Gilpin, 1989; Hirsch, 1990; Cohen, 1990).[10]

Labor conflict of this sort continued on into the next several decades in Chicago and the country at large, much of it stimulated by the restructuring of manufacturing that was taking place. Not all of this conflict occurred in the giant consumer products corporations, like McCormick Reaper/International Harvester, the Pullman railcar factory, and others. The owners of some smaller machine shops themselves fought their workers, as they attempted to rationalize their labor processes to become more efficient by employing Frederick Taylor's ideas of "scientific management" to the extent possible given their often more customized product. Montgomery (1987) points out that, prior to 1900, machinists rarely caused strikes at metalworking and related factories--although they may have joined others who initiated the strike action (e.g., with the molders at McCormick Reaper Works). After 1900, however,

[10] The sentence of several of the anarchist labor leaders was later commuted by Governor John Peter Altgeld (Pierce, 1957).

they most often led work stoppages because they now too experienced a diminution of control over their craft. Much of this had to do with the fact that machinists in the latter two decades of the 1800s increasingly found themselves working in the giant mass production factories that made these consumer products. But small machine tool manufacturing companies also attempted to control machinists' skill and efficiency in a variety of ways.

> [E]ven though printing presses, rolling mills, elevators, machine tools, and ships were still made to customers' specifications, many of their components were machined in large prefabricated batches.
>
> Standardized components and products, in turn, encouraged not only inside contracting[11] but also work specialization, piecework payment, and demands that a worker operate two machines at once. Although "accuracy" in production still depended, as C.T. Porter had observed, "entirely on the skill of the workman," that worker was increasingly often assigned to apply his skills to a single lathe or milling machine, or simply to filing and fitting components on the erection floor. As production runs became longer, employers were tempted to convert his wages to piecework. Conversely, "piece work develops specialists," as an Omaha strike committee argued. "One man learns to do a particular piece of work... and can do it rapidly, but he can do nothing else" (Montgomery, 1987: 206).

Machinists and other skilled metalworkers--whose jobs were being deskilled in both large and small factories alike--were often at the forefront of much of this industrial conflict after 1900 and Chicago's machinists often took the lead nationally. For instance, 5,000

[11] Between 1860 and 1890, inside contracting had become commonplace in factories throughout the country, states Montgomery (1987) citing the conclusions of a federal government study. Inside contracting "encouraged some workers to become temporary or long-term employers of other workers while using the firm's machinery and floor space, and it gave the contractor a monetary interest in maximizing the output of a group of his workmates that was small enough to be supervised effectively" (Montgomery, 1987: 187). During downturns or when the group rates were being cut, however, that employee/supervisor was often pressured to retain a higher rate for himself and exploit his co-workers.

workers belonging to Chicago's Machinists Union (District 8) went out on strike against 150 foundry and machine shop owners in that year after the latter would not agree to their conditions in negotiating a new contract. (The IAM's demands included the nine-hour day, a "closed" or all unionized shop, use of seniority in making layoffs, recognition of shop committees, and a specified minimum wage.) Some employer reactions of the Machinists terms, as reported by Montgomery (1987), indicate the heat of the times. Many did not object to the minimum wage since many machinists in the city were paid higher than that currently; many employers also decided to grant concessions on the shorter day and union recognition in the shop. But they worried that a shorter work week would prove disadvantageous against their competitors in other cities and some did not want to "settle grievances with what one [employer]... called the 'arrogant, dictatorial' unions of Chicago. ...The president of Western Electric concurred: 'Well, we should not have a committee or what they call a steward, an official of the union, in our place to represent the union among our employees. We should not have it'" (Montgomery, 1987: 260, quoting from a U.S. Industrial Commission report). Since more than 40,000 building trades workers were also on strike at that time, and in a city where the sympathy strike had been raised to an art form, "more work was closed down in Chicago than at the height of the Pullman boycott" (Montgomery, 1987: 260). This strike in Chicago inspired machinists in other cities to join them, while bringing business recruits to the employers' newly formed National Metal Trades Association (NMTA). This strike was a watershed in crystallizing the two opposing camps--the Machinists Union versus the NMTA--and stimulated the "open shop" movement in the early part of this century which was an employers' assault on organized labor, especially machinists.

Before this assault occurred and the open shop movement gathered steam, however, another path to industrial conflict presented itself. Stimulated by a conference organized by the Chicago Civic Federation on the impact of trusts on the country's industrial future, this "high road" or cooperative labor-management approach to industrial conflict was further developed by the National Civic Federation out of what was called the "Murray Hill agreement." Murray Hill refers to the hotel in which the Machinists Union and the NMTA first ironed out their disagreements in 1900 after the national strike that started in Chicago. Although sacrificing the Chicago Machinists' demands in the process, the national officers of the IAM agreed that labor would not limit production in the shop if the employers, through the NMTA, agreed to shorten the work week in all related firms nationally. An arbitration board would hear all grievances throughout the country and no strikes could be called during the life of the contract. Hailed nationally as a solution to industrial strife, the National Civic Federation put together an advisory council of 500 members to guide it in encouraging these types of labor-management agreements throughout country; this panel included labor and business leaders from Chicago (such as George Schilling, once part of the Chicago anarchist labor movement and later Illinois Governor J.P. Altgeld's personal adviser on labor matters; Cyrus McCormick, Jr.'s brother, Stanley McCormick; and William Chalmers, who headed the Chicago branch of the Milwaukee machine tool company, Allis and Chalmers)(Montgomery, 1987; Newell, 1961). However, after only a year, this agreement between the IAM and the NMTA wore out.

At this point, the NMTA in cooperation with the NAM (National Association of Manufacturers)--representatives from both of which had earlier participated in the National Civic Federation effort--organized employers in an "open shop" drive to turn unions out of their shops. Employers organized themselves locally across the country, but especially in the Midwest, to confront unionized labor. As Montgomery (1987: 270-71) writes:

> Outside Chicago, the militant metal-trades employers generally carried the day. In Dayton, Ohio, Sedalia, Missouri, Birmingham, Alabama, Cincinnati, Ohio, and Beloit, Wisconsin, employers' associations mobilized the local business communities to support companies battling the IAM. Their actions initiated a campaign on several fronts that quickly gained momentum throughout the land. The NMTA, guided by Commissioner E.F. DuBrul... provided struck employers with advice on strategy, as well as with financial assistance, private detectives, legal assistance, and a card file on every one of the thirty-five thousand workers employed by the association's 325 firms. It organized the Independent Labor League of America, which enrolled machinists and would-be machinists who were ready to go anywhere in the land to replace strikers. By 1911, it had registered sixty-six hundred machinists in Chicago alone. ...it honeycombed the unions with spies. ...These undertakings led employers' associations into judicial and political activity on a broad front... press[ing] court cases against boycotts and sympathy strikes, establishing judicial precedents for the issuance of injunctions and collection of damages against unions in such cases. Not until the early 1920s did a series of U.S. Supreme Court decisions... establish a uniform interpretation of federal law controlling boycotting, picketing, and sympathy actions by labor...

Local police often supported employers' activities. In Chicago alone between 1902 and 1904, police arrested 8,299 machine-shop and foundry workers during strikes (Montgomery, 1987:279). Although the National Civic Federation maintained sufficient credibility in business circles to help bring employers and workers to the bargaining table 274 times between 1902 and 1905, its efforts became ineffective after that. The "low road" of labor suppression prevailed more often than not. Chicago's employers often took a lead role nationally in organizing employers against unionized labor; its workers responded with an equally harsh and conflict-oriented response. In Chicago, a "city [that] could challenge London for the title of trade-union capital of the world", employers reacted harshly especially during the business depression of 1903-04 (Montgomery, 1987: 269). When the Chicago Metal Trades Association (which included many of the large manufacturing firms in the region) demanded wage cuts and other concessions from the Machinists Union, the union objected stimulating a general work stoppage from sympathetic unions across the city. This capital-labor conflict escalated such that by 1905 "the city erupted in class and racial violence, bringing President Roosevelt himself to town... to threaten the strikers with military occupation of their city" (Montgomery, 1987: 270). Eventually, some metal-trades employers began to again sign contracts with the IAM (International Association of Machinists); some others, notably International Harvester (of which McCormick Reaper Works was a part), Link-Belt, and Pullman, refused to negotiate with the Machinists again. Employers fought labor militance with equally tough tactics (e.g., International Harvester and Pullman closed their plants for two weeks and then reopened them on a non-union basis); they also fought unionization through "welfare capitalism," a philosophy of providing a range of benefits to workers (e.g., recreational programs, employer-provided insurance) to strengthen their loyalty to the company rather than the union (Montgomery, 1987; Cohen, 1990).[12]

This highly conflictual brand of industrial politics that national level actors developed to deal with the restructuring of American manufacturing in the early 1900s also dominated

[12] Piore and Sabel (1984) offer a more nuanced view of "welfare capitalism," arguing that it could be employed either to increase workers' participation in company affairs or to discourage it.

many dealings in Chicago and characterized the region's institutional structure at large. Let us survey the broader institutional structure in the Chicago region in greater detail in the next chapter to discover why the "low road" of class warfare was followed more often than not.

Conclusion

As we have seen in this chapter, Chicago's metal-related manufacturing complex has consisted of a well-developed cluster of metalworking job shops alongside large, nationally and internationally-oriented manufacturing corporations. Whereas the job shops oriented their production process along highly skilled and worker-autonomous craft lines, the larger manufacturers pursued a deskilling of the manufacturing process in order to implement mass production. They employed lower-skilled machine operators instead to produce standardized parts and assemble final products. These large manufacturers wanted to eradicate the craft labor process as much as possible from within their workshops.

This maturing of mass production in Chicago's and America's factories in the 1910s and 1920s stimulated a revolt by skilled machinists and other craftworkers, whose jobs were deskilled or eliminated due to this restructuring. While some employers and unionists initially forged a cooperative settlement to labor strife in this period, it was short-lived. Most other major employers throughout the country and in Chicago instead pursued a "low road" of suppressing labor organization and participation in this restructuring process. They did this through an "open shop" campaign from about 1905 through the 1920s. We will see how this class conflict was resolved in Chicago, and mediated by its unique set of local institutions, history, and practices, next.

CHAPTER 3--THE ESTABLISHMENT OF CHICAGO'S COLLABORATIVE METALWORKING NETWORK IN THE MIDST OF A HOSTILE INSTITUTIONAL ENVIRONMENT

Introduction

In this chapter, I look in a detailed fashion at how Chicago's key economic actors in its metal-related industries responded to the crisis of restructuring that mass production brought upon them. Hinted at in the foregoing account of how this crisis played out on the national scene, we have seen a great amount of conflict and polarized interaction already among Chicago's key players--from the tragedy at Haymarket, to the aggressiveness of this region's Machinists Union, and to the continued wrath of certain large employers (e.g., International Harvester, Link Belt, and Pullman) wanting to reassert their control over the production process. To what extent do unresolvable differences, heightened conflict, and polarized stand-offs between actors characterize industrial politics as a whole in the Chicago region? Do egalitarian or hierarchical decision-making processes prevail when solutions do occur? How should we expect Chicago's institutional setting to influence the way in which local actors mediated the changes that economic restructuring forced upon this region in the mid-1920s?

As I argue in the first half of this chapter, the dominant brand of industrial politics practiced in the Chicago region, and upon which histories of Chicago mostly focus, would lead us to expect this period of restructuring to be resolved locally in a hierarchical and conflictual manner, which it often was. But, as I lay out in the second half of this chapter, understanding this dominant institutional tendency within the Chicago region is not enough. There are other social, cultural, and institutional features in this region's history that push actors along a different path. What is interesting, however, are the conditions under which these subordinate tendencies activate themselves.

In the case of Chicago's craft-oriented precision metalworking and tooling industry, shop owners and workers called upon an historical tradition of ethnic collaboration to assist them in overcoming their potential marginalization at the hands of mass production. Implied by a mass production system is the devaluation of craft skills and shedding of certain risks and costs downward onto smaller, less vertically integrated, manufacturers in a region. In this way, for example, as described by Piore (1980) in his work on industrial dualism, large mass producers retain the stable portion of market demand for themselves in order to keep their dedicated production machinery continuously operating through round-the-clock shifts while delegating the unstable and fluctuating portion of demand to smaller firms. Infrequent and changing demand can be met more easily by craft producers, such as Chicago's precision metalworking shops, Piore posited.

Yet, Chicago's small metalworking firms also experienced severe pressure on their prices and, hence, returns in this period of the mid-1920s. Fearing that cutthroat bidding, encouraged by their large mass-production-oriented customers, would ruin the quality of the industry, these small firms looked for a strategy to fight back. It is here that the alternative lessons inherent in Chicago's industrial past played a part. Drawing upon their German ethnic identity and alternative ideologies within the labor movement, Chicago's metalworking shop owners developed strategies themselves for lessening the risk that they absorb for others. By joining together in a collaborative interfirm and labor-management network, Chicago's small metalworking shops resisted price-slashing and other cutthroat behavior that their large customers, as mass producers, fostered among their ranks. Organized into a trade association, these small metalworking supplier firms created their own "shelter" against risk in order to keep prices, skills, and long term investment in their industry at an adequate level. Thus, labor-management collaboration in the metalworking industry was encouraged as much by the strategic aims of these craft workers and shop owners as by their particular historical legacy. Let us see how this collaborative solution for the problems posed by a restructuring industrial base in the 1920s came to pass.

I. THE CHICAGO BRAND OF INDUSTRIAL POLITICS--HIERARCHY AND CONFLICT

In this section, I attempt to characterize the dominant features of Chicago's wider institutional and industrial relations setting to understand how its various actors reacted in the period of industrial restructuring. I build off the work of Locke (1994) and Saxenian (1994) who typologize the key institutional features in regions in order to gain a general understanding of how conflicts are resolved by the individual economic actors (e.g., firm owners and workers) who reside there. As both authors argue, and to which I agree, the local institutional lay of the land shapes actors' understanding of conflicts and the range of solutions available to them. While, in this section, I characterize a dominant tendency for institutionalized interactions among Chicago's key economic actors, as the chapter unfolds we discover how much more complex and multivaried is the region's institutional structure. As Locke (1994) also points out in his study of institutional relations in Italy's different regions, some regions can have multiple institutional legacies combined within them. Chicago happens to be such a "hybrid" region as we come to understand by the conclusion of this chapter. However, I think it is useful, first, to look at Chicago's dominant setting in order to understand, later, how actors in the metalworking industry tried to reshape and confront this dominant production and institutional philosophy.

Based on much of the literature about Chicago in the late nineteenth and early twentieth centuries, I would characterize its institutional relations as promoting hierarchical decision-making among actors in the region, the centralized accumulation of power and resources in the hands of a few, and often highly antagonistic relations among different groups of actors.[1] (This contrasts with regions that are "policentric" in Locke's typology, where the existence of multiple interest groups, having well developed communication channels between them, fosters cooperative relations among economic actors. Saxenian poses a similar contrast between hierarchically organized regions, like that surrounding Massachusetts' computer industry, and highly networked and egalitarian regions, such as

[1] I conflate two of Locke's categories when I describe the dominant institutional structure in the Chicago region. Thus, in this region, interactions between firms and they with their workers take place along "hierarchical" lines but also break down into highly "polarized" conflicts between two camps at times. Locke (1994) describes three ideal-typical sets of institutional relationships within regions. Actors in regions with "polarized" institutional structures often experience unresolvable conflicts because they are parochially concerned and often organize themselves into two opposing camps that do not communicate. Instead, they depend on national-level or other more powerful actors to mediate their conflicts or solve them for them. Similarly, actors in "hierarchically" structured regions have greater difficulties handling conflicts. These regions host multiple interest groups, like "policentric" regions which are organized in a more egalitarian manner. But, communication between groups is limited and those with greater power and resources make decisions for the region at large in a top-down hierarchical manner. "Policentric" regions foster institutions that encourage collaboration, dense patterns of associationalism, and network forms of production. When conflicts emerge, collaboration does not break down because individuals are willing to mediate across different groups and associations.

California's Silicon Valley.) During much of Chicago's industrialization period, when initial relationships between economic actors were being built, the region experienced a massive influx of immigrant workers. The shear diversity of the region's population, fragmented it into a multitude of groups split off from each other by ethnic, racial, religious, and regional lines. These divisions weakened class and political solidarity which, as some contend, necessitated the creation of highly centralized power structures to overcome. We would not expect this type of institutional context to stimulate sufficient collaboration among actors such as the NCF, or "high road," solution--that I described in the previous chapter--required. What evidence points to the Chicago region as having a hierarchical, non-collaborative, institutional environment? Let us look at the city's demographic make-up, its political structure, the composition of its business community, and its history of labor relations.

Chicago's Fragmented Demographic Base Fosters a Centralized Local Political Machine

What did the city's population look like in its early period of industrialization in the latter half of the 1800s? Chicago was clearly an "immigrant city" in this time period, as Kleppner (1985) points out. For instance, more than 75% of its population in 1890 consisted of the foreign-born and their children. The German community remained the largest, compared to even the native American element over several decades. German immigrants and their offspring comprised about 30% of the total population from 1860 to 1900 (Keil, 1983). The native-born segment equalled about 23% in 1884, for instance; when the Irish, as the third largest group, totalled approximately 19% (Hirsch, 1990). Other early immigrants included the Bohemians, English, Norwegians, Swedish, and Polish and other eastern

Europeans. African-Americans and Mexicans--two other large ethnic/racial groups in the city's history--flocked to the region's factories later (from about 1920 on) when the U.S. Congress curtailed European immigration (Reisler, 1976; Kleppner, 1985). Not only were the city's people split by ethnic and racial lines, but there were divisions within these groups as well, such as according to their religious and regional backgrounds. The Irish, for instance, were split into those who were Catholic and those who were Protestant. German (and other) immigrants differed by region of origin. For instance, the first wave of Germans brought craft skills and industrial experience from the urban Southwest as compared with the later wave of migrants who stemmed from Germany's agrarian eastern provinces (Keil, 1983). These groups, of course, were also subdivided by occupational background and class (Faires, 1983; Keil, 1983).

Kleppner (1985) states that, while many cities which industrialized in the latter half of the nineteenth century also recruited significant numbers of immigrants (e.g., Boston, New York, Philadelphia), Chicago's experience critically differed. It not only attracted a wide range of different immigrant groups, as did these other cities, but none of its immigrant groups achieved a majority in terms of population size. Thus, Kleppner argues, no one group could easily control city politics. Political parties had to develop coalitions among this heterogeneous mix of voters, which was extremely difficult given the ethnic, religious, and other conflicts which subdivided them. Once a political party became dominant, its coalition also threatened to splinter again. To forestall the inevitable factionalization, party leaders created "mechanisms of centralized control" (e.g., the use of patronage to buy the loyalty of different groups)(Kleppner, 1985: 20). Party leaders did this because they wanted to ensure the candidates they selected were nominated by those beneath them; they also wanted to control the behavior of these candidates, once they became elected officials, for the good of the coalition.

Before the 1920s, factionalism between ethnic, racial, and religious groups in Chicago prevented a true political machine from forming contend many historians (Kleppner, 1985; Cohen, 1990). Even so, the Democrats carried City Hall seven out of eleven times prior to 1893 (with Carter Harrison winning five of the seven Democratic victories) and "reformers had routinely denounced 'bosses' and spoke often and negatively of 'the Machine'" before then (Kleppner, 1985: 20). By the end of the 1920s, however, Anton Cermak, a non-Catholic Bohemian, formalized local politics into a machine when he became chairman of the Democratic Central Committee of Cook County and, a few years later, mayor of Chicago. Through his direction, the Democrats staged a "takeover" of local politics, from 1928 to 1936, by assuming control of all governmental agencies within the City and dispensing patronage (City jobs and contracts) to cement alliances among the various ethnic factions which comprised this machine coalition (Kleppner, 1985: 23; Cohen, 1990). Centralized political control in the region continued under various Democratic machines (e.g., Richard J. Daley's reign from 1955 to 1976), occasionally interrupted by a reform administration (e.g., Mayor Harold Washington, from 1983 to 1987), up to the present day when Mayor Richard M. Daley, the former mayor's son, heads the Democratic party (Kleppner, 1985; Grimshaw, 1986; Clavel and Wiewel, 1991). Thus, ethnic fragmentation eventually led to hierarchical relations in the political arena in Chicago. While local political machines dispensed certain benefits to the city's ethnics (e.g., City jobs), they did so at a cost--of silencing dissent, preventing open access to local government, and discouraging a more egalitarian set of political relationships from forming. Collaboration among groups was created from the "top down," as it were, and in the interests of those at the top of the political structure.

Hierarchy in Business Affairs with the Growth of Large Commercial and Manufacturing Interests

Similar to the hierarchy in the local political structure, was that in the business sphere. The Chicago region bred some of the largest industrial corporations in the country, as already indicated, which were able to centralize massive wealth inside their firms. In addition, corporate leaders created their own organizations to carry out regional policymaking on their own terms and to fight the labor movement. These civic and business associations stipulated the rules for others int he region (e.g., workers, smaller firms) to follow. Such rules benefitted those at the top of the corporate hierarchy as they did the mayor and the mayor's allies in the political sphere, rendering collaboration by others with those rules an "enforced" quality. First, let us see how, for example, Chicago's business elite controlled civic affairs in their own interests. I discuss corporate strategies for controlling labor in the next section.

As Chicago grew rapidly in the last half of the 1800s, so too did some of its businesses. The city, with a population of 50 in 1830, grew to 5,000 in 1840, one million in 1890, two million in 1910, and three million in 1930 (Mayer and Wade, 1969; Weiss and Metzger, 1989). Its manufacturing sector expanded as fast, providing 300,000 jobs in 1900 and 500,000 by 1920 (Weiss and Metzger, 1989). Early residents were attracted as much by the anticipated real estate boom as by the potential of commerce, such that some of the city's merchants (e.g., Potter Palmer, Levi Leiter) also made great fortunes in the rapid development of the downtown and surrounding residential areas (Mayer and Wade, 1969). This foreshadowed the interest of the city's business leaders in the continued development of the downtown, as I discuss later.

Railroading, the transportation of goods through Chicago from the country's east to west coasts, and wholesale trade contributed to the city's rapid growth initially. However, eventually, manufacturing became the basis of the city's prosperity. Many of the region's first manufacturers accumulated great wealth while achieving national prominence. By 1902, for instance, Cyrus McCormick's reaper factory (in Chicago since 1847) was producing over a third of all harvesting machinery in the United States (Barrera, 1979; Mayer and Wade, 1969). Later in that year, the McCormicks merged their company with several smaller firms to make International Harvester, which "soon became one of the largest corporations in America, operating some twenty-eight manufacturing plants (along with steel mills and iron mines) mostly in Chicago and the Midwest" (Gilpin, 1989). The North Chicago Rolling Mills followed a similar trajectory. Established in 1857 not far from the central business district, this company manufactured the country's first steel rails eight years later. By 1875, Chicago produced more steel rails than any city in the country (Mayer and Wade, 1969). Eventually, this plant moved to the south side and became the largest steel plant in the city (known as South Works, after it merged with the United States Steel Corporation, one the country's largest corporations, in 1901)(Mayer and Wade, 1969). Meatpacking was also one of Chicago's first industries. By the 1860s, this industry already required expanded space so it moved from the central city to the south side into a planned industrial district, the Union

Stock Yards. Two of, what in the post-World War II years were called, the "Big Four" companies in meatpacking (i.e., Swift and Armour) built plants in the new Union Stock Yards (Mayer and Wade, 1969). These became the two biggest corporations in the meatpacking industry in later years (Galenson, 1960). Other corporate giants also grew out of Chicago soil. For instance, Pullman Company, the railcar manufacturer, was an early resident. Inland Steel, Wisconsin Steel, and many other steel companies grew up in this area. Western Electric, Zenith, Motorola, Sunbeam, and Admiral--as leaders of the region's and country's electronics equipment and appliance industries--produced telephones, radios, and televisions, and other products in Chicago. The auto industry started in Chicago in the late 1800s, left, and then returned as Ford and General Motors built assembly and stamping plants in the area in the post-World War II era (Pierce, 1957; Mayer and Wade, 1969; Cohen, 1990). In the early twentieth century, a large proportion of the working class held jobs in these large manufacturing plants. For instance, in 1919, greater than 70% of the city's manufacturing workers labored in companies employing more than 100 workers; one-third of such workers held jobs in establishments having over one thousand workers (Cohen, 1990).

Chicago's corporate business class attempted to control or lead policymaking in the region through a variety of organizations. Preeminent among these is the Commercial Club which did, and still does, count among its members the leading industrialists and merchants of the day. Started as the Commercial Travellers Association in 1866 to protect the merchants and manufacturers in Chicago and the wider Midwest region, this organization subsequently held great interest in Chicago's downtown and real estate development that was prompted by its century long boom in manufacturing (Pierce, 1940).[2] The Commercial Club, for instance, sponsored the 1909 "Plan of Chicago" which followed on the civic boosterism that had brought the 1893 World's Columbian Exposition to Chicago and its fantastic "White City," a collection of buildings and landscapes designed for the fair (Mayer and Wade, 1969; Weiss and Metzger, 1989). The 1909 plan was written by Daniel Burnham--who headed Chicago's largest architectural firm, designed many of its skyscrapers, and also belonged to the Commercial Club--and Edward Bennett. Burnham's and Bennett's plan established a central commercial/corporate core for the city by moving industrial uses farther out. It also planned a system of parks, boulevards and other amenities and linked these to upper-income housing in the suburbs, that managers in the region's large corporations may have purchased, through highways and rail transportation.

Importantly, this plan for targeted public investments ignored the inner areas adjacent to the downtown where immigrants and other workers lived and worked (Weiss and Metzger, 1989). In other words, this plan of Chicago's business elite gave little thought to or room for expressing the concerns of the bulk of the region's population and voters. And, although there were "vigorous battles" between Commercial Club members and other local constituency (e.g., manufacturers and other business owners) who opposed the plan, "the Commercial Club triumphed" in implementing at least parts of its plan (Weiss and Metzger,

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[2] This association was originally created to help travelling salesmen, merchants, and manufacturers to obtain more amenable shipping rates from the railroad companies, Chicago's first industry. Once established, this organization helped strengthen Chicago's second and third industries (trade and manufacturing) and to secure
"the dominance of Chicago over the wholesale trade of the Mississippi Valley" (Pierce, 1940, p. 107).

1989: 125). The Commercial Club has backed and pushed the implementation of subsequent real estate and economic development plans for the Chicago region in a similar top-down manner at times during the last century ignoring the issues facing Chicago's neighborhoods and the concerns of its working population (Weiss and Metzger, 1989).

Antagonistic Labor Relations Set the Stage for a Corporate-Union Showdown in Manufacturing

Not only did Chicago's hierarchically-structured, centralized, and powerful corporate community attempt to direct civic affairs, but it also developed mechanisms to deal with its perceived labor problem in this era of restructuring. This created an antagonistic set of labor relations in many manufacturing plants in the region, as I have already hinted at earlier, and an environment unsuited for collaboration. In the words of one observer, "Chicago was a city which had a long record of industrial violence. Each time that violence had flared the business community and the press had emphasized the tragedy as the product of radical groups" which then required repression (Newell, 1961: 146).

As mentioned in the previous chapter, the Haymarket riot in 1886 and trial of the anarchist labor leaders stood out as a constant reminder to both labor and management of the potential power of the other group. Corporate leaders felt that organized labor was becoming too aggressive. For instance, in 1893, the Chicago convention of the American Federation of Labor (AFL)--at which Chicago labor leaders played a critical role--demanded the collective ownership of factories and other businesses. This greatly concerned Chicago's industrialists (Kelly, 1940). Therefore, business leaders in the late 1800s organized among themselves to fight back.[3] One important organization emerged at this time--the Illinois Manufacturers Association (IMA). A small group of "prominent Chicago industrialists" established the IMA in 1893 "for the specific purpose of destroying [a recently enacted state labor] law" (Kelly, 1940: 3). The state legislature enacted this law after being pressured by the State Federation of Labor (i.e., the state's AFL chapter), Chicago trade unions, and activist social workers from Chicago's Hull House; it would limit women's working day to eight hours. After the IMA brought suit against the law, the state Supreme Court declared it unconstitutional, and the IMA's track record of successfully overturning labor and other pieces of social legislation in its early history was begun.

The IMA upheld its actions in the name of "laissez faire" economics and the belief that self-interested businesspeople would "eliminate... evil practices from industry" (Kelly, 1940: 18). Because of its early successes, the organization grew rapidly in size from 50 firms in 1897 to over 700 in 1904 (Kelly, 1940). Kelly reports that between 1911 and 1929, only one piece of legislation that the IMA objected to made it successfully through the state legislature; "[a]ll other 'labor' and social reform bills were effectively disposed of" (Kelly, 1940: 14). The IMA also took a lead role nationally in the employer movement to block the "closed," or all-unionized, shop in the 1920s. Having always defended the open shop, the IMA increased its efforts in regard to this issue in conjunction with the "American Plan"

[3] As Kelly (1940) points out, Chicago industrialists had organized themselves to counteract labor's demands almost since the time of the city's founding. For example, printing firm owners organized the Chicago Typothetae Association to counteract the Chicago Typographical Union in 1879; Chicago's meatpackers formed an association in 1886 to fight the Knights of Labor; the Amalgamated Building Trades Council organized construction firm owners in resistance to the demands of their workers.

campaign of the National Association of Manufacturers. The IMA convened an open shop convention in Chicago in 1920 and later "flooded the middle-west with open shop literature, and inspired dozens of smaller open shop rallies in this area" (Kelly, 1940: 21). The Machinists Union was simultaneously "badly wounded by the open-shop movement" that the larger metal-related firms in Chicago and their business association, the IMA, were spearheading (Newell, 1961: 28). Other citywide business associations--such as the State Street Council and the Chicago Employers Association--also vociferously promoted an open shop, anti-union stance (Newell, 1961; Cohen, 1990).

The greatest fear of Chicago's manufacturers in the late 1800s and early 1900s was a united workforce. To discourage labor solidarity, the area's industrialists often played on their workers' ethnic rivalries on the shop floor. International Harvester's management, for instance, carefully maintained an ethnically diverse workforce in many of their plants since their experience had taught them that ethnic cohesiveness worked against the company during strikes (Ozanne, 1967; Barrera, 1979; Cohen, 1990). The "welfare capitalism" of employers in the 1920s, Cohen (1990) argues, was also an attempt to replace the ethnic loyalties of groups of workers with individual worker loyalty to the company (she documents how company insurance programs, for instance, were to substitute for those of Chicago's various ethnic mutual assistance associations). Occasionally in Chicago's history, however, labor was able to coalesce into large and often militant movements. To counter these situations, Chicago's employers organized themselves into powerful and centralized business organizations to defeat labor collectively. These organizations alternately utilized repressive and cooptive strategies in their dealings with labor. Again, fragmentation and hierarchy intermittently characterized institutional relations--in this case, those related to business interests--in the city. Chicago's large manufacturers kept their workers fragmented by playing on ethnic and racial divisions; they developed hierarchically structured and powerful business associations to fight labor in a concerted fashion and on the floor of the state legislature. Egalitarian and collaborative labor-management relations would be difficult to accomplish in this setting.

Radical Unionism Interposed with Machine-Like "Big Labor"

A final instance of the fragmentation of (or polarization among) actors embedded in Chicago's institutional environment and the potential for actors to develop hierarchical power structures to overcome this fragmentation comes from the labor movement itself. The labor movement early on was fraught with ethnic/racial tensions and divisions, which it overcame periodically in bursts of radical activity. Eventually successful in organizing among the region's large manufacturers in the post-World War II era, however, some of the movement's own institutions grew centralized and "machine-like" as had the city's political and business institutions in order to quell reform and discontent from workers in different plants below while meeting with "Big Business" on an equal footing.

Early into Chicago's experience with industrialization, labor [illegible]ists faced difficulties uniting workers across ethnic and racial divides. Hirsch (1990), for instance, documents how workers' attitudes toward the union movement in the late 1800s were shaped by their ethnic backgrounds and the availability or not of opportunities open to them because of this. Facing different avenues for advancement, Chicago's workers rarely joined together as a class but instead turned to ethnic solidarity. Thus, Hirsch argues that Germans--who were excluded from elite Anglo-American craft unions (even though they possessed craft skills), skilled jobs, and political representation because of vote fraud--turned to a radical anarchist labor philosophy which espoused the overturning of the entire capitalist structure (replacing it instead with producers' cooperatives). Anarchist workers formed their own citywide craft union trades assembly, the Central Labor Union. Anglo-American workers--and immigrants of similar ethnic background (e.g., Scottish, Welsh, or English)--tended toward a reform-oriented labor politics because of the greater opportunities available to them (e.g., access to skilled jobs, political representation, and a middle-class lifestyle or a realistic aspiration for upward mobility) and, hence, their interest in maintaining the status quo. They established the city's Trade and Labor Council which pushed for labor-oriented legislation. Irish workers in Chicago, Hirsch maintains, also sought an ethnic solution to their limited opportunities (i.e., immigrant status and lack of skills) as did the Germans, but one which focused on advancement not through revolution but through control of the city's political machine. The Irish mostly participated in their own Knights of Labor unions. Thus, early on the labor movement was fragmented into these various constituencies. Later immigrants (e.g., Mexicans and Poles) and other newcomers (e.g., African-Americans) to Chicago's labor scene often took jobs as strikebreakers or as unskilled machine tenders, who were replacing skilled craftworkers in the large factories which were mechanizing. These were the opportunities that employers offered them; yet, by taking such jobs, they exacerbated ethnic and racial tensions with the rest of the region's labor force. Such tensions often kept the region's labor movement divided (Herbst, 1932; Reisler, 1976; Pacyga, 1981; Barrett, 1983).

While others have documented how ethnic and racial divisions weakened the labor movement in other cities (e.g., Oestreicher, 1983, for early Detroit) and across the United States (e.g., Mink, 1986), that Chicago's population was and continues to be more diverse than most other regions in the country has at times contributed to both the fragmentation and militance of its labor movement. Chicago's unionists overcame these divisions temporarily through radical bursts of labor organizing which brought workers together in opposition primarily to the large employers. To maintain labor's strength over the long run required establishing big, powerful, machine-like unions to quell dissent and fragmentation below. For instance, Chicago's, mostly German, anarchists and the left-leaning Central Labor Union temporarily joined together with the city's more reform unionists and labor coalitions (the Anglo-American-supported Trades and Labor Assembly, and the Knights of Labor, in which the Irish participated) in promoting a general strike for the eight-hour day in the 1880s. The Chicago labor movement took the lead nationally in regard to this issue. Thousands of workers came out for the frequently held rallies; the movement eventually fell apart, however, after the Haymarket riot and subsequent parting of ways of the anarchists and more reform-minded and often Anglo-American unionists (Hirsch, 1990).

Chicago's labor movement again took the lead nationally in developing many of the first industrial unions in the CIO (Congress of Industrial Organizations) organizing drives of the 1930s. Again, radical Communists, many having had experience organizing with John L. Lewis and the more militant United Mine Workers, joined with more reform-minded and often ethnically-divided workers in Chicago's large manufacturing plants to establish unions on a plant, versus craft, basis. Thus, in 1936, the Steel Workers Organizing Committee

(SWOC) of the CIO, which included Communist organizers, started a steel industry organizing drive in the Chicago area with local workers in the steel plants and support from some other local craft unions (e.g., the Bakers Local 2, Elevator Operators Local 66, and the Chicago Federation of Labor, the city's AFL affiliate) (Newell, 1961; Cohen, 1990; Meyerik, interview). SWOC gained union recognition (as the United Steel Workers, USW) from many companies by the late 1930s, including the U.S. Steel Corporation (Newell, 1961). The CIO-financed Packinghouse Workers Organizing Committee (PWOC) achieved union status for workers in both the smaller meatpacking companies and the giants like Armour in the late 1930s (Galenson, 1960; Newell, 1961; Cohen, 1990). The often militant Farm Equipment Workers Organizing Committee (FE) practiced an "aggressive, confrontational style of unionism" that included efforts to unite the ethnically divided workforce at plants like International Harvester's Tractor and McCormick Works and the use of "wildcat," or spontaneous, strikes to better working conditions in factories in the farm equipment manufacturing industry; the FE was centered in Chicago but organized workers throughout the Midwest (Galenson, 1960; Newell, 1961; Gilpin, 1989; Cohen, 1990).

These CIO victories came about because workers were able to organize across their ideological and ethnic divides and aggressively hold out for union status from the large corporations. Yet, these labor coalitions also fell apart as the more reform-minded unionists purged the radicals from their ranks and took on a centralized, machine-like structure of their own. Thus, the FE--the most radical of Chicago's CIO unions--succumbed to raids by the UAW (the United Auto Workers) as much as it did to International Harvester's aggressive strike-breaking activities in the early 1950s (Gilpin, 1989; Derber, 1989). Other CIO unions in Chicago (e.g., the Steelworkers) purged their ranks of Communists and other left-leaning unionists to become corporate-leaning "labor statesmen" (Nicolai and Derber, 1989a; Derber, 1989; Rosswurm, 1990; Meyerik, interview). District 31 (the Chicago region), of the United Steel Workers, grew huge from SWOC's early organizing successes (representing over 100,000 workers from 1945 on) when it subsequently was ruled for thirty years by one man, Joseph Germano. "Germano's behavior often appeared to be that of a prototypical machine politician, much in the manner of his close political ally, Chicago mayor Richard Daley" (Nicolai and Derber, 1989b: 86). Furthermore, the fact that SWOC (USW's predecessor organization) and PWOC (and possibly the other CIO unions) were directed by outsiders (i.e., organizers from the United Mine Workers), argues Nicolai and Derber quoting from a U.S. Department of Labor report from the era, meant that the resultant unions would become machines. From the start, SWOC was "not an autonomous, member-controlled union" but the United Mine Workers and its organizers maintained "a tight control at the top which took the form of a benevolent autocracy" (Nicolai and Derber, 1989b: 87, quoting the U.S. DOL's <u>Collective Bargaining in the Basic Steel Industry</u>, 1961). Many of these "Big Labor" institutions, thus, also did not encourage collaboration and the involvement of workers in their ranks, but instead often stifled this participation.

II. CHICAGO'S COLLABORATIVE MANUFACTURING NETWORK IN THE PRECISION METALWORKING INDUSTRY

The foregoing has been a lengthy, but important, presentation of the institutional setting in which Chicago's small-firm-oriented metalworking industry operated in the early part of this century. Many of the region's key institutional spheres--its local politics, business affairs, labor relations, and even unions--all operated in a hierarchical manner with the most powerful actors (e.g., city "machine" bosses, corporate leaders, and union heads) setting informal rules as to how the local economy should function. These leaders amassed power through the organizations they created--their political machines, civic and trade associations, and union bureaucracies--and often quelled dissent and grass-roots participation from below in an aggressive manner. When conflict did erupt it often escalated into protracted stalemates between the different parties (e.g., between certain unions and employers, or political reformers and the Democratic "machine") rather than a solution that all had participated in developing and could stand by.

In such an environment, one would not expect business competitors to collaborate--unless it was to present an organized front against labor's demands. Even less likely, one would expect, would be instances of labor-management cooperation. Yet, it is just such a production model--of both close interfirm and worker-employer collaboration--that Chicago's metalworking shop owners erected in the 1920s. Their collaborative ethic and "high road" to production--with equitable returns for all its participants--drew upon several alternative historical traditions within the Chicago region. These included the experiences learned in the region's German ethnic enclave, as well as from early craft industry attempts in printing to forge an accommodation between shop owner and craft union. But, in this era, Chicago's metalworking shop owners and highly skilled toolmakers in the Machinists tool-and-die Local #113 also required a strategy to stop continued degradation of the machinists' craft that mass production in its expansion promoted. Thus, as we see here, these shop owners and skilled workers formed a strategic alliance that entailed a promise of mutual collaboration to maintain the craft livelihood and status to which they were accustomed.

Alternative Roots to the Dominant Regional Pattern of Industrial Politics

Chicago's small-firm metalworking industry has experienced a degree of collective organization and institution-building throughout its history which is unparalleled by many, if not most, of the metalworking centers in this country. Organized as a highly innovative and growing small-firm industrial district since the late 1800s, this industry sounds in many ways like today's flexible and craft-oriented manufacturing economies in southern California, southern Germany, and northern Italy. Chicago's metalworking industry at the turn of the century grew innovative and skill-intensive while it focused on the production of high quality and custom-designed machinery and metal parts. It also clustered side by side with the German immigrant enclave, and shared in the collaborative community and labor-management relations that this enclave developed. Furthermore, its shop owners benefitted greatly through later discussions with the CFL (the Chicago Federation of Labor) which presented it with a strategy for collaboration in the 1920s. These features allowed Chicago's metalworking district in the early part of this century to develop an approach to production and industrial relations which was significantly different from many other manufacturers in this region.

Roots in a German ethnic enclave in the late 1800s. That Chicago's small-firm metalworking industry required highly skilled workers to carry out its production process in the late 1800s and early 1900s made this industry a likely candidate to become dominated by

German immigrants. Representing the city's largest ethnic group in the first decades of the twentieth century, and having brought well-developed craft skills along with them from Germany, Chicago's Germans and their American-born children easily fit into these small shops and allowed the German ethnics to progress up the social ladder. That German workers and shop owners lived and worked in the same community facilitated labor-management cooperation. The German community penchant for socialist politics and its exclusion from the dominant institutions of the day also fostered the formation of an inward looking and mutually supportive enclave that promoted a more collaborative approach to industrial politics.

As stated earlier, about 30% of Chicago's population around the turn of the century were German immigrants and/or their American-born children. Germans outnumbered the native population in that time period, causing the Chicagoer Arbeiter-Zeitung to boast that Chicago was "A German City in America" and that only five cities in Germany had a larger German population (Keil, 1983: 20). Many of the first wave of German immigrants (prior to the 1880s) brought with them highly developed craft skills and an industrial working class background that encouraged Germans to concentrate within the manufacturing and mechanical sectors. The "tradition of work and skill that German immigrants brought with them... [they] partially handed on to their children" such that the second generation flocked to higher-paying, skill-intensive sectors as well (Keil, 1983: 28). Thus, the "metal industry, requiring often highly sophisticated skills and paying good wages, constituted a desirable sector into which second-generation Germans continued to move" from the 1880s to 1900 (Keil, 1983: 28). Table 3-1, taken from Keil (1983: 28, listed as Table 3 by the author) indicates this growing concentration in metalworking. Second-generation Germans also entered the traditionally German crafts of woodworking and furniture making--which also retained a highly skilled labor process into the new century--and the new industries such as the manufacturing of electrical products (Keil, 1983; Jentz, 1983).

These industries grew significantly between 1880 and 1900 to accommodate the influx of Germans. The "metal trades expanded considerably" within the city of Chicago, quadrupling in size of employment over this period (from 4,887 to 20,641 workers) (Jentz, 1983: 74, drawing upon the U.S. Census). But, whereas individual firms in the electrical industry and others increased in size through mechanization, the foundries and machine shops that make up metalworking remained small and highly specialized. This sector grew again by 1910 to 669 machine shops and foundries that employed over 35,000 workers, but declined to 512 firms and over 23,000 workers within the city's boundaries, by 1923 after World War I (Jentz, 1983: 79, 85, citing U.S. Tenth, Twelfth, and Thirteenth Censuses; U.S. Census of Manufactures, 1923). Thus, it "was precisely in industries [like metalworking]... where so many of the renowned German craftsmen worked" (Jentz, 1983: 74). German representation in the machinists trade--that spread across a larger number of sectors than foundries and machine shops--grew from 25% to 28% from 1880 to 1900 (including first and second generation Germans) (Jentz, 1983: 82).

Not only did Chicago's Germans concentrate in metalworking but many of these small shops clustered geographically in the midst of Chicago's northside German ethnic community in this period. The fact that the northside lagged behind the rest of the city in the development of rapid transportation strengthened this community's ethnic coherence and economic self-sufficiency, at least until an elevated railway line was extended to it in 1900 (Harzig, 1983). Therefore, the skilled German craftworkers, who settled on the northside between 1850 and 1900, worked and/or opened small metal shops in the same neighborhood in which they lived. This community land-use pattern may have proven significant in the development of a more cooperative, or at least less hostile, form of labor-management relations. For instance, German workers successfully organized community-wide boycotts among other ethnic Germans against unfair employers (also Germans) in their midst (e.g., as they did against a prominent furniture manufacturer attempting to substitute cheaper Polish for German labor in the 1880s; Jentz and Keil, 1986).

Collaborative labor-management relations were strengthened by a host of other communitarian institutions that the German community created. According to Hirsch (1990), these institutions drew strength from their ethnic cohesion and from the interconnectedness of their memberships. German immigrants, excluded from the dominant Anglo-American business, trade union, and community institutions, created their own organizations which were inclusive in the sense that they involved Germans from all classes in society. The "Jacobin" socialist ideology, which many of Chicago's German immigrants held, also promoted the blurring of class boundaries in that it included respect for small property-owners while detesting the rich (Buhle, 1983; Heiss, 1983; Levine, 1983; Schneirov, 1984). As state socialists, German workers in the community supported the notion of producers' cooperative businesses as an alternative to capitalism (Pierce, 1940; Schneirov, 1984).[4] This socialist

[4] Pierce (1940) states that many workers, in general, were enamored of starting business cooperatives in the 1870s but that the "Germans, in the workingmen's associations, were especially willing to undertake such experiments in the hope of more nearly equalizing the

ideology permeated the life of the German community, given the shared memberships of its varied institutions. Thus, German cultural activities in northside music halls, gymnasiums, and lecture halls coexisted and were influenced by the neighborhood's socialist German-language newspapers, workers' militia, craft unions, central trade union assembly, and wing of the Socialist Labor Party.

While not all Germans were socialists nor opposed to private property, the exclusion of all Germans from the broader social sphere unified this community--workers and shop owners, alike--in their economic dealings--so argues Hirsch (1990). Since the northside metalworking industry was part of this broader German "ethnic enclave," one could suppose that its shop owners collaborated more easily with each other and their workers, as fellow Germans. One could expect this collaboration to continue as long as Germans felt the need to band together as a single community. Although a German "assimilation" campaign, staged by the Anglo-American population in Chicago as a response to Germany's aggression in World War I, weakened these ethnic bonds (and which I describe later on in this chapter), such ties continued through the early post-World War II period--at least in regard to the metalworking industry. Not only did the descendants of Chicago's German immigrants start the metalworking trade association in 1925 (along with a group of Scandinavian metal shop owners), but these shop owners continued to meet and arrange business deals at Chicago's Germania Club until the 1960s. In this way, industrial cooperation and German heritage were intertwined.

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cost of living and the returns of labor... [linking] cooperation with the eight-hour question, as they sought a way to abolish 'the system of hired labor'... [so that] the blessings and benefits of capitalism might be had" by all (p. 183).

The contribution of the Chicago Federation of Labor in the 1920s. Yet, although their German heritage, cultural cohesiveness, and earlier receptiveness to labor-management collaboration in the form of producers cooperatives may have fostered an alternative philosophy among many of Chicago's small metalworking shop owners regarding labor-management and interfirm cooperation, it was not enough to stimulate shop owners in establishing a collaborative network on their own. They required an additional push from their workers and the reform-oriented Chicago Federation of Labor (CFL), the city's AFL affiliate. In a visit from the CFL and the Machinists Union, an alternative to the open shop madness was laid out to the metalworking shop owners. This alternative was being tried by other similarly structured industries in Chicago and it proved workable as a solution for maintaining a "high road" of high prices, high wages, and substantial investment in an industry's future. Thus, the shop owners found an updated strategy they could organize around, rather than the dusty (and defeated) anarchist ideals of a generation past. In this section, I recount the contribution of Chicago's labor movement to the metalworking industry's collaborative network. In the next section, I describe how Chicago's metalworking shop owners built on this contribution to construct their own brand of industrial collaboration.

In the mid-1920s, with a renewed wave of open shop fervor inspiring employers in Chicago and throughout the land, representatives from the Machinists Lodge #113 (Chicago's tool-and-die local of the IAM) began to demand higher wages from the local machine shops that comprised the contract tooling industry. Told that profits in these shops were too low to pay higher wages, the Machinists left and returned with a plan to confront this situation. But rather than strike these small shops, they proposed that the precision metalworking shops form a collaborative network among themselves and an alliance with the union to raise profits and wages to an adequate level. Cutthroat pricing practices were endemic among the small firms in the emerging tool-and-die industry.

Facing this situation, the union proposed a strategy of cooperation rather than conflict to solve their joint problems and the degradation of this craft-oriented industry. At a second meeting, the Machinists brought a Chicago alderman, Oscar Nelson, to speak to the metalworking shop owners on the "value of associations". Alderman Nelson was identified in the metalworking trade association's early board minutes as a "labor person" (TMA, Board minutes, 1925). In fact, Alderman Nelson at that time was second in command of the Chicago Federation of Labor (CFL), the city's local AFL office, and he worked alongside one of the most important labor leaders in Chicago history, the CFL President, John Fitzpatrick (Newell, 1961). To understand the significance of bringing Nelson to meet with the owners of Chicago's small metalworking jobbing shops, let me briefly highlight the role of the CFL in genera in the region's labor movement.

John Fitzpatrick, with whom Oscar Nelson teamed up, is significant in Chicago's labor history because he brought reform to Chicago's chief labor organization--the CFL--ousting the opportunistic regime of "Skinny" Madden. Madden's base was in the building industry and he has been described as "the personification of graft, violence, and intimidation... [He was] adroit as a labor politician, uncanny in his methods of removing from the game anyone who happened to cross him, [but] lacking any very penetrating grasp of the forces at work in American industrial life, [and] indifferent to the need of permanent contractual relations [between workers and their employers]" (Newell, 1961: 22, quoting Professor Royal

Montgomery). In 1905, the reform-oriented unions in Chicago rallied around Fitzpatrick, a "blacksmith... [with] a reputation for integrity and honesty" to rid themselves of Madden and clean up the CFL (Newell, 1961: 24). In describing Fitzpatrick's politics, Newell (1961: 24) states that he was a close friend of the social reformer, Jane Addams; some called him a "radical Fabian"; and he "was against big business and for municipal ownership of such things as city transportation." Fitzpatrick's reign at the CFL was marked by reform and experimentation--he often focused his attention on organizing the unorganized--who at that time consisted of mostly unskilled workers in the city's mass production plants. Fitzpatrick lent the CFL's support to the use of an industrial union model early on (in the 1910s) to organize the steel and meatpacking industries.[5] This was an unusual step for the head of an organization of craft unions to take. Fitzpatrick also helped start a Labor Party in Illinois and ran on its ticket for mayor in 1919 and U.S. senator in 1920. In this period, the CFL also started its own newspaper, The Federation News, and radio station, WCFL that was also called "the voice of labor," to put forward the labor point of view since the "city press was hostile toward Fitzpatrick and those things for which he stood" (Newell, 1961: 25; Cohen, 1990).

Oscar Nelson, the Vice President of the CFL, teamed up with Fitzpatrick in the 1920s and 1930s to help organize both Chicago's large mass producers and its small shops. Newell (1961) describes one innovative organizing strategy this team helped develop in Chicago's

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[5] Needless to say, these early efforts at industrial unionism failed. It was not until the CIO campaigns of the late 1930s that steel, meatpacking, and other mass production industries were more fully unionized.

laundry, cleaning, and dyeing industry at the outbreak of the Depression in 1929.[6] This industry consisted of small highly competitive shops that often experienced waves of price and wage cutting, cutthroat behavior in the industry, and the subsequent bankruptcy of many of its firms--much like the small firms in metalworking. Throughout its history, the laundry and dyeing industry occasionally staved off market chaos through various permutations of employers' associations; but in the 1920s, market discipline and interfirm agreements were imposed by Chicago's gangland syndicates that controlled the industry. In 1929, with the fall of the stock market and loss of business immanent, cutthroat behavior again threatened. The Chicago Cleaners, Dyers, and Pressers Union, Local 17742 (which the CFL had helped to organize a decade earlier) faced a lockout by their employers who wanted to reduce wages. The union threatened to build its own million-dollar plant as a response; this impasse induced the two sides to sit down together for negotiations.

The result produced was an unusual agreement. The two parties decided to organize an association for the industry that would maintain price and wage levels and stem ruinous competition. The participants appointed an arbitrator, Professor B.M. Squires, to establish price and wage rates for the industry in situations of disagreement. Squires was to consider competitive conditions in the industry, the productive capacity of each firm, and the cost of living before establishing such rates. Local 17742, the Chicago Master Cleaners and Dyers Association, and Local 712 (the Laundry and Dye-House Drivers, an arm of the Teamsters) put together this agreement with the support of the CFL and numerous other civic and

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[6] For this account, I draw exclusively from Newell (1961), who researched this episode and interviewed its key participants.

community organizations.[7] Others in the community, however, were less enthusiastic. The State's Attorney, Thomas Courtney, put all those involved on trial, including the CFL's Fitzpatrick and Nelson. However, the trial was delayed until 1933--the year that the National Industrial Recovery Act (NIRA) passed.[8] Since this act "encouraged close facsimiles of the Chicago association"--that is, industry cartels--the defendants in the trial were acquitted (Newell, 1961: 40).

This "Chicago association," or experiment with labor-management and interfirm cooperation, was soon tested. In 1934--five years after the initial agreement--76 employers in the cleaning industry's employers association again locked their workers out of their plants. Cleaning establishments in the outlying suburbs had not joined the association and were undercutting the city cleaners' prices. Explaining their predicament, the employers association's head, F.W. Crowley, stated that:

> [the association] has no quarrel with organized labor and ... its members are satisfied with their employees who are all union members, but ... under the present conditions they cannot continue to pay the union wage scale... Some of the large cleaning and dyeing establishments outside the association clean and press dresses and men's suits for three for a dollar, while we have obeyed the [NRA] code provision and are charging the code price of 75 cents a garment. The association is a member of the NRA, and, while the plants outside the association have not signed the code, they are supposed to come under its provisions... The situation which led to the lockout is essentially the same which had prevailed in Chicago in the Cleaning and Dyeing industry for the last decade. It has led to price wars, price fixing combinations which

[7] These included the Chicago Chamber of Commerce, the Greater South Side Chamber of Commerce, the Illinois State Federation of Labor, and the Chicago Women's Trade Union League.

[8] The NIRA established the National Recovery Administration (NRA) to carry out its work.

> were successful for limited periods only, [and] waves of racketeering and violence... (Newell, 1961: 49).

Promptly, organized labor fulfilled their implicit side of the bargain. They set up picket lines around the non-union shops and in a week all the nonunion shops agreed to become unionized. Following this, 6,000 employers forged an agreement on prices, wages, and a union shop (Newell, 1961).

The cleaning and dyeing industry's agreement postdates by four years that which employers and their workers made in precision metalworking (that I spell out in the following section). However, the existence of a similar mechanism for labor-management cooperation in the printing industry much earlier suggests that this strategy was one which clearly lay in the Chicago labor movement's (and, perhaps, small employers') collective memory. Progressive unions and the CFL promoted this strategy of the "Chicago association" in the 1920s as a means to achieve good working conditions in the region's small-firm-oriented industries. Some industry leaders earlier also pushed for this model, as we see in the printing sector.

In her study of labor relations in Chicago's book and job printing industry, Brown (1931) describes how a segment of the industry set up a collaborative agreement to stem the frequent price and wage-cutting wars that bedeviled this industry, as well, since the city's founding. This agreement, between the Chicago Employing Printers' Association and Chicago's Typographical Union No. 16 diverged sharply from the strategy employed by the non-union firms in the Chicago Typothetae. While the Typothetae's firms enthusiastically joined the open shop movement (and included Chicago's very large printing firms such as the

Donnelly Printing Company), the smaller firms comprising the Chicago Employing Printers Association decided the industry would be better off cooperating with the union and focusing on solving industry problems jointly. In appointing a negotiating committee for the two sides in 1909, C.S. Peterson, the employers association secretary, writes:

> The Committee, and I believe most of the proprietors as individuals, realize that the future of the printing trade--and particularly the machine end of it--lies in co-operation between the union and the proprietors, and not in antagonism. The work of unionizing the surrounding towns and bringing wages and working conditions in them to a better condition, is particularly a matter that both the union and the proprietors of this city are equally interested in. In that, as in many other matters, our interests are identical, and we ought to pull together instead of working against each other (Brown, 1931: 134).

Thus, in return for union efforts to organize firms in the competitive environment (and bring them into the fold of firms signing onto this agreement), the printing association's shops pledged to raise workers' wages. Jackson (1984) cites this example of labor-management cooperation as an unusual variant for craft industry employer associations to follow. Traditionally, employers band together to offer instead an organized opposition to strong craft labor unions, much as the NMTA did in its open shop campaign (see also Harris' account, 1991, of the anti-union activities of an employers' association in metalworking, the Metal Manufacturers' Association of Philadelphia). Yet, these collaborative industrial relations models which brought workers together with their employers, and shop owners with their local competition, inspired Chicago's metalworking shop owners to replicate this strategy for their industry in the 1920s. Let us see exactly how they did this.

A Collaborative Metalworking Network in the Guise of a Trade Association--the 1920s

Although German ethnic cohesion may have lessened somewhat in the 1920s, affecting the relations among shop owners and their workers, Chicago's metalworking industry was able to maintain a collaborative production philosophy through other institutional means--the establishment of a metalworking trade association along the lines of the Employing Printers Association and CFL-inspired laundry industry models. Not only did this trade association, as a new form of guild, recreate trusting labor-management and interfirm relations, but it was able to maintain an industry-wide focus on innovation, product quality, and skill acquisition by setting clear ethical goals for the industry collectively. In the remainder of this chapter, I outline the principles which guided this collaborative metalworking network during its early years of operation. In the next chapter, I trace the ability of metalworking shop owners and skilled workers to deal with pressures that sought to break this network apart.

The external environment facing Chicago's metalworking industry offers a choice. Since the manufacturing expansion required to support American troops in World War I was substantial, it fostered the growth of existing firms in metal-related industries, and the start up of new ones, to increase capacity quickly (White and Sinclair, 1945; Wagoner, 1966). Small machine shops, like those on Chicago's northside were increasingly asked to take on the custom-building of specialized tooling, freeing up the large mass producers to run huge lots of armaments. This period proved a boon to Chicago's machine shop industry and stimulated the birth of its contract tooling industry, as reported in the previous chapter. Yet, faced with overcapacity following the war and pressures on the cohesiveness of Chicago's German community--many of whom worked in metalworking--this industry's firm owners became competitive and cutthroat to each other and their workers alike. Given this environment, Chicago's metalworking shop owners faced a choice: to cut prices and wages to obtain business in the short run, or collectively to raise them both and in so doing ensure the long term viability of this industry. Let us consider briefly business conditions facing Chicago's metalworking industry in the 1920s before returning to this choice.

Some indication of the overcapacity in Chicago's precision metalworking industry following the first World War can be seen by looking at national statistics for this industry. The 1927 Census of Manufactures, for instance, reports that the number of foundries and machine shops in the country decreased drastically from a high of 10,934 in 1919 to a low of 8,134 firms in 1925, after which the industry started to expand slowly again. This industry also shed more than 150,000 workers between the census years of 1919 and 1921 (dropping from about 483,000 to about 321,000 production workers in the country as a whole), after which the industry's total workforce fluctuated widely throughout the 1920s. Similarly, the machine tool industry--which also produced tools, dies, and other precision metalworking products--cut its workforce in half from 1919 to 1921 nationally (from over 53,000 workers to over 21,000 in this two year period) with a number of firms going out of business (a drop from 403 firms in 1919 to 329 in 1925). Overcapacity stimulated metalworking firms to engage in cutthroat behavior as did the highly competitive bidding practices of their large customer firms--the mass producers of durable goods--that were also trimming down after the war. Prices in Chicago's precision metalworking and tooling shops, thus, plummeted to very low levels in the mid-1920s. Describing this environment, George Rockwood, of Chicago's soon-to-be-established metalworking trade association, (n.d.: 3) writes: "In the early days of the new [tooling] industry, most owners viewed each other with suspicion and distrust. Competition was 'cut throat', and profits were consequently small."

Often ethnic bonds allowed individuals to overcome hardship collectively and mitigate against cutthroat behavior. Cohen (1990) documents extensively how Chicago's workers and small-shop owners in the 1920s lived lives that were heavily circumscribed by and dependent upon ethnic bonds. Most individuals resided in geographically isolated and ethnically concentrated communities within the broader Chicago region and received support from a variety of ethnically based institutions (e.g., ethnically based credit unions and mutual assistance organizations). The owners of smaller firms tended to work in the communities in which they resided, drawing their workforce from co-ethnics who surrounded them. This often facilitated collaborative dealings among such firm owners and their workers in hard times, such as the recession following World War I. Yet, Chicago's Germans--at least those in metalworking--may have found ethnic cooperation difficult after the war due to a citywide campaign to assimilate them and break their pride after Bismarck.

Chicago's citizenry at large attacked the local German community--to which the precision metalworking industry was linked--for its exclusiveness and encouraged Germans to assimilate following World War I. Many of Chicago's German-American residents had supported Germany in the war effort before the United States entered the conflict. For instance, when a German submarine sunk the British passenger ship, the Lusitania, killing Americans on board, Chicago's Abendpost spoke in favor of this action, saying it would "teach Americans a 'lesson'" (Holli, 1984: 481). Both other immigrant groups (e.g., Chicago's Slavs) and the city's native-born residents united in a common front to weaken the German community. They campaigned to remove special Germanic privileges in the public school system (e.g., use of a "Kaiserized" spelling book, German language instruction), investigated German-Americans for espionage, criticized all aspects of German culture in the press, and pressured segments of the German-American community to repress their ethnic heritage. (For instance, Chicago's Germania Club, at which the city's metalworking shop owners often met, voluntarily changed its name to the Lincoln Club in 1918.) This attack on Chicago's German community was significant, argues Holli (1984: 511): "Even today in Chicago, *Deutschtum* has never experienced a third-generation revival. ...Whereas Chicago has museums and cultural exhibit halls for Lithuanians, Ukrainians, Poles, Swedes, Jews, blacks, and others, no museum or permanent public exhibit of German-America is anywhere to be found."

Given this environment--a recession, overcapacity in the industry, and weakening ethnic bonds among Chicago's German community--Chicago's metalworking shop owners, many of whom were German, saw their industry decline into a price war. This left these shop owners a choice. They could individually cut prices to secure sufficient business to survive in the short run and take this cut out of the wages they paid to their skilled workers. Or, they could attempt to rebuild a cohesive industrial community and raise both [illegible] and wages together. Each of these strategies was considered by Chicago's me[illegible]ng shop owners, and each entailed their own risks. While the price cutting strategy might help each firm immediately, it carried serious long term implications. As the association's own history of this period describes this choice: "The Chicago area tooling trade... was suffering from a rash of over zealous companies trying to secure a footing in this young business. Many firms found it necessary to carry to extremes the practice of slashing prices to attract customers and remain competitive. Although it was a legal and commonly used method, left unattended would create a never ending spiral and ultimately result in the demise of the tooling industry in Chicago" (TMA 50th Anniversary, n.d.: 14). Not only would price wars put many metalworking firms out of business, but it would also set up an antagonism between these shops and their workers resulting in strikes, work stoppages, and poor workmanship on one hand and the long-term degradation of craft skill and knowledge on the other--much the way the open shop movement was producing in other industries.

The alternative, as I indicated in the prior section, was to adopt a collective and collaborative strategy--one that would bring shop owners together and they, in turn, with their workers. This option was laid out to the metalworking shop owners by the CFL and the Machinists Union. As reported by the trade association's George Rockwood: (n.d.: 3): "The union man... sought out a well-known Chicago alderman, Oscar Nelson, sympathetic to labor and urged him to do something about getting the owners together so that both men and bosses might benefit" by agreeing to a floor for wages and prices. This strategy carried the risk that a segment of the industry might not play by these collective rules, and continue to successfully undercut those that did. However, the advantage to this collaborative strategy was that it provided sufficient cushion for the firms in this industry to invest in training the highly skilled workers they required and to build up their own expertise over the long run. With sufficient investment in craft skill and knowledge, the small metalworking shops could continue to turn out the high quality products they had been known to produce earlier. The need for such a cushion in this "Special Tool & Die Industry" is explained fully by Stuart Sinclair (White and Sinclair, 1945: 6), a shop owner and early secretary of the metalworking trade association that was to come:

> [This industry] has a very high risk factor in its operations. The high degree of risk is caused by: (1) the great possibilities of scrap when working with tolerances of one-thousandth of an inch and down as close as twenty-five millionths of an inch as allowed variation from stated dimension, (2) the undeterminable length of time necessary for a tool, die, or gage maker to process material to a finished dimension within the tolerances stated above, (3) the tendency of the skilled workers of the trade to migrate, even during periods of depression, presenting the employer with a constantly questionable skill factor in his plant, (4) the small quantities produced of each item, and (5) the voluminous amount of knowledge needed by administrative men in the Tool & Die shops.

Thus, a cushion of profits would allow the shop owner to build up his engineering expertise, to secure adequate and often scarce skilled labor, and to cover errors made in bidding on highly precise and custom-made products manufactured by an uncertain and highly variable production process. The uncertainty surrounding labor was exacerbated by the new immigration laws which the U.S. government enacted in 1923 that "all but dried up the last remaining source of supply" of cheaper but highly skilled European labor that Chicago's German-owned shops had often depended upon (White and Sinclair, 1945: 6). Given these risk factors, it made sense that Chicago's metalworking shop owners chose to attempt the collaborative model that the Machinists union proposed to them. Therefore, a small group of eight firm owners, with the help of the Machinists union, decided to try to stabilize conditions in Chicago's precision metalworking industry by forming the Tool, Die, Special Machine and

Manufacturers Association in 1925.[9] "M.P. Heinze of the same company name was elected its first president. He was to hold this position for the next six years, and Ben Irmis who along with his brother Miles Irmis, operated the Superior Tool and Stamping Co., was named recording secretary. Others in the group included Rudolph Krasberg of R. Krasberg & Sons Co., William "Bill" Orth, of the same name company", Sam Swenson, the group's vice-president, and "before too long such men as Karl Harig, Herman Siemund and many others" (Rockwood, n.d.: 3). How exactly was this collaborative model structured in its early years? Let us look at the goals that the fledgling trade association set out for itself.

The goals of Chicago's collaborative metalworking network. Chicago's metalworking trade association continued to meet monthly throughout the 1920s and develop a collective plan for stabilizing the tooling industry. By 1928, it had grown to over 100 member firms and had spelled out its program clearly in a code of ethics for the industry as a whole. This code and the discussions held at its initial meetings show an emphasis on building a collaborative rather than confrontational set of labor relations and an interfirm agreement that focused on reducing costs, sharing information, and eliminating cutthroat practices by tooling firms and their customers alike. Let me discuss each of these goals in turn.

In terms of labor relations, there is evidence that the early metalworking trade association considered both the more divisive open shop approach and the collaborative CFL

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[9] This association changed its name several times in the last seventy years--to the Tool & Die Institute (T&DI) and most recently to the Tooling and Manufacturing Association (TMA).

model, but eventually chose a model closer to the latter path. Over a year after the CFL's Oscar Nelson stimulated the association to start up by presenting his view of the "value of associations," E.F. DuBrul, the General Manager of the National Machine Tool Builders Association in Cincinnati and past leader of the open shop movement (through his participation in the NMTA) came by to do likewise. That is, he wanted to discuss his view of "the value of an association to an industry and the need of the co-operation of the manufacturers within an industry, especially on its value in eliminating destructive practices" (TMA Board minutes, 1925, 1928).[10] While the two talks might have emphasized similar interfirm practices that could be achieved through association (e.g., eliminating cutthroat bidding), Nelson and DuBrul most certainly would have disagreed on their approach to labor relations. Several months after DuBrul visited the association, representatives from the open-shop-oriented National Metal Trades Association also presented their views. Yet, at this point the metalworking trade association discussed how their approach would differ in that they did not intend to deal with "labor problems" whereas the NMTA did (TMA Board minutes, 1928). In that same year, Chicago's metalworking trade association continued to confer with their representative at the Machinists Union (the tool-and-die Lodge #113) on "how the union could help them stop price cutting" (TMA Board minutes, 1928).

Thus, the metalworking trade association attempted to collaborate with the union and with their skilled craft labor throughout these early years, although this alliance may have

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[10] As late as 1939, the metalworking trade association still remained in touch with the CFL approach to interfirm association; in that year, George Buick spoke to them of "the methods used by the Industrial Laundries Association to stabilize prices and conditions in that industry" (TMA Board minutes, 1939). Chicago's laundry industry is that which the CFL had been taken to task by the State's Attorney for organizing in 1929.

been often uneasy and reflective of the paternalism the metalworking shop owners held toward their workers. This comes through in the early goals of the association. For instance, its code of ethics states that the metalworking shop owners' duty should be "to elevate the moral character and ameliorate the financial condition of [their] workmen" (Code, n.d.: 4) Not only would interest in their workers' welfare help in "preventing strikes and lockouts," but the shop owners wanted to be able to take credit for workers who were competent, well trained, prosperous, and good citizens (Code, n.d.: 4). And, while this early trade association felt that no firm should "be dictated to by labor organizations," it also emphasized that "any action which tends to **decrease** the rate of wages should be looked upon with as much distrust as is an effort to increase them" (TMA Code, n.d.: 4, emphasis added).

Similarly, the metalworking trade association tried to encourage collaboration among each other as shop owners. Initially, the trade association fostered trust and collaboration among its member firms through social events, peer sanctions, and collectively provided services. In the words of the association's first director, George Rockwood (n.d.: 4): "In the congenial atmosphere of good fellowship, the old antagonisms began to disappear, and as the group learned first to socialize together, they then learned to work together." The code of ethics the early trade association established also reflects the interfirm tensions that the association had to overcome to achieve its goals of stabilization. This code focused on several dimensions of the interfirm relationship; how to: (1) uphold standards for product quality, (2) encourage the sharing of technological, market, and other business information among the member firms in the association, (3) promote the equitable distribution of work among all firms in the metalworking industry, (4) curb excessive price cutting and competitive bidding, and (5) standardize customer practices. By promoting these goals for interfirm collaboration, the founders of Chicago's metalworking trade association wanted their industry to remain competitive through technological innovation, the advancement of skills, and insistence upon high standards for product quality, while recognizing that the bulk of firms in their industry would remain small. In other words, they wanted to follow a progressive vision of a "high skill" production philosophy rather than a "low road" of price cutting and cheaply made products. What does the code state about each of these goals for interfirm collaboration?

The first goal that Chicago's metalworking trade association wanted to achieve through interfirm collaboration was to uphold quality standards for work done in the metalworking industry. Member firms should "endeavor to get a reputation in the community as... [a] first-class manufacturer", stated the association's Code (n.d.: 1). Instead of competing on the basis of low cost, the Code further implied, metalworking shop owners should try to obtain contracts by doing a higher quality job. "The young employer who starts with small capital, and does most of his own work, should... never make the mistake of supposing that because he does his own work, he can do it for less than his neighbor who employs fifty or more hands, with a long list of superintendents and foremen. He should rather insist that the work which he does with his own hands will be better done, and therefore he should receive more for it" (TMA Code, n.d.: 2). In 1928, the trade association's firms suggested the adoption of a special trade mark. This trade mark was printed on plaques to hang in the windows of member shops. In this way, the industry's high-quality producers (i.e., those that were association members) could distinguish themselves from firms that were not.

Related to this goal of product quality, was another that the association hoped to achieve through interfirm collaboration. This second goal was to encourage member firms to share technological, market, and other industry information. Only in this way, the association's founders thought, can Chicago's metalworking industry hope to advance. To quote M.P. Heinze (1929: 6), the association's first Board president and a metalworking shop owner:

> The fundamental reason why a trade association is so vital at the present time is because an industry survives or progresses only through scientific research and analysis, the discovery of new methods, new materials, new fields and markets. Only through a trade association can an industry find the ideal, can it have the vision to see what ought to be done as well as what is needed. Only by their combined weight can the objective be achieved.

"Contact" and "intercourse" between individual metalworking shop owners must be encouraged for the "good of the whole", continued Heinze. The association also adopted ethical rules governing interfirm communication. The Code of Ethics instructed member firms to welcome any new young competitor into their ranks and "help him to any information and assistance which will enable him to overcome the difficulties we had so much trouble in surmounting" (TMA Code, n.d.: 2). By sharing knowledge, "so long as we are satisfied that the information generously given will be honorably used", member firms can eliminate "the element of ignorance, which does so much to demoralize the industry,... [and which is] one of the most dangerous factors of competition." By sharing knowledge, one can also make "a business friend of one who... otherwise [would] become a business foe" and expect that the favor will be returned eventually "fourfold" (TMA Code, n.d.: 2).

The third result that the trade association hoped to achieve through group cooperation was a more equitable distribution of work among shops and the sharing of orders during a slowdown. Again, the association's Code of Ethics (n.d.: 2) states: "When a manufacturer is offered work which he cannot do,... [he should] decline it and refer his customer to the establishment that can do it, and not accept the work... [getting] a neighbor to do it... [for a] commission." Similarly, the Code directs other member firms to help out those shops that are in a rush and to not criticize the price of another, hoping to steal that work away from the other's customer. These rules, the association's founders hoped, would curb "the temptation [of individual metalworking firms] to add to [their] facilities [which will] oftentimes [become] much too large for the work done in a given community... [I]dle machinery makes it almost impossible to maintain any standard prices which may be adopted." Thus, such work-sharing rules limited the creation of excess capacity in the industry over the long run--either through the enlargement of a single firm or the addition of new business start-ups--and helped to maintain prices at an adequate (or higher) level. In this way, small firms in the metalworking industry also remained on equal footing--no one single member either growing overly large nor utilizing the others as cheaper subcontractors. In line with this ideal, small and large firms had equal influence within the association--with its one firm-one vote rule.

In terms of the fourth goal for interfirm collaboration, the founders of Chicago's metalworking trade association felt that if they could not stop interfirm price-cutting and competitive bidding, it would ruin Chicago's future, in the long run, as a tool, die, and precision metalworking center (TMA, 50th Anniversary, 1975). Accordingly, through its Code of Ethics and other activities, the association attempted to encourage firms to set "fair" yet competitive prices to cover all costs including overhead, a sufficient wage to skilled labor, and enough to ensure a "fair profit" to the firm owner. Competitive bidding between member firms was to be discouraged; to cut prices below the minimum needed to cover all expenses was seen as, "in the first place... FOOLISH; in the second place, it is WRONG" (TMA Code, n.d.: 1).

A final goal the Chicago metalworking trade association wanted to pursue through its establishment of interfirm ethics, and one related to the previous goal of discouraging cutthroat pricing, was to limit the divisiveness of certain customer practices for the industry at large. For example, the association's founding member firms thought that customer demands for detailed cost estimates on any job--estimates which separated out the value of different items--should be refused since this knowledge in customers' hands was "one of the surest methods of provoking unfair competition" (TMA Code, n.d.: 3). When making estimates, so stated the founders through their Code of Ethics, "the intelligent manufacturer should endeavor never to lose sight of the fact that the only price proper to make is the one that he would make were the work entrusted to him without any estimates having been requested on it" (i.e., the estimates should be based on material, labor, and overhead costs--including the desired profit--and not with an eye to competitive bidding). The Code further suggests that if a firm owner subsequently loses a job--due to making a relatively higher bid than his neighbor--he should console himself with the thought that had he "encumbered himself with the work at a low figure he would have incapaciated [sic] himself from doing what may presently come along at a remunerative rate" (TMA Code, n.d.: 3). Lastly, the founders and their Code state that should a customer show a metalworking shop owner the bid of another metalworking subcontractor, the first shop owner should take caution since "if [the customer] will show you another's bid he will show yours to a third party. He wants you to do the job, if you will do it for less than anyone else" (TMA Code, n.d.: 3). Hence, standardized practices in regard to customers allowed the Chicago metalworking association--through a united front--to prevent the ruinous price cutting that had injured the industry earlier and which had been a drag on maintaining continued high product quality standards. The founders and their Code also counsel firm owners that have been "aggrieved" by another who lured away their customer with a lower bid to, first, seek an explanation from the other metalworking subcontractor--assuming the low price to have been made by "ignorance,... thoughtlessness,... or mistake"--rather than break the cooperative bond that has been built between the two metalworking subcontractors.

These early rules of Chicago's metalworking trade association were not meant to create a monopoly per se among subcontractors in the industry, but to induce a production philosophy of fair play so that metalworking shops could continue to compete on the basis of quality in the long run.[11] At its second meeting, for example, the fledgling trade association

[11] The Code written by the national association for submittal to the NRA gave less play to the idea of fair competition, although it too states that it "is not designed to promote monopolies" (STDMSI, 1933: 11). This group, which included all tooling and precision metalworking centers around the United States, for instance, wanted to limit the entrance of new firms into the industry by suggesting that an industry rule be implemented wherein new firms would have to "show evidence of the necessity for such increase in productive capacity" before starting up (STDMSI, 1933). By contrast, the national's Code did not stress the sharing of technological, market, and other business-related information among its members. Instead, a Code item stipulated that "[p]irating ideas, designs, drawings, or sketches of any product that has been submitted to prospective customers, by a competitor, constitutes a violation of this Code" (STDMSI, 1933: 12). Although the Chicago association was instrumental in establishing the national tooling and precision metalworking association and the national's early headquarters were in Chicago, the Chicago group early on disagreed with

featured a speaker on current anti-trust laws, which prohibited monopolistic price-setting. In the development of standardized price lists, the association's shop owners always linked price setting to the accurate calculation of costs. But the association and its members wanted to distinguish between destructive price and cost-cutting and that which was merely competitive. They wanted to relieve the industry "from the deleterious effects of guess prices", instead to have "every TRANSACTION [governed] by the standard of truth and justice" (TMA Code, n.d.: 1). Not only should all the costs of doing business carefully be included, but no extra charges should "be entered on the books that can not be proved by competent evident in a court of justice to be a fair competitive price" (TMA Code, n.d.: 1). Chicago's metalworking trade association had its eye on regulating industry behavior to allow firms to improve their performance over the long run. This necessitated sharing information and encouraging innovation and other efforts to upgrade product quality. It also, however, necessitated ensuring that metalworking firms received sufficient financial returns to allow them to invest in purchasing machinery, training workers, and making other improvements. Should these investments falter (e.g., because of cutthroat pricing behavior), the industry's quality would also deteriorate. How effective was this vision for stabilizing Chicago's emerging tool, die, and precision metalworking industry and protect it from the cutthroat bidding practices that many of its large customers hoped to stimulate? In the next section, I evaluate the trade association's early activities in terms of how well they carried out its goals.

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the national on certain positions--a tension which heightened over the years as the Chicago association became increasingly independent.

The metalworking network sustains itself--the record of its first decade. Chicago's metalworking trade association set out to construct a collaborative set of labor and interfirm relations for its industry to counteract the cutthroat behavior that threatened this skilled craft industry with extinction in the post-World War I period. How did the association go about achieving its goals? Was it effective at establishing a workable compromise with its workers and the Machinists Union? Were these industry leaders also able to convince other metalworking shop owners to go along with them in upholding prices, product quality and production efficiency, the free flow of production-related information, and standards for ethical bidding practices. Let us look at the early record as it appears in the association's board minutes and other historical documents.

While the record on the association's early relationship with labor is meager, it does suggest that shop owners did try to uphold a decent wage for the industry's workers and refrain from exploiting them as the Depression hit. However, the association also assumed some functions of a craft union for itself--notably control over the recruitment of and supply of skilled tool-and-die-making labor. This latter function became critical soon after the association's formation and with the coming of an expansionary economic cycle in the latter half of the 1920s. Since access to sufficient skilled labor during boom times determined whether firms could take on an extra workload, the association investigated starting its own labor bureau as early as 1926. A Labor Bureau could link unemployed craftworkers to the association's firms--a function the union hiring hall similarly fulfilled. By 1929, "the labor situation" became critical, so the association appointed a Labor Committee which proceeded to set up a labor bureau for its member firms. However, when firms were assessed a fee to support this service, many balked; few member firms also utilized the labor placement service. This lack of interest may have been due to the fact that firms may have already been adequately serviced by the union in locating an adequate workforce; or, the slowdown of the Depression years may have already started such that few jobs existed for the labor bureau to fill. Regardless, the association in other ways in this period indicated a desire of the firm owners to gain greater control over aspects of its labor supply; the labor bureau would offer more immediate access to this supply while the training classes the association started to offer in the early 1930s (and about which I will say more in Chapter 6) would allow firm owners to strengthen the quality of skills that their workers embodied.

In addition to regulating the supply of labor, the early association did attempt to fulfill its pledge to pay better wages to the industry's workers. This goal proved increasingly more difficult to reach with the coming of the Depression. Nevertheless, the metalworking trade association consistently discouraged the "sweating" of, and other exploitative practices in regard to, its members' workers in this decade. It collaborated with labor in this regard since its members relied on both the extensive skills and loyalty of their workers in order to remain competitive in the highly innovative field of precision metalworking. Let me cite two examples of the association's support of a decent wage for metalworkers. The onset of the Depression in the 1930s induced some firms to begin subcontracting work to their inside employees--a practice which allowed employers to circumvent previously agreed upon or guaranteed wage rates and to encourage workers to bid against each other. The Machinists Union had long been against such practices because it diluted the control of each craftworker over his or her job (Montgomery, 1987). In 1931, the members of Chicago's metalworking trade association voted to prohibit this practice (although only a small majority of members present agreed to this new regulation) and used pressure on each other throughout the next decade to enforce it.[12] In 1938, for instance, complaints of member shops contracting work inside to their employees again surfaced with the second downturn of this decade; a motion was made and agreed upon at that meeting that the association's secretary (its staff person) was to gather information on these shops, including the names of their key customers and "credit men representing our association's members", with "a view to bringing pressure to bear to put a stop to all such foolish and unethical practices" (TMA Board minutes, 1938).

Chicago's trade association also pushed for higher wage standards among its peer organizations from other regions that belonged to the national Special Tool, Die and Machine Shop Institute, an organization the Chicago group helped establish in the late 1920s. For instance, when President Roosevelt signed the National Industrial Recovery Act into law in 1933, it encouraged national and regional industry associations to be set up that would formulate rules, or Codes of Fair Competition, governing practices in each industry. Such rules could cover wage setting. In devising the national tool-and-die industry's Code for approval by the National Recovery Administration, the Chicago association argued for the inclusion of a \$.70 per hour minimum wage for skilled workers.[13] This wage protection was critical, Chicago's precision metalworking shop owners felt--and as the association expressed

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[12] The members of the national tooling and precision machining association also agreed to prohibit this practice in their "proposed Code of Fair Conduct" submitted to the National Recovery Administration in 1933 (STDMSI, 1933).

[13] This minimum wage appears in the proposed code agreed upon at the national's convention in Cleveland, August 25-26, 1933; yet, it was deleted in the final version sent to Washington later that year.

in a telegram sent to Washington arguing their point of view--"as this class of labor represents the principal item of cost in our products, [and] it is felt here that stabilization of the industry and prevention of demoralizing competition will become extremely difficult without this protection" (TMA Board Minutes, 1933). This is a strong position to take at the height of the Depression; the other metalworking trade associations represented by the national organization would not go along with the guarantee of a fair return to their workers that the Chicago shop owners sought. Therefore, a minimum wage never became part of the national tooling industry's code.

Thus, through examples such as these, we see that Chicago's metalworking industry was beginning to forge a collaborative working relationship with its workers and their union. Shop owners consciously and collectively provided training, a decent wage, and moral guidance (in becoming an upstanding member of the craft) to their workers. Although the metalworking industry remained mostly non-union in this period and shop owners did not always pay the wage rates requested by the union, the trade association and its member shops consistently fought for a higher pay rate for its workers than was paid to machinists in the large production plants in the region and in the contract tooling shops in other regions of the country. The association also resisted other trends that would cause the "sweating" of the industry's labor force. In return, the shop owners expected these activities to be rewarded with loyalty and quality workmanship on behalf of their workforce.

In contrast to the strengthening, yet somewhat leery, partnership between metalworking shop owners and their labor, how well did the partnership between shop owners operate in this first decade? Here we see a similar pattern. In the growth years of the twenties, the association attracted many new firms to join it in regulating industry practices. The association's leaders started several concrete projects to begin to set such industrywide standards. The slowdown of the 1930s here also produced pressures on this bargain between firms. Yet, on the whole the shop owners were able to establish a pattern of collaboration as they headed into the Depression much as workers and management had done.

By the end of the 1920s, Chicago's metalworking trade association was well on its way toward achieving its interfirm goals of collaboration. A key effort of the association's members in this period was to increase the industry's overall efficiency collectively at the same time that it held up prices and wages. It did this by promoting the free flow of information between firms--with early "meetings to be mostly educational and open" to all in the industry (TMA Board minutes, 1928). It also encouraged greater efficiency on the part of member firms by trying to standardize their cost estimating practices. While the metalworking shop owners objected to the divisive bidding practices that their larger customer firms often followed to play one shop off against another, they worried as a group about how their association might be perceived by these same customers. In these early years, President Heinze reminded the other member firms that they had organized into an association to "cut costs, and make better tools, not to raise prices"; they sent a letter to each of their customers stating these principles.[14] Carrying through on this idea of stimulating increased efficiency throughout the industry by cutting costs, the association established a Standardization

[14] While it is difficult to determine what exactly happened to costs and prices within these association shops in this time period, the significance of this letter to its customers is that the trade association tread a thin line between resisting its customers' efforts to stimulate cutthroat bidding practices among suppliers and driving these customers to take their business away to non-member metalworking shops.

Committee. Since one of the key factors that firms considered when bidding on a job was the amount of labor-time that went into it, the association wanted to ensure that member firms and their workers estimated labor-time accurately. The Standardization Committee developed a cost estimating project in which a request for "standard specimen dies" would be distributed to all member firms to calculate their cost estimates on this practice job. These estimates would be compared and disseminated within the metalworking industry. In this way, through the proper calculation of costs, prices of these metalworking supplier firms would also become standardized at a higher and adequate level (i.e., a price floor could be regulated)(TMA Board minutes, 1925-27). The association's skill training program for its craft workers--which it started later in the early 1930s--also focused initially on teaching accurate cost-estimating procedures to workers. Thus, the information the association garnered on how to improve the industry was available to all firm owners and workers collectively.

In addition to sharing information on cost estimating and production of standard dies, the association early on began to help its member firms market themselves to a wider customer audience. This service became critical again for helping the small firms in the industry improve their lot collectively. In 1928, for instance, President Heinze made a trip to Detroit to market the Chicago industry's collective wares; he "emphasized the need for the association to have on file the complete equipment of its members" to help in this marketing effort (TMA Board minutes, 1928). The association also put together its first marketing "booklet... the forerunner of [the association's] present day 'Purchasing Guide & Directory' which has remained a valuable tool in promoting the members over the years" (TMA 50th

Anniversary, n.d.: 16). In addition, the association started a monthly trade journal in the 1920s, "The National Die Builder," which achieved a circulation of about 10,000 in this period (TMA 50th Anniversary, n.d.). Because of the success of these early activities, membership rolls expanded quickly and the association started to hold out national aspirations for itself and the promotion of its form of industrial collaboration and regulation. As reported in the association's history (TMA 50th Anniversary, n.d.: 17-18):

> As [the association] continued to grow, its story traveled to other regions and a deep interest in membership from firms outside the Chicago area developed. This outside interest inspired the members to study the possibility of extending its boundaries. ...[In 1928, the association] voted to broaden its scope and encompass members from other regions. The By-Laws were changed to incorporate this new expansion and the association's name was [also changed to]... the National Die & Special Tool Builders Association.

Firms from Milwaukee, New York, St. Louis, Cleveland, and Dayton expressed interest in joining with Chicago's precision metalworking shops in their association. "Even ...the [early] depression ... did not stop this organization from continuing its services or halt its growth. This was evident when George Tuthill returned from a trip to Cleveland, Ohio with a petition from eleven companies requesting permission to establish a Cleveland branch. By the end of July, 1930, nineteen applications from Cleveland had been received" (TMA 50th Anniversary, n.d.: 18).

This movement to spread its model of industrial organization, however, eventually halted as business conditions worsened into the 1930s. Yet, even in the Depression, the Chicago association and the collective ethic of its member firms held together better than its peer organizations in other regions and nationally. For instance, in discussing how the NRA code never became adopted for the tooling industry as a whole across the country, George Rockwood writes (n.d.: 5):

> To develope [sic] a code for the industry nationally, a national association was necessary, and it was hastily organized in Cleveland. Miles [Irmis, from the Chicago association,] and other leaders from Dayton, Cleveland, and Detroit attended, and an individual from the latter city was chosen president. Three sessions were subsequently held in Washington with the industry's code authority to work out a code. However, it was never finalized--due in part to lack of funds by the national group for regulation of the industry and enforcement of its various provisions. This was not important in Chicago though, the small group of establishments there had little need for policing themselves. According to Miles, "we were all broke, and in the same boat. So it was agreed among ourselves not to do any chiseling, and go along as best we could, helping each other if we could."

The NRA was declared unconstitutional by the Supreme Court in 1935 further undermining the ability of the industry to sustain a national association (Rockwood, n.d.). But even though the "Depression continued to drag on after the demise of NRA... in this period a seed was planted, which later was to bear more than an abundant crop in the years ahead" (Rockwood, n.d.: 6). This collaborative spirit among firms in Chicago's tooling industry was helped along by additional rules governing competition that the association created. For example, in 1931, the members of Chicago's metalworking association voted to adopt a five-day work week (no single shop subsequently could take on overtime), agreeing to limit the amount of work any one member could accept in the slowdown that was upon them (TMA Board minutes, 1931). In this way, their lot would remain equal throughout the hard times and overly greedy and cutthroat behavior forestalled. Collective regulations such as these kept the interfirm agreement operational through boom and bust.

Conclusion

As we have seen in this description of economic events in Chicago in the early part of this century, much of the region's institutional make-up--as described in a variety of written accounts of this region--encouraged hierarchical and/or polarized interactions among its various actors. A history of centralized local political structures kept a democratic machine in office for much of this century. A machine was needed to amass sufficient power at the local level to create a governing coalition among an ethnically diverse, fragmented, and highly divided population. Chicago's history of labor relations has also mostly been played out by actors ascribing to polarized and/or hierarchical relationships. Employers and unions alike developed large, top-down organizations to push their agendas--for civic, legislative, political, and economic affairs--and to control dissent within their ranks. One would not expect collaborative dealings to emerge in a region like Chicago, with its history of hierarchical and polarized relationships among key industrial actors.

Surprisingly, however, collaboration did emerge among Chicago's metalworking shop owners. I have tried to show how the owners of these small supplier firms drew on other historical legacies within the region to counteract hierarchy. Yet, they were motivated to create such institutional alternatives--like the metalworking trade association--for strategic reasons. Collaboration was one mechanism they felt could ensure their survival as a small-firm, versus mass-production, oriented industry. How persistent was this collaborative network strategy in a dominant regional industrial culture that cherished hierarchy? How well did this network of metalworking firms and the Machinist Union perform over time? I begin to answer these questions in the next chapter.

CHAPTER 4--CHICAGO'S METALWORKING NETWORK BEGINS TO FALL APART-- A CHALLENGE FROM UNIONISTS OUTSIDE THE ENCLAVE

Introduction

In this and the next chapter, we come to understand how Chicago's collaborative metalworking network fell apart by the mid-1950s. In many ways, this is the classic tale of industrial dualism that many authors have told about American firm structure, subcontracting relations, and labor markets in the postwar era (e.g., Piore, 1980; Helper, 1990, 1991) and that others have employed in describing today's flexibly-oriented production process (e.g., Martinelli and Schoenberger, 1991; Harrison, 1994). This period in the Chicago metalworking association's history also substantiates the notion that some authors have introduced (e.g., Powell, 1990) about the inherent long-term instability of network forms of production. The pressures on Chicago's metalworking network mounted throughout the 1940s so that it became difficult to hold the collaborative labor-supplier alliance together into the next decade. Interfirm collaboration between metalworking suppliers also weakened by the mid-1950s such that cutthroat pricing behavior, the "pirating" of skilled workers, and reluctance to share information (e.g., about markets) occurred with serious destabilizing effects for the precision metalworking industry as a whole.

What were the pressures that produced this outcome? First of all, internal problems occurred within this craft enclave between the various shop owners, and between owners and their workers. The problem of cheaters in a collaborative endeavor--as the game-theoretic Prisoner's Dilemma suggests (see Ostrom, 1990)--reared its ugly head. That is, given the difficult environment--of first too little work during the Depression and, secondly, too much in the war years--induced many forms of "opportunistic" behavior.

But, as I argue here, a second source of pressures proved to be more fatal to the craft network's collaborative model. These were pressures from outside the craft enclave that forced it to break up. Resisting both the control that skilled crafts exerted over certain segments of the production process and the pay premium they collectively had been able to exact for themselves, these outside actors (in this case, unskilled production workers, from the mass production plants that Chicago's tooling job shops helped to mechanize, and the large mass producers themselves, as "customers" of precision metalworking) developed strategies to lessen their risk in the manufacturing complex as a whole vis a vis the skilled metalworking craft enclave. Specifically, lower skilled workers began to close the historic pay gap--due to skill--through the activities of the Congress of Industrial Organizations (CIO). The mass producers lessened their dependence on Chicago's high-priced--although top quality--toolmaking job shops through an expansion campaign of their captive shops that the Department of Defense helped start during the war years. These strategies of actors external to the metalworking industry threatened the skill-based "shelter" metalworking shop owners, workers, and their union had been able to create for themselves. Responding to this threat, skilled metalworkers became more aggressive like their competition, the CIO, while job shop owners started to compete with the captive shops on price rather than quality. These developments eventually pulled the enclave apart, as I describe in the ending to the next chapter.

In this chapter, I lay out the internal tensions that increasingly bedeviled the metalworking trade association as it moved into the war years. I also discuss the first set of external pressures--those related to the CIO and the labor movement as a whole. I then describe how Chicago's tool-and-die shop workers responded to this competition of the industrial union movement. In Chapter 5, I lay out the mass producers' problems with tooling jobs shops, in general, and Chicago's highly organized enclave in particular. These internal and external pressures resulted in a significant weakening of the collaborative metalworking enclave by the mid-1950s.

I. INTERNAL TENSIONS THREATEN THE COLLABORATIVE METALWORKING NETWORK

Although in the first ten years of its existence Chicago's collaborative metalworking network appeared sustainable, in its second decade more difficult tensions surfaced among actors in the alliance that needed to be faced. The Machinists Union became increasingly vocal in its opposition to some of the association's policies and practices. It also conducted an organizing campaign against the association's members and other metalworking job shops in the Chicago region. Yet, although friction between management and labor increased significantly in this period, the employers in the association held fast to their commitment of paying higher wages to their workers, commensurate with the craft status and skills these workers--as toolmakers--represented. The union also occasionally collaborated with management on issues of mutual interest. Interfirm tensions between the metalworking job shops also mounted in this second decade of the association's existence, stimulated, first, by the length and severity of the Depression and, second, by the boom in prosperity that World War II brought. In this section, I examine the growth of internal tensions within Chicago's metalworking network and how the association handled them.

Tensions Mount Between the Machinists Union and the Metalworking Shop Owners--the Late 1930s On

Difficulties surfaced between the Machinists Union and Chicago's metalworking shop owners as the Depression wore on and both wages and profits fell. The metalworking trade association made attempts to stand by their bargain with labor, yet individual firms cheated on this bargain and workers saw their position seriously eroded during this decade. With the upswing in the economy and the labor movement along with it in the late 1930s and 1940s, the Machinists tool-and-die Local #113 in Chicago engaged in an aggressive organizing campaign against the city's small tooling job shops that were mostly non-union at the start of the war years. Although this organizing campaign created a serious rift between the Machinists Union and the metalworking shop owners, the association's firms again saw fit to raise their workers wages to the highest rate in the land. Furthermore, a critical segment of the association's members also still urged the group to take a cautious and collaborative approach to their workers in order to retain the smooth labor relations they as a group had been able to achieve in the past. Thus, while tensions between the two groups--labor and management--surfaced in the late 1930s and 1940s, a collaboration of sorts was maintained which stands in stark contrast to the confrontational approach taken by other firms in the region.

According to the U.S. Census of Manufactures (1937), 1935 represents the low point in manufacturing nationally for the decade of the Depression, from 1929 to 1937. Manufacturing jobs slid to a low of 5.8 million for the country at large, a 31% decline from the high point of 8.4 million in 1929. Similarly, the number of manufacturing establishments in the United States decreased by 33%, or from about 207,000 firms to almost 140,000. Illinois suffered a proportional decline in this period. The census did not disaggregate its records by states in the mid-1930s, so we cannot determine how far manufacturing declined at the trough. Yet, from 1929 to 1939, Illinois manufacturing jobs dropped by nine percent and the number of establishments by 22% (U.S. Census, 1958).[1] It is at the time of this Depression-era trough in the economic cycle that disagreements between labor and management in Chicago's metalworking industry surfaced.

I return to the situation reported in the last chapter wherein Chicago's metalworking trade association strove to insert a minimum wage provision in the national NRA (National Recovery Administration) code for the tooling industry. Here we find Chicago's

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[1] It is difficult to compare manufacturing statistics for this time period for individual industries and at more disaggregated geographical levels for several reasons. First of all, the industry categories employed by the census changed radically from 1929 to 1937 such that, for example, the earlier category, "Foundries and Machine Shop Products," was split up into four separate industrial categories. Two new categories, "Machinery, Not Elsewhere Classified" and "Machine-tool Accessories," also appeared for the first time during this period. The contract tooling and precision metalworking industry which I follow in this history is dispersed and hidden in all these different industrial categories, as more and more machine shops began focusing on toolmaking exclusively. These changes make comparisons over this time period difficult. Similarly, state and substate level reporting was abandoned during the height of the Depression, as the federal government strove to save its finances; the local data that was reported may have included serious inaccuracies (for example, the census reports no agricultural machinery industry in Chicago in 1927, even though the McCormick reaper factory, employing several thousand workers, lay within the city's boundaries; e.g., see Cohen, 1990)(U.S. Census, 1927).

metalworking employers, as it were, caught in the middle between its peers in other regions and its local workers who wanted a higher minimum stipulated. As I mentioned, the Chicago shop owners wanted a $.70 wage floor to be set to protect their workers and prevent "demoralizing competition" through the sweating of wages (TMA Board minutes, 1933). Chicago's shop owners argued for this minimum before its peers at a national meeting of the tooling industry and again with the federal code administrator in 1933. Yet, the provision did not stand because firms in the country's other tooling centers would not agree to it.

However, at the same time as these shop owners were trying to hold to "the high road" in their agreement with labor during the Depression, the Machinists Union objected that the minimum rate that the shop owners advocated was not enough. In 1934, the union and the association's Employee Relations Committee met to iron out their disagreements over the code provisions. The Machinists wanted overtime pay stipulated in the agreement (one and one-half the rate of the regular hourly rate) and a full-time work week of 40 hours (not the 48 hours that the shop owners wanted). The shop owners agreed to these conditions, but not to the additional demand for a minimum wage of $1.02 an hour. The Machinists did not accept this counter-offer so the association voted to stop negotiating with it (TMA Board minutes, 1932-34). In 1935, the code provisions were rendered mt since the U.S. Supreme Court declared the NRA unconstitutional. Furthermore, regardless of the association's preferred policy of setting a minimum wage for the industry locally, the Machinists' anger probably stemmed from the fact that the association could not prevent individual shops from circumventing this standard. Conditions for workers deteriorated drastically in this decade, along with those for shop owners, as indicated in this comment made by an officer of the

Machinists Lodge #113, Ben Skidmore, in 1950: "back about 17 years ago [in 1933]... we were faced not only with low wages, but in some instances ... we worked for no wages, [and] that is what brought the Tool and Die makers together" (IAM/NTDC, 10/28/50).

In spite of these differences, the union and the metalworking trade association did cooperate on other matters in this time period. For instance, after the association, along with a group of other trade associations, lobbied against and defeated the state's proposed Producers Tax Bill (HB#28) in 1938, it sent a letter of "appreciation of cooperation received from Mr. Uhlman of the Machinists Union in taking similar action" (TMA Board minutes, 1938). Uhlman's support in defeat of this bill helped to save the member firms of the metalworking association thousands of dollars by eliminating this tax on personal property which would have been levied on toolmakers' tools and gauges, necessary to do their jobs. Yet, tensions mounted as the two groups--labor and management--entered the growth years from 1937 onward when the labor movement in Chicago and across the country increased in strength and organizing activity. Much of this organizing activity took place in the region's large industrial plants of the mass producers and involved the newly created Congress of Industrial Organizations (CIO), as I discussed in the previous chapter and will revisit again later in this chapter. But the Machinists Lodge #113 in Chicago was also extremely active in this period. Starting with a low of "approximately 600 members [who were] steadily employed" in 1940, Local #113 was able to grow to a membership of 3,500 workers by the end of 1947--representing 125 tooling shops in the region (IAM/NTDC, 1/27/40, 11/15/47). This roster mostly included Chicago's contract tooling industry, or the small job shops. While these organizing gains were quite small compared to those in the large industrial plants where a single contract with one large firm could cover as many workers, Local #113 had been making significant inroads into organizing much of Chicago's contract tooling industry--which at that time was among the most organized in the country.

Many tool-and-die lodges within the IAM had great difficulty organizing job shop workers even after the disruption of the 1930s and the labor militance of the 1940s. As one union business agent, Claire Smith from Lodge #66 in Milwaukee, explained: "As for organizing the jobbing shops, regardless of the amount of work you put in, it is much like batting your head up against a stone wall. The pay in the unorganized jobbing shops... was higher than in our organized [i.e., unionized] corporation shops. That tells the story" (IAM/NTDC, 7/26/41). Another union representative, from Lodge #439 in Cleveland, told a similar tale: "Due to the scarcity of good tool-and-diemakers [after the wartime boom had started] the jobbing shops have raised the starting rate to $1.05 per hour and these tool-and-die makers seem to be satisfied as they will not listen to organization" (IAM/NTDC, 10/26/40). Yet, "Local #113 in Chicago [was] doing a very good job"--so a national conference of tool-and-die unions concurred--organizing tool-and-diemakers in the small job shops and setting a standard for pay and other working conditions to which workers in many regions aspired (IAM/NTDC, 11/15/47).

Local #113 also expanded its activities by moving out of Chicago into the larger metropolitan region and into some of the area's large production plants as well. In both instances, the union wanted to bring tool-and-diemaker wage rates up to the level agreed to by Chicago's job shops to stop the flow of work outward to these regions and unorganized firms. So, for instance, when visiting at a meeting of tool-and-diemakers in Aurora, Illinois, "Bro[ther] Art Netrefa [from #113]... explain[ed] in further detail that if certain shops (after they were signed up [with Local #113]) the boss refused to pay the Chicago rates, he guaranteed each and every one of the toolmakers in that plant a job at the Union rates in Chicago, and that this would eventually make the boss come to time and recognize Lodge #113 and pay the rates in order to get Tool and Die Makers" which were in short supply given the wartime boom (IAM/113, 12/17/51). This prompted an observer at that meeting to ask of P.L. Siemiller, the IAM's General Vice President: "I am wondering how far the jurisdiction of Lodge #113 goes, knowing that District Lodge #108 at Aurora has its distinct jurisdiction set forth and agreed to by Grand Lodge [i.e., the IAM's national headquarters], also District #122 of Elgin which would be disturbed by the action of Lodge #113 having jurisdiction as far as Batavia, and some of those employees of Batavia were in attendance at this meeting" (IAM/113, 12/17/51).[2] Local #113 increasingly relied on absentee ballots for its internal elections--both because some of the job shop owners were starting to move out of the city at this time and because of its organizing activities farther out (see IAM/113, 12/22/53).

It was for a similar reason that Local #113 increasingly focused its attention on the large toolrooms inside mass production plants--to equalize toolmakers' wage rates and bring them up to the high levels of Chicago's job shops. So the union focused its attention on workers such as the 1000 toolroom employees at Ford Motor's aircraft production plant in

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[2] See also the letter from A.J. Hayes, the IAM's International President, to Berwyn Hanley, the Business Representative of Lodge #113, suggesting he discuss his plans to organize toolrooms in Chicago's outlying districts with General Vice President Siemiller, who was based in Chicago (IAM/113, 12/19/51).

1951, the 100 toolmakers employed at Stewart Warner's electrical equipment plant (ignoring its 12,800 other lower skilled production workers), and even the tool-and-diemakers at International Harvester's McCormick Works (IAM/113, 6/1/51, 10/14/54; IAM/IL T&D, 3/23/49). In this manner, then, by organizing the competitors of Chicago's small tooling job shops, Local #113 could be seen as fulfilling its initial bargain with the trade association much like the laundry workers had organized the suburban competition of Chicago's small cleaners earlier (that I discussed in the previous chapter).

Yet, even though this organizing campaign became difficult for shop owners at times, it may have been less strident than the activities of the labor movement in general in this time period, especially by the CIO and other non-craft unions. In 1937, for example, a member shop, Brust Tool Manufacturing Co., called Karl Harig, president of the association's Board and head of its Labor Relations Committee, regarding the "wage situation, stating that the men were clamoring for more money and apparently were not satisfied with raises of $.05 per hour" (TMA Board minutes, 1937). A week later Brust reported a sitdown strike at his plant because he let an employee go for unsatisfactory work who was also an organizer for M.E.S.A.[3] The association's Board urged Anton Brust to reinstate the man. In 1941, Brust

[3] M.E.S.A., or the Mechanics Educational Society of America, was a smaller union involved in organizing auto and related workers (Galenson, 1960). Newell (1961) reported that the sitdown strike was utilized occasionally by workers in the smaller metalworking shops and foundries on Chicago's northside during the late 1930s. However, although Chicago contributed the test case, Fansteel Corp., for the court proceedings at which this tactic was eventually ruled illegal, relatively few sitdown strikes occurred in Chicago compared to other region's. She explains why by citing Gordon Hostetter, president of Chicago's Employers Association, who maintained that the sitdown strike never gained ground in Chicago because of the firm policy of the State's Attorney, Thomas Courtney, who declared that he would use police action against any workers employing this tactic.

agreed to sign a contract with the AFL--notably the Machinists Lodge #113 (IAM/NTDC, 7/26/41).

Because of their past close relationship with the IAM, many within the metalworking association urged that it continue to take an accommodationist stance with its workers. Thus, in 1937, when the Machinists Union planned on asking for a minimum wage of $1.48 per hour for the high-skilled tool-and-die makers versus the association's agreed upon starting wage of $1, a committee of the association that was looking into the situation cautioned the entire organization about getting "t alarmed..." Instead, the committee suggested, "wages of tool and die makers should [be allowed to] increase, but that they could be kept within reason" (TMA Board minutes, 4/1937). Instead, the association discussed the "ways and means of increasing prices for products in our industry, in keeping with the steadily increasing costs of doing business" such as wage increases (TMA Board minutes, 4/1937). The association wanted to stop the "unprofitable operation of our shops" and since many were recovering from a decade-long depression where prices and wages had dropped, the association felt there was "no need for downward revision of prices or wages" at that time (TMA Board minutes, 4/1937).

The association continued to publicly stress the "value of cooperation between employer and employee" at functions such as its training school's graduation ceremony in 21937--and throughout most of its dealings with shop workers (TMA Board minutes, 6/1937). Thus, when the Associated Employers of Illinois wanted the association's support in stopping "certain dangerous labor bills" in the state legislature (TMA Board minutes, 1/1939), the metalworking trade association demurred because--as stated one Board member later on--it was "felt that particularly where labor bills are involved, we should maintain a neutral attitude, in view of the excellent labor relations we have had" (TMA Board minutes, 4/1943).[4] Worried, as the end of World War II approached bringing a slowdown along with it, the association discussed how to confront labor on the wage escalation issue. Asked a board member: "is labor going to become revolutionary as work slows up after the war, or will it understand that our problems are its also?" (TMA Board minutes, 2/1943). The consensus agreed on by the board was that "if employers approach the subject right, they could sell labor on the fact that cooperation will be mutually beneficial..." and that, perhaps, profit-sharing, some other kind of incentive plan, or the pooling of workers among all shops in the association would provide "security within our own group... [to help skilled craftworkers deal with] the heavy and slack periods in various shops... [and] which would make it worthwhile for our labor to cooperate more fully" (TMA Board minutes, 2/1943).

This approach of the trade association to its workers in this early period of union organizing stands in contrast to the much more aggressive stance that other employers adopted in this time period. The often cited and most repressive example is that taken by Republic Steel during the CIO's United Steelworkers' campaign to organize "Little Steel" (i.e., those companies that were smaller than U.S. Steel but corporate giants none the less). In 1937, Republic Steel was embattled in opposing unionization at its plant; fearing a mass

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[4] As wages were bid up during the war, labor became scarce and the industrial union movement continued to achieve organizing victories. Employers in Chicago in general organized themselves to resist what they saw as voracious demands by unions. The Associated Employers organization directed some of these efforts; the metalworking trade association joined this group and felt it would gain a lot of benefit from a relationship with this association. But at the same time the trade association would not participate in the anti-labor legislative efforts of the Employers Association in this period.

action, it persuaded the Chicago police to fire on picnicking unionists outside its gate who were also gathering to picket the company. Ten workers were killed in this "Little Steel" massacre (Newell, 1961).

Besides practicing restraint in dealing with the demands of the Machinists Union, the job shops belonging to Chicago's metalworking association also continued to pay quite high wages. By 1947, Chicago's contract job shops paid the highest rate in country, at least among those firms organized by the International Association of Machinists. For example, in a listing of IAM contracts in tooling job shops and other toolrooms throughout the country (see Appendix 4-1), Chicago's shops paid from $1.75 to $2.20 per hour for tool-and-diemakers in contrast to other cities which paid much lower rates, such as: Cleveland ($1.50 to $1.75); Rockford ($1.60); St. Louis ($1.71); Long Island, New York ($1.60 to $2); Dayton ($2); Seattle ($1.81); San Francisco ($2.01); and Los Angeles ($1.75 to $2.10) (IAM/T&D, 8/23/47).[5]

In summary, although the metalworking trade association and the Machinists Local #113 were becoming increasingly reluctant as partners, the "bargain" struck by the Chicago association model, such as that in the printing and laundry/dyeing industries, had also held in precision metalworking in Chicago through most of the 1940s. The association's shops paid among the highest wage rates in the country to their workers--the highly skilled and

[5] Detroit is missing from this list because its tooling industry was organized by the UAW in the CIO; wages in Detroit may have been higher than in Chicago, as a different data source, a U.S. Bureau of Labor Statistics (BLS) study found--and that the "Preliminary Working Paper on the Tool and Die Industry" from the U.S. Office of Economic Analysis cited (IAM/T&D, 1952). The BLS statistics are included in Appendix 5-2.

aggressive tool-and-diemakers. At the same time, the Machinists Union accomplished what it originally suggested--the organization of a large percentage of the association's competition into union contracts. Yet, in the coming postwar years, this bargain would grow increasingly shaky. By contrast, how did collaboration among the small metalworking shops and their owners fare in this period--the late 1930s and early 1940s? I will look at tensions in this relationship next.

Conflict among the Metalworking Shop Owners as a Group

Tensions among Chicago's small tooling job shops also became exacerbated due to the longevity of the Depression in the 1930s. Although the association created rules to police its members' cutthroat tendencies in this period, compliance to such rules became increasingly difficult to achieve. The boom in the 1940s during the war years also instigated conflicts among metalworking shop owners. Worries of access to sufficient skilled labor caused pirating between shops and the explosion of business created a host of new firms--that is, new competitors--in tooling that had not been initiated into the association's guild-like ideology. Yet, as with the tensions between labor and management in the tooling industry, the conflicts that emerged between the small shops were dealt with sufficiently by the association so that a semblance of collaboration continued on through the 1940s. Let us look more closely at some of these interfirm difficulties.

Throughout the 1930s, Chicago's metalworking association created a set of policies or rules to govern its members' behavior and to discourage a "low road" of cutthroat practices and the sweating of labor. That the association needed to create these rules in this time period is testimony to the fact that some tooling and metalworking shops were engaging in low road behavior. Yet, the association's officers and core group of firm owners did not give up on their goal of trying to stabilize the industry, while retaining its focus on quality and skill, throughout the Depression. Instead, it became more aggressive in utilizing peer pressure tactics to try to bring offending firms into line. More specifically, in what kind of low road tactics were firms engaging? Let me cite a few examples.

As I mentioned in the previous chapter, several instances of internal contracting arose in this decade. In the first instance, in 1932, the association's members carried out a long discussion of the pros and cons of this industry practice and decided by a bare majority to outlaw it. When this practice cropped up again in 1937, the association's officers took more serious measures and informed the offending firms' customers of this unethical behavior (implying, perhaps, the negative impact this practice would produce on the quality of the metalworking firm's output). Selling practices of various member firms in the Depression also became an issue that the association investigated. In 1935, for instance, the association looked at how to make the selling practices of its members more uniform. Underbidding was again becoming problematic. At one meeting that year, a shop owner reported on an advertisement that one tooling company (International Tool & Equipment Co.) was mailing to customers offering to do work at "the price of the lowest bidder and doing tool-and-die work on a time and material basis of $1.25 per hour and machine work for $1.05 per hour" (TMA Board minutes, 1935). Also recognizing the role of customers in simulating cutthroat bidding, the association held a discussion of "the ways and means of publicizing those buyers who continually indulged in unfair practices" (TMA Board minutes, 1937).

In addition, the association also dealt with members' attitudes toward the dwindling market and the shares each firm grabbed for itself. The association's lead firms planned a lecture series for the broader membership on "profit mindedness" in order to sell to them "the idea of increasing [their] profits rather than [their output] volume" in this time period (TMA Board minutes, 1937). Greater profits could be had on a smaller market share by controlling costs rather than stealing away the business of another member. In line with this notion of cost reduction, the association promoted its new training program among its member firms. This program offered classes on "estimating the cost of products for our industry"--these were open initially to shop owners and foremen and later to workers. The association's officers encouraged its membership "to get behind our educational effort" (TMA Board minutes, 1934-35).

Finally, some of the association's firms--those that had diversified into a wider range of metalworking product markets besides tooling--found themselves pressured in this less skill-intensive segment of their business by companies that had not joined the association nor agreed to a set of standard pricing guidelines and other "stabilizing" procedures for these related industries. For instance, metal stamping--often combined with toolmaking in the shops of the tooling firms--was one such industry. In the late-1930s, the issue of "unfair competition from certain stamping manufacturers" was discussed and referred to the Board for action. The association's President Harig met with his counterpart at the Pressed Metal Institute "to find a way to improve the competitive conditions in the stamping division of [the association's] industry" (TMA Board minutes, 1938). This issue lingered unresolved, and created tensions between the association's stamping-oriented members, until the wartime boom solved it.

As the economy heated up in the last years of the 1930s and into the 1940s, the association's attention turned to the problem of labor "pirating". That the association devoted a meeting to discussing the "stealing of labor" through the inducement of higher wages--seen as a problem by the shop owners since they invested much time and money training apprentices to become qualified journeymen--meant that its incidence was rising. But the association still thought it could control the "cheating" firms. As President Harig stated, he did not take reports of "pirating" among the association's members seriously as "there is too much mutual respect among members of [the association] to let it become a sizeable problem. [Harig] asked members to recall that during the troubled years of 1934-36, when there was so much trouble over the country, our shops experienced very little disturbance and he felt things were well in hand now" (TMA Board minutes, 1942). The other members present agreed with him; since the association had held together so well during the very lean years of the Depression, they were not worried about the overall ability of the membership to band together and discipline the backsliders among them now.

Yet, as the boom continued on into the decade of the 1940s, the association's ability to continue shaping the practices of the industry as a whole and disciplining individual firms became seriously challenged. This challenge came from the fact that, since America's late entry into the war required a rapid buildup in the country's war materiel, the federal government could only accomplish this task by encouraging the start up of many new firms in tooling, machining, and other metal-related industries. In the Chicago region, the many new tooling job shops that were set up for defense purposes did not belong to the trade association nor necessarily agree with its "high road" and high skilled principles. As White and Sinclair (1945: 7)--two association members--describe this period:

> The Government, before the outbreak of the war with Germany and Japan, instituted an expansion program of tool shops throughout the country. The various procurement agencies placed the necessary machine tools and precision measuring equipment into the tool-and-die shops on a lease basis and encouraged others to expand on their own finances. In some instances shops were expanded more than ten-fold. The greatest need was then the manpower to work in these expanded facilities...

As they also describe, there was pressure on the shops at the time to deskill their craft production process:

> It was therefore urgent that the Tool & Die Industry, with the small nucleus it had in its shops, expand its manpower to equal the expansion of its equipment. The Industry took men into its shops who had operated machines on production work and trained them to be tool machinists...
>
> In its efforts to expand its manpower the Industry discarded its formula of one trainee for every ten skilled workers and was operating with five trainees for every skilled man. During all this time the Industry was operating two shifts of twelve hours each, six or seven days a week in an attempt to overcome the acute labor shortage.
>
> The Industry conscientiously tried to institute job breakdowns in the hope that through simplification and specialization the manpower problem could be solved. It found, unfortunately, that this could not be done if the Industry was to operate within the necessarily close tolerances [i.e., high quality] and with sufficient efficiency to allow the manufacturing plants to use unskilled labor through simplification and specialization. The Tool and Die trade is probably the most intricate and complex trade in the entire manufacturing and processing system of this country (White and Sinclair, 1945: 7)

Thus, an organizing task of great proportions lay before the trade association if its "high road" craft model, and the future quality of the region's tooling trade, was to be retained in the coming years of prosperity after the war. As George Huebner, the chief of Tooling within the Small Plants Division of the War Production Board and publisher of the Tool and Die Journal, urged the association's members in a visit to them in 1943--the association should recruit these new and often more marginal tooling shops into its ranks to prevent them from producing shoddy products, employing less than skilled craftworkers, and harming the image of the industry. Through its recruitment efforts, the association could "maintain a high standard of business" in the industry, while also providing "assistance to and direction of [these] smaller shops in a cooperative way." Furthermore, the association could advise these new member firms of "new ideas and developments" in the industry, helping them to improve their quality and widening the "reputation of all shops in the [Chicago] area." Huebner completed his talk to Chicago's metalworking association with a "plea for cooperation between all shops as the best way to cope with the war to peace transition"--or coming slowdown--that they all predicted (TMA Board minutes, 1943). In other words, Chicago's association was urged to continue spreading its gospel of cooperative interfirm dealings with the newcomers into its industry in the region.

The association's value to these new members was soon to be tested. It had to continue to produce adequate services to the new shops to encourage them to join and pay dues to the association as a long term proposition. In this vein, the association again started its marketing efforts for the products of its firms (e.g., by developing a brochure to do a comprehensive selling job to potential customers of tooling products, by emplcying a manufacturing representative to seek business for association members in Detroit), it worked continually on securing draft deferments for its members' skilled workers, it overturned a State sales tax on the output of the tool-and-die industry, and it developed a cooperatively-financed fund to ease its members' postwar transition when it thought that "intelligent selling... on an industry wide basis" would be required (TMA Board minutes, 1943, and 1939-45; Rockwood, n.d.). The association's organizing activities must have been at least moderately successful. It maintained a membership of around 100 firms during the Depression and early 1940s; this climbed to several hundred firms by the late 1940s (TMA 50th Anniversary, n.d.; Rockwood, n.d.; TMA Stats, n.d.). Furthermore, many of its core shops played key roles in innovating new weapons systems--testifying to their ability to retain this craft focus on high skill and quality of output (White and Sinclair, 1945; Rockwood, n.d.).

Thus, we see that in the second decade of the metalworking association's operation--from the mid-1930s throughout most of the 1940s--internal tensions between the actors involved created serious challenges for the association to mount. Labor-management disagreement heightened significantly during this decade, and at times any collaboration between the two parties seemed to have broken off. Yet, despite this conflict, the result of the initial bargain between the two parties was still achieved. Tool-and-diemakers in the Chicago area--that is, those that worked in the region's small job shops--climbed to among the highest paid in the country, second possibly only to Detroit (see Appendix 4-2). The shop owners somewhat willingly paid these high rates to retain the best workers and the industry's high quality reputation. At the same time, the Machinists Union Local #113, albeit extremely aggressively, carried out its responsibility of organizing the association's competitor shops, especially in the growth years when many new job shops were forming. By doing its part to organize the industry, the union assured that the association's job shops would not be unfairly positioned by initially paying these high wages. Similarly, defections occurred among the tooling job shops that belonged to the metalworking association. Group adherence to the "high road" of ethical craft behavior became increasingly more difficult to achieve both because of the Depression and the influx of new firms into the industry during the war years. Yet, the association did its part too by organizing a sufficient number of these new firms to join it and its collaborative production ethic. Thus, collaborative relationships among actors in Chicago's metalworking industry held in this time period.

As it turns out, however, the actions of workers and firms outside the tooling industry's craft enclave in this time period wrought more serious consequences on the ability of the collaborative model to stay afloat. These actions by actors who lay external to the tooling enclave but within the region at large eventually brought this collaborative model down. Before discussing the demise of Chicago's labor-supplier alliance in the 1950s in the next chapter, let me first acquaint you with the actions of these "external" actors in the Chicago region.

II. EXTERNAL ACTORS CHALLENGE THE NETWORK FROM THE OUTSIDE--A DIFFERENCE OF OPINION INSIDE THE LABOR MOVEMENT

A more important threat to the survival of Chicago's collaborative metalworking network than its internal dissensions, I would argue, were the actions of actors who remained outside its boundaries. Labor and management in the region at large and throughout much of the country did not agree with this collaborative set of rules for industrial behavior. They pursued a conflictual set of strategies to solve their problems instead. Furthermore, these outside actors objected to the gains that Chicago's job shops and their skilled workers were able to obtain, in part through their collaborative association. Among the tooling centers, nationally, Chicago especially was able to hold fast to its tradition as a "job shop town" in spite of the encroachment of mass production. The Chicago metalworking industry's cohesiveness through its collaborative network model only strengthened its position vis a vis other workers and firm owners in the region which eventually only exacerbated the pressures that outside actors brought to bear upon it. Let us examine the strategies these "external" actors (i.e., those outside the metalworking network) invented for lessening the relative gains achieved by this united metalworking craft industry in Chicago. I look at the activities of unionists outside Chicago's craft-based metalworking enclave, first, in this chapter and the response of the Machinists Union. In the next chapter, I consider the resistance of the region's large customer/manufacturers to Chicago's craft-based enclave and how this external pressure from unions and customers eventually tore the enclave apart.

A Difference of Opinion within the Labor Movement and the Challenge of Industrial Organizing

The organizing activities of the Machinists tool-and-die Lodge #113 in Chicago during the late 1930s and 1940s must be put into the context of the region at large to understand why this local was becoming increasingly aggressive toward its small metalworking shop employers. Although tool-and-diemakers' wages had declined significantly during the 1930s and some shop owners increasingly utilized unethical practices in regard to their skilled labor, this fact alone does not explain Local #113's actions. Local #113's workers recouped their high skilled wage rates as the economy rebounded out of the Depression to become among the highest paid manufacturing workers in the country. To understand Local #113's increasing militance, we must look at how these skilled workers were faring vis a vis all workers as a whole and how their past high rate of return to skill had set up a dynamic wherein they and their alliance would be contested. What we see is that the unskilled production worker, jealous of the gains made by these elite craft metalworkers, finally engaged in a successful strategy to make gains of their own--that is, by organizing into industrial unions through the CIO. The new CIO unions achieved better working conditions for the unskilled worker through confrontation with employers rather than collaboration. It is this model of labor-management confrontation--promoted in the labor movement in the wider Chicago region at that time--that the Machinists Local #113 increasingly began to emulate.

With the upsurge in industrial, rather than craft-based, organizing, the creation of the CIO, and the huge successes of these industrial unions in the 1930s, the country's craft workers, including the highly paid ones in Chicago were losing ground. The differential in wages paid to skilled versus unskilled workers in this period was fast closing and this fact stimulated Lodge #113 and other tool-and-die locals in the International Association of Machinists around the country to become increasingly militant. They employed this aggressive stance against others in the labor movement--i.e., against workers outside the tooling craft enclave that they had helped erect in the mid-1920s--as much as they did against the job shop employers with whom they had earlier collaborated. Thus, the competing actions of the CIO and the unskilled workers, whom the CIO represented and whom wanted to access the high pay and job benefits that the craft workers historically obtained, pushed the Machinists Union #113 away from their agreement with the metalworking shop owners. How exactly did this come about?

The story starts by looking at the beginning of the Congress of Industrial Organizations (CIO), which emerged in the 1930s, in the Chicago region. This period was one in which Chicago's labor movement in general became increasingly more militant. In 1935, the federal Wagner Act gave workers the right to organize into unions; this facilitated organizing plant-wide rather than craft, or occupational, unions (Morris, 1958). Because of this, the industrial union movement took off in this period--both around the country and in the Chicago region (Galenson, 1960; Piore, 1980). Chicago's workers organized the large manufacturing plants that were customers of metalworking to try to gain wage increases and the betterment of working conditions that had up to now proven elusive. Production workers banded together to form unions which would represent all workers in a manufacturing plant not just its skilled craft workers as the union movement had done earlier.

As already mentioned in the previous chapter, the Chicago area was the scene of several CIO unions' initial organizing drives for the country at large. Its steel industry, which had been largely unorganized in the 1930s, was the first to experience a major CIO campaign. The Steel Workers Organizing Committee (SWOC), was started with the help of organizers from the national level United Mine Workers (UMW) and craft unions from the local garment trades, after pressure from rank-and-file unionists in the steel plants had built up through in the mid-1930s (Newell, 1961). Such rank-and-file groups emerged spontaneously within each steel plant after the Federal government began sanctioning union organization through the National Recovery, and later Wagner, Acts (Interview, Meyerik; Newell, 1961). Although John Fitzpatrick, of the CFL, initially assisted in the early organizing efforts of the steelworkers in this period (he had also helped organize campaigns in steel during the effort of 1919), in time steelworkers increasingly allied themselves with SWOC and the CIO. In 1937, the giant U.S. Steel signed a preliminary agreement with SWOC--after the UAW's first agreement with General Motors in the Detroit area went through--starting the CIO's movement into steel and allied metal-related industries in the Chicago area (Newell, 1961; Derber, 1989; Cohen, 1990).

At the same time that the CIO's SWOC was organizing steel in South Chicago in the 1930s, another CIO-aligned group, PWOC or the Packinghouse Workers Organizing Committee, was engaging in campaigns against the region's meatpackers. Chicago's meatpacking giants--such as Armour, Swift, Oscar Mayer--had long been pledged to an open-shop, or non-union, policy in their plants. The CFL's Fitzpatrick and William Foster had also attempted to organize these plants earlier (in 1917) as they had steel. The CIO's Van Bittner (from UMW) and local garment organizers (especially Sam Levin of the Amalgamated Clothing Workers of Chicago) helped PWOC get started at the same time they organized SWOC. Going head-to-head against the AFL's Amalgamated Meat Cutters in a 1939 organizing effort within Armour, PWOC won the workers' support there, at the same time that it chipped away at the AFL inside smaller meatpacking plants (Newell, 1961; Cohen, 1990).

The Farm Equipment Workers Organizing Committee--also within the CIO orbit--made significant gains in Chicago and the Midwestern farm machinery and related products industries in this period. The Farm Equipment Workers' strength was particularly anchored within International Harvester plants (Newell, 1961; Gilpin, 1989). Later, however, as Communist influence was purged from within the AFL-CIO, this union was challenged by and gave way to another originally CIO affiliate, the United Auto Workers (UAW) in many of its plants (Gilpin, 1989; Derber, 1989). Later in the post-World War II years, Chicago's metal-related plants were organized by the Farm Equipment Workers, the UAW, SWOC (later became the United Steelworkers), the CIO's UE (United Electrical Workers), and the originally AFL unions--the Machinists, the IBEW (International Brotherhood of Electrical Workers), and other smaller unions.[6] They all contested for the representation of these workers (Newell, 1961; Gilpin, 1989, Interview; Cohen, 1990).

This success of the CIO organizing campaigns, following on the heels of the open shop movement which attempted to break the strength of the machinists and their craft union, meant that the wage gap between unskilled and skilled workers was declining in Chicago as it was elsewhere in the country. This closing of the gap between skilled and unskilled production wages was particularly unsettling in region's such as Chicago--with a well developed craft union history, aggressive Machinists Union, and formalized alliance between

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[6] Newell (1961) reports that the UAW did not have much of a presence in Chicago until auto companies opened assembly and parts plants in the region during the war years of the early 1940s. The UAW, therefore, was a latecomer to Chicago among the CIO. The UE did not enlarge its presence in the region until later also, after Ernst DeMaio came to organize under its banner in 1940 (Newell, 1961). The UE and IBEW, for instance, battled it out successively inside many large plants, like Chicago's Stewart Warner Company (Newell, 1961; Interview, Burke, Mueller).

the job shop owners and their highly skilled workers that produced a payoff of much higher wages for skilled workers. How sizeable was this declining skill differential and when did it start? Citing R.A. Lester in a speech to the national convention of the IAM in 1952, the speaker[7] mentioned that the return to skilled workers--expressed as a ratio--had slipped from three, to one-and-one-half, times greater than the rate paid to unskilled workers during the preceding century. Half of this reduction occurred during the forty-year period from 1907 to 1947. Thus, the ratio of wages paid to skilled versus unskilled workers had been falling consistently for many decades. The CIO's activities merely hastened this process and brought it to the attention of its union competitors--the IAM and others in the AFL who historically represented the skilled workers.

While the **ratio** of skilled to unskilled workers' wages was falling, however, **actual monetary returns** to these two groups of workers diverged in the 1940s. This fact angered unskilled workers within industrial unions such as the CIO's and tested their sympathy for the demands of skilled workers, such as Chicago's toolmakers, during this national renaissance of the labor movement. An IAM economist, Albert Epstein (IAM/T&D, 7/8/53), explained to a local lodge member this seeming paradox in the comparative wage rates of the two groups:

[7] This speech (IAM/T&D, n.d.), on the narrowing of the wage differential for skilled versus unskilled workers, appears in the IAM archives of the International President's files, under the national tool and die industry. It was possibly given as a "Report of [the] Machine Tool and Die and Tool Industry Committee" to the 1952 IAM national convention. The speaker was unattributed. This issue of the declining skilled wage differential was a key topic at this convention, due to the increasing unhappiness of skilled workers in the tool, die, and machine tool industry at that time (see the letter from Roy Brown, IAM's General Vice President to Johnny Fry, at Lodge #720 in California, about this convention, IAM/T&D, 11/25/52).

You will note ... that except for the depression period of 1931 and 1932 the wage differential between the skilled and the unskilled has been narrowing continuously. However, this is not to be interpreted to mean that the differential has also narrowed when expressed in terms of dollars and cents. For example, in 1937, the skilled trades in seventeen manufacturing industries were getting 30c an hour more than the unskilled [as calculated by the Bureau of Labor Statistics]; in 1947 the skilled were earning 43c an hour more than the unskilled. But if the wages are compared percentage-wise then there would be a narrowing in the difference of the skilled and unskilled.

In 1947 the rates of tool-and-die makers [more specifically] was $1.74 per hour as compared with $1.12 for helpers. In other words, the tool and die makers were earning 62c an hour more than the helper in 1947. In 1952 the tool and die makers' rate was $2.26 per hour as compared with the helper rate of $1.55 per hour, a difference of 71c an hour in favor of the tool and die maker. Thus,... the tool and die maker increased his spread over the helper from 62c to 71c per hour during the period 1947 through 1952.

Now let us express the same figures in terms of percentages. To obtain the ratios we divide the tool and die makers' rate by the rate of the helper. Thus for 1947 we have: $1.74/$1.12. This gives us a ratio of 155%. Now let us obtain a ratio for 1952 by dividing $2.26/$1.55. This gives us a ratio of 145%.

To sum up: The tool and die maker improved his position as compared with the helper, when expressed in cents per hour, by increasing the differential from 62c per hour to 71c per hour. When expressed in terms of percentages we find the differential has decreased from 55% to 45%. The period covered in both instances is that from 1947 to 1952.

I have taken the trouble to explain in detail the differences between the two methods of computation so that you will understand exactly what is meant by the expression "narrowing the wage differential."[8]

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[8] As reported by the IAM's Epstein (IAM/T&D, 7/8/53), the Bureau of Labor Statistics (BLS) figures are based on a definition of skilled workers as "those occupations comprising the trades or crafts that normally require extensive learning periods under formal apprenticeship or equivalent arrangements" and the unskilled as "occupations that comprise janitorial, productive, and other like unskilled work". Based on these definitions, the BLS calculated the skilled versus unskilled worker wage ratio as the following for various periods in this century:

That the gap appeared to be growing in dollar terms, however, bothered the country's unskilled workers. But, it is the declining ratio of skilled to unskilled wages that toolmakers and other skilled workers riveted upon. Requesting data about the wage gap from the IAM's Research Department, Frank Kauffman, a local IAM representative wanting to organize Elkhart, Indiana's tool-and-die job shops, stated: "It is my purpose to use this information to prove graphically to any doubters that toolmakers through their own lack of interest in becoming unified have been taking cuts in pay for a number of years in spite of employer propaganda to the contrary" (IAM/T&D, 6/28/53). Although many tool-and-diemakers employed in the country's job shops remained complacent in this period of labor unrest--because of the preferential treatment they often received by their employers in terms of wages and working conditions--many saw the CIO's gains and the subsequent narrowing of the skill differential as a call to arms to organize the elite skilled crafts in defense of their historical advantages. This fostered the increasing militance of groups of highly skilled workers--such as the tool-and-die locals, like Chicago's #113, within the IAM--in this period.

Year	Ratio
1907	2.05
1918-19	1.75
1931-32	1.80
1937-40	1.65
1945-47	1.55

Revolt of the Skilled Trades--the National Tool and Die Conference

A "revolt of the skilled trades" (i.e., tool-and-diemakers) within the larger Machinists Union actually began during the Depression in 1935. It was at that time that several of the tool-and-die IAM lodges around the country formed the National Tool and Die Conference "to promote uniform wages, hours and general working conditions... [in] the highly skilled branch of the Machinists' craft, namely the Tool, Die, Fixture, Gage, Sample, Model, Special Machinery, Experimental and Instrument Makers" within the IAM (IAM/NTDC, 10/14/38). Early founders of this group include unionists from the key tooling centers in the Midwest who felt that collaboration with their union (the IAM) and metalworking job shop owners, as was the case in Chicago, had done little to stem the degradation of their standard of living and status as artisans. In time, the militance of this group progressed to the point where they were calling for their own union and a split with the IAM. This militance occurred alongside the organizing gains of the CIO and, in Chicago, eventually resulted in the breakup of the labor-supplier alliance that the tooling industry established through the metalworking trade association. How exactly did the tool-and-diemakers carry out their revolt?

Discontentment by the skilled trades was not unique to the Machinists Union. Many CIO unions experienced similar division within their ranks. In 1937, at the upswing of the industrial union movement, skilled workers wanted to leave the CIO's United Auto Workers (UAW) for the IAM that was part of the craft-based American Federation of Labor (AFL). The UAW created Skilled Trades Councils to ease this rift.[9] The CIO's Steelworkers

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[9] Problems with the skilled trades and with tool and diemakers continued within the UAW, at least through the 1950s. As reported in the American Machinist at that time, toolmakers formed the Society of Skilled Trades within the UAW to bargain for greater rights

experienced similar problems (IAM/T&D, n.d.). Yet, this split between the skilled and unskilled worker could be expected within the CIO unions which expressed little sympathy for the issues of elite skilled craft workers. The unskilled production workers who formed the CIO harbored resentments at craft workers who had often been reluctant to endorse their organizing efforts (e.g., in the steel industry organizing campaign in Chicago and elsewhere in 1919) (Newell, 1961; Cohen, 1990). Tool-and-diemakers thought their membership in the Machinists Union, however, with its roots in the highly skilled craft tradition of the machinists and mechanics trade, would continue to offer them the status and higher returns they felt they deserved. Such collaboration with the IAM and other craft standard-bearers, such as Chicago's highly organized job shop owners, should have protected this craft tradition. But it did not, in part, because of the immense organizing successes of the CIO in this time period. So, four local Machinists lodges met to form the National Tool and Die Conference (NTDC) in Racine, Wisconsin, on March 3, 1935, to seek a means of redress (IAM/NTDC, 10/12/38).

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than lower-skilled workers and to get the wage premium for skilled workers "restored to its 'normal' 50%" within the CIO (AM, 1/14/57: 89). In 1957, the UAW started granting preferential rights to its skilled workers as did the IAM and other industrial unions (AM, 1/14/57; AM, 7/15/57). The American Machinist argued that it was in the UAW's long term interests to satisfy the skilled worker. "The hard fact behind it is that the ratio of skilled workers to unskilled and semi-skilled is rising, maybe automation is the cause [because it eliminated the production worker], and these almost unheard of moves by UAW are aimed straight at keeping the people happy who may one day soon become its dominant factor" (AM, 1/14/57: 89). Yet, the wages of skilled and lower-skilled production workers continued to converge throughout the 1950s and 1960s such that young people were not going into apprenticeship training programs to become skilled metalworkers (AM, 12/19/55b; Sealy, 11/27/61).

The NTDC initially focused on sharing information about the tooling industry, wages and working conditions, and union-management relations around the country at its quarterly meetings, which were held at various tooling centers. This exchange of information facilitated worker mobility between cities for job openings during slow economic times. The monthly reports sent in by affiliated lodges to the NTDC show how this information was used. For instance, in 1939 (IAM/NTDC, 3/13/39) such reports indicated:

> Fifteen Lodges reported. They reported condition of trade as averaging "fair to good."
>
> Lodges reported no positions available at present.
>
> Milwaukee Lodge 66 reported a slight increase in membership.
>
> Chicago Lodge 113 reported a surplus of tool and die makers.
>
> Youngstown Lodge 404 reported members steadily employed.
>
> Cincinnati Lodge 729 reported all die makers employed. They reported going on record favoring the identification card. They also reported a special meeting to take up the question of the benefit fund. They have chartered a bus for the 17th of March and are planning to visit the brothers at Dayton, Ohio, for the purpose of exchanging fraternal greetings and for the good effect their visit may have for the good and welfare of the organization.
>
> St. Louis Lodge 688 reported that they are attempting to organize several tool rooms, and they ask the conference to assist them in their efforts by writing personal letters to non-members whose names and addresses they have secured.

This sharing of information also helped build a data base and collective understanding of the relative well-being of the various tooling centers. This information became useful during the organizing upswing that occurred in this industry from the late 1930s on.

At first, this organizing activity focused on increasing the unionization rates and wages in the relatively unorganized tooling regions of the country. The NTDC would meet in cities requiring help and use their conferences as an opportunity to raise the consciousness of unorganized toolmakers in that location (see IAM/NTDC, 1/10/39). Thus, as reported at a meeting of the Executive Board of the NTDC in Indianapolis, Indiana, in 1939:

> President Witte [of the NTDC] reported on the purpose of the meeting and the reason for holding it in Indianapolis. He stated that it was necessary to arrange for our next meeting place and that because of the difficulty that the Indianapolis Tool and Die Lodge #1539 is in, our meeting in their city would be of some moral support to our members who are now out on strike at the RCA plant.
>
> ... Motion passed that if the dispute continues for sometime that we go on record advising our members [of the NTDC] to refrain from doing RCA work (IAM/NTDC, 9/10/39).

In this way, by helping unionize unorganized tooling centers around the country, the higher wage rates and better working conditions in the strong union centers, such as Chicago, could be protected. Early demands of the NTDC for its toolmakers included: union recognition, seniority benefits to long-time employees, a minimum wage (90c in 1938), and a limited work week ("Five consecutive days of eight hours, constituting a forty-hour week. Time and one-half for over time, and for any work performed on Saturday. Double time for Sundays and holidays.")(IAM/NTDC, 10/12/38).

The NTDC increasingly attracted the attention of tool-and-die workers who wanted a union but did not feel the Machinists provided them with the representation they required.

Thus, as one unionist from a similarly-situated and highly skilled Die Sinker's Lodge (#216) in Coraopolis, Pennsylvania, explains:

> We would like to know if your office [H.W. Brown, the Acting President of the IAM in Washington, D.C.] can inform me as to the names and addresses of the officers of the Tool and Die Maker's Conference. This information is wanted by a number of unorganized die makers in this district who are interested in organizing in our Association [the IAM], but do not want to join the [local] Machinist's Lodge. We tried to get them in the Die Sinkers, but they feel they do not fit in there. I believe they might be brought in [to the IAM] if the Tool makers can be contacted... (IAM/NTDC, 5/31/39).

Similarly, a LaCrosse, Wisconsin IAM unionist writes to IAM headquarters in 1940:

> At our last meeting I was also instructed to write the Grand Lodge [i.e., the IAM national office] in regard to this matter. Our Local feels that it has never had Grand Lodge Representatives that understand our problems and proved helpful in these lines. The Representatives we have had were not Tool and Die Makers themselves, possibly with the exception of Brother Hayes and we are having trouble getting the healthy, hard-hitting organization we would like to have. Our Lodge has asked me to suggest that it believes Mr. John J. Witte, Cincinnati Lodge 729 and President of the National Tool and Die Conference would be a good man as a Grand Lodge Business Agent in this area (IAM/NTDC, 4/9/40).

Many of the NTDC affiliated lodges were set up exclusively as tool-and-die lodges within the IAM; they operated essentially separate from the other IAM lodges which combined machinists of all ranks and, like Chicago's tool-and-die Lodge #113, could claim jurisdiction to organize the toolmakers within larger plants that had been organized by other units of the IAM.

Later, the NTDC stimulated more aggressive organizing activities in highly unionized settings like Chicago as well. In addition, the NTDC increased its collection of dues from affiliated lodges by taxing its membership to build up a strike fund in 1940. Because of this attention to organizing toolmakers in this period, the NTDC expanded from four affiliated IAM lodges in 1935 to 31 in 1947 and growing (IAM/NTDC, 10/12/38; IAM/NTDC, 11/15/47). In midst of all this organizing activity, the NTDC's members had their eye on gains achieved by their competition, the CIO:

> [The] Milwaukee, Wisconsin, delegates [to the NTDC]... explained their problems in organizing some of the larger corporation shops... [and] requested information [from the other tool and die lodges present] relative to wages being paid in the Detroit area [where UAW gains with the tool and die shops were being made](IAM/NTDC, 1/27/40).

Chicago's Machinists Local #113 helped to found and develop the NTDC. That relationship, plus its own challenge by the CIO, pushed it to act in an increasingly aggressive manner both with the metalworking job shop owners in Chicago and with its own union leaders--the IAM's regional office in Chicago and its international headquarters in Washington, DC. Local #113's Ben Skidmore, acted as the NTDC's first vice-president (with John Witte of Cincinnati, its president, and John Sovic of Milwaukee its secretary/treasurer). In the reports given by NTDC affiliated lodges, #113 often played a lead role--both because of its greater size as a tool-and-die local[10] and its organizing success. It was able to have a

[10] Only Detroit would have been a larger tooling center in this period, but its tool and die shops had signed a collective agreement with the CIO's UAW and were, therefore, not involved with the NTDC.

minimum wage upheld in all its organized shops by 1946 and was commended by the rest of the NTDC for "completely eliminat[ing] job classifications as have several other locals, an example we [the NTDC affiliated lodges] should all follow" (IAM/NTDC, 11/15/47). Local #113's Skidmore, gave credit for Chicago's organizing successes to the NTDC; as the minutes of this organization's meeting in Milwaukee in 1950 suggest: "[Skidmore] told of the [favorable working] conditions in Chicago [for tool-and-diemakers] and how the Tool and Die Conference had helped in bringing about this condition and if we would weld ourselves more firmly together we could accomplish much more in the future" (IAM/NTDC, 10/28/50).

Yet, for all its successes in what had up to now been a strong IAM and AFL town, Chicago's Local #113 also felt pressure from the CIO which made huge inroads into Chicago plants in the war years. For instance, the CIO's UAW put together an organizing committee in 1949 to try "to organize all tool-and-die shops in Chicago. There are over 100 of these organizers [--reported Local #113's John Winke at a meeting of the NTDC--] but so far their efforts have met with little success" (IAM/NTDC, 4/30/49). Local #113 also felt the competition of the CIO's UE (United Electrical Workers), which it thought negotiated "lousy" contracts for toolroom versus production workers (IAM/IL T&D, 2/22/44). For instance, the IAM, and its Local #113, charged that the UE in one particular contested plant (the Howard B. Jones Co.) ignored the demands of the highly skilled toolroom employees while providing better representation instead to the more sizeable number of production employees. The IAM and Local #113 requested jurisdiction to represent only the toolroom workers in this plant from the National Labor Relations Board (NLRB). Charged the IAM's Grand Lodge Representative, A.M. Keeney, in a letter to the NLRB's Oscar Smith (IAM/IL T&D, 3/27/45):

"[t]he union [i.e., the UE] now negotiating for the production employees dictates the terms of wages, hours, and working conditions of these [toolroom] employees about whom they know nothing... [The toolroom employees] have not... acquiesced to the U.E. and its plant-wide industrial unionism, and they have no intention of ever doing so... [The toolroom employees, as a] minority group could not seek a rectification of an injustice on a union floor, first, because they would be in a minority and, furthermore, they do not consider themselves a part of this union. Second, their skills are beyond the conception of the common layman or production workers. Third, such workers (laymen and production workers) are not concerned in regard to these highly-skilled crafts. This last fact is further emphasized with the knowledge that increases were negotiated for and granted during the month of January, 1945, to all employees of the company excepting this highly-skilled group".

In its growing opposition to the contracts that industrial unions struck for tool-and-die workers in the larger production plants, Chicago's Local #113 also found itself in battle with its own organization--the IAM at both the district and national levels. Local #113's disagreements with the IAM mirrored similar difficulties that the NTDC as a whole was having. In regard to the IAM's District #8, that represented the larger region in which Local #113 was situated, the district officers and those at Local #113 experienced a long-standing feud with each other. From the early 1940s through the 1950s, the IAM Archives contain continual correspondence documenting the deteriorating relationship between the two. In large measure, the conflict stemmed from the fact that the IAM in general, as reflected in the activities of District #8, was transforming itself into an industrial-type union along with the restructuring of the labor movement as a whole in this period. Thus, charged Local #113, District #8 increasingly focused its attention on improving the lot of production machinists who worked in large plants while providing inadequate representation to the more highly skilled machinists in the plant's toolroom. As expressed by Art Netrefa (IAM/113, 8/26/46), of Local #113 in a complaint to District #8:

> In the August, 1946, issue of the Machinists Monthly Journal... there is an item which states that the Business Representatives of District No. 8 are signatory to agreements wherein the rate of pay for Tool and Die Makers is substantially below the minimums that have been established for such job classifications by Die and Tool Makers Lodge No. 113. In the case of the Bodine Electric Company, which agreement was signed by Business Representative Robowski, a rate of $1.23 per hour was established for Tool and Die Makers. In the Barco Mfg. Co., which agreement was signed by Business Representative Oddo, a rate of $1.60 per hour was established for Tool and Die Makers.
>
> Die and Tool Makers Lodge No. 113 is hereby protesting the signing of these agreements as far as Die and Tool Maker classifications are concerned... We think that the delegates here [of District No. 8] can readily understand the difficulties we will encounter when we face the employers in Chicago and vicinity with whom we have signed agreements wherein we have demanded that they adhere to the minimums established by our local lodge when they in turn will be able to show us where other local lodges of the Machinists' Union have gone out and signed agreements with considerably lower minimums than that established by Lodge No. 113.
>
> Therefore, we hereby request that District No. 8 immediately adopt a position which will prohibit the signing of any [such] agreements...

District #8's point of view about this matter, however, differed greatly. As its business agent, James McDonald explained to the IAM's President Brown (IAM/113, 8/27/46):

> For your information, Lodge #113 has never, during the period of my term as head Business Agent of the District, notified me as to shops they are organizing or contracts

> they sign, which, I believe, is contrary to the policy generally followed by the Grand Lodge.
>
> [Furthermore, t]his question of toolmakers representation is, as you know, a ticklish one in the sense that the toolmakers confine themselves to negotiating wage rates and conditions for toolmakers alone excluding everybody else. Where District 8 have contracts covering all classifications, it is not always possible to justify a so-called toolmakers' rate to the exclusion of other employees, and sometimes we find in establishing a higher wage rate for toolmakers it unbalances the rest of the shop, especially where any large amount of production workers are involved. I must look on these matters on an over-all basis taking into consideration the welfare of the organization as a whole [i.e., the IAM].
>
> I want to retain the right, as head Business Agent of the District, to use my best judgment in the handling of these situations as they pertain to the welfare of the organization as a whole, and it would help the situation in Chicago greatly if the toolmakers [i.e., Local #113] were instructed to notify the head Business Agent of the District [i.e., #8] as to contracts they sign and shops they organize so that the District might be fully informed of conditions that prevail in the District generally.

This difference of opinion created constant controversy between the two IAM lodges, with Local #113 on occasion threatening to "secede from the district" (IAM/113, 2/9/43) and District #8 suspending Local #113 for late payment of its per capita taxes to the district (see IAM/113, 10/15/53). On the whole, the central office of the IAM came out in support of District #8 and its industrial organizing efforts. As H.W. Brown (IAM/113, 8/30/46), the IAM's International President, confided to one of his vice presidents:

> With further reference to the correspondence both you and the writer received from District No. 8 and Lodge No. 113 relating to grievances... the ideal arrangement to which end we must work, is to have a grievance in the Chicago area negotiated by District No. 8 in behalf of the Lodge... involved.
>
> When we reach that day when District No. 8 will be the recognized authority for our entire Association in the Chicago area, other than the Railroad and Air Transport

Industries, there will be more cooperation and harmony among our Lodges in that area and District No. 8 will enjoy the prestige and influence it rightfully deserves.

These disagreements with District #8 continued to enrage Local #113 which, therefore, increasingly began to strive for jurisdictional rights over toolroom workers employed in plants organized in total by the IAM's District #8. It also began to discuss the creation of a new union for tool-and-diemakers that would lie outside the IAM. As reported to the IAM's President Hayes by one of his staff in 1952 (IAM/113, 4/29/52):

> The position stated by Brother Berwyn Hanley, Business Representative of Tool and Die Lodge No. 113, was to the effect that the tool and die makers in Chicago and in all sections of the country are going to follow the course presently being taken by Lodge No. 113 and will, wherever possible, seek individual certification of work claimed by them to be tool and die work and/or tool room work, wherever such skills are represented.
>
> ... [T]he final statement made by Brother Hanley before this hearing adjourned was to the effect that unless the Machinists agreed that the tool and die makers would have their own certified individual units, on the basis of what Tool and Die Lodge No. 113 in Chicago is attempting to establish at the present time, that the tool and die makers throughout the country will have no other course to follow than that of seeking affiliation with another union.

This controversy within the Chicago region in the 1940s and 1950s was played out on a national scene between the NTDC and the IAM in Washington. Increasingly, through the war years, the NTDC called upon the Grand Lodge of the IAM (i.e., the international's headquarters in Washington, DC) for greater recognition of the plight of highly skilled toolmakers and their inability to keep pace with the gains of production workers. In 1940, the NTDC wanted the IAM Grand Lodge to appoint a special representative for their niche in metalworking. The IAM (IAM/NTDC, 5/5/40), at first, demurred, stating that:

> [this] would be a precedent and [would] make it certain that other groups (Auto Mechanics, Aircraft Mechanics, Machine Builders, Government Machinists and such other groups who could segregate themselves) would demand the same type of support and have the right to expect it... [Even if] they could secure all of the assistance from G.L. [Grand Lodge] that they deserved... there were 250,000 members watching the stewardship of their affairs by G.L, most of whom were not tool and diemakers, and that G.L. would be justly condemned by the membership if they picked out one branch of the trade for special favors...

The IAM Grand Lodge eventually provided a special representative to the tool-and-die industry, after the NTDC anteed up additional funds to pay for this position. Throughout the 1940s, the NTDC wanted to IAM Grand Lodge to do more to help tool-and-diemakers and to support their organizing. The response of the Grand Lodge never entirely satisfied the NTDC, such that by 1950 the relationship between these feisty local tool-and-die lodges and the IAM central office definitely soured. In that year, a committee from the NTDC presented a list of demands to the IAM's Executive Council that expressed their displeasure. The NTDC's representatives (IAM/NTDC, 10/28/50) stated their "six point program," or demands of the Grand Lodge, as a series of questions:

> 1. Why has the Grand Lodge allowed low paid areas to exist, such as Michigan City, LaPorte, Kankakee, Rock Island, Indianapolis, the whole state of Iowa and many others?
> 2. Why the Grand Lodge cannot appoint a man or staff of men to correct these deplorable conditions?

3. Will the Grand Lodge instruct their representatives to help rather than discourage, as they have done in the past, in the setting up of Tool and Die Locals?

4. We want the help of all the Vice Presidents in setting up a Tool and Die Conference in the East, West, and South West.

5. Why do the members of the Grand Lodge Executive Council seldom attend a Tool and Die Conference?

6. Will the Grand Lodge instruct all their representatives to respectfully request all Locals having Tool and Die makers in their membership to affiliate with the Tool and Die Conference?

These demands continued to heighten in the years ahead (e.g., the NTDC in 1951 wanted their own separate department within the IAM "similar to the departments for railroad workers and automobile mechanics... [and] more assistance and attention to tool-and-die makers lodges in the future [by the Grand Lodge] than has been given in the past" (IAM/NTDC, 5/3/51). This militance of the country's tool-and-diemakers caused some to call for a separate tool-and-die union. This frustration of the skilled tool-and-diemaker with the labor movement in the postwar period can be seen in two letters from individual workers that were filed in the IAM president's papers on the tooling industry. One is a letter to the Editor of the Newark Evening News. I quote it in entirety:

To the Editor:

Sir--I wish to say a few words in memory of that forgotten man of American industry, the tool and die maker, of which there are a good many who reside, and earn their daily bread, in the Newark area.

Tool and die making, I feel safe in claiming, is one of the most exacting and difficult of all trades. By rights it should be rated as a profession. Complex mechanical devices, precision high-production dies, master gauges and intricate jigs and fixtures, all constructed to thousandths of an inch, tenths of thousandths or even closer, are just a few of the infinite variety of problems which a tool maker is called upon to solve every day.

Everything which he is required to make is of a special nature, requiring a special setup for each and every part of the tool involved. After a four-year apprenticeship, a tool maker has only a meager framework of experience, and before he can hope to be called a first-class, all-around mechanic, he must spend a minimum of 15 to 20 years at the trade. A tool maker in the business a thousand years would still be learning something new every day.

Bearing all this in mind, one would think that a tool maker's skill would put him in the class of a Croesus, financially. But, as Shakespeare would say, there's the rub. Unskilled labor, in some lines, is getting as much, or even more, per hour as the average tool maker. The hourly rates of the construction trades run up to as high as double that of a tool and die artisan.

This doesn't seem quite right when one considers that the tool makers' trade is the very backbone of all modern high-speed production. Incidentally, it is not the purpose of this letter to hold any other honorable trade up to disparagement, but to better the lot of the adherents of the writer's chosen trade. With the high cost of living soaring to new heights with the passing of each day, it is interesting to note that the wages of tool makers have remained at the same level as two years ago.

Why does this unique condition exist? **Does the trade need a union of its own to carry out its demands?** One would think so. I am very much interested in the opinions of other tool makers on this subject. I'm quite sure that they, t, are seething and fuming at this crying injustice.

Maplewood. AUREL E. VARGA (Newark Evening News, 9/5/48; in IAM/T&D; emphasis added)

A few years later, Harry R. Peck wrote to the AFL Organization Committee in Washington, D.C; a letter forwarded to the attention of the IAM (IAM/T&D, 4/17/54):

Dear Sir:

Sometime ago I wrote to the Congress of Industrial relations (C.I.O.) in regards to why the tool makers, die makers, model makers, machinist, etc. were not organized into one large independent craftsman union as your outside building tradesmen were. Their answer was that it was better to be united with the same as non-skilled help in the factory.

I disagree with this assumption on the part of the C.I.O.

I believe that this kind of union I speak of would be one of the strongest unions in the U.S.A.

I would like to have your opinion expressed on this so vital a question. I am surprised that the A.F. of L. did not do something about this before. I hope you people could see the potentiality of such a craftsman union as I speak off.

Please give this serious consideration. Thank you. Much obliged.

Sincerely yours, Harry R. Peck

The IAM's Grand Lodge responded with alarm to calls such as these that were also echoed by the NTDC. As Grand Lodge Representative, A.M. Keeney, writes to A.J. Hayes, the IAM's President (IAM/NTDC, 9/21/51):

Enclosed is a notice for a meeting sent out by the National Tool and Die Conference. I send it for ready information. I do not like the language in it, especially the heading.

I am becoming more alarmed about this Tool and Die Conference. It appears they have these conferences and agree to set programs. We have trouble with Tool and Die Lodges in Minneapolis, Chicago, Racine, and most all other points.

They have started a drive, apparently, for separate contracts and bargaining recognition, separate and apart from other Machinists' Lodges. This is causing a great deal of aggravation in some places, particularly here in Chicago and in Minneapolis. I particularly direct your attention to the large document sent by the undersigned to Brother Berwyn Hanley.

Thus, we see that although the agreement that the Machinists Local #113 had with Chicago's metalworking job shop owners was not entirely working in the interests of these highly skilled craftworkers, neither was participation in the national body of the IAM. While Chicago's job shops provided them with the highest wage rate in the country, it was not enough to maintain their historic compensation levels as compared with the unskilled worker. This slip in pay meant loss of status for them and the degradation of their craft identity. Therefore, Local #113 increasingly pulled out of its former alliances with the IAM and Chicago's metalworking shop owners. At the same time it joined with its peers across the country and sought to redress its problems through the NTDC.

Conclusion

At the beginning of this chapter, we saw how conflicts emerged between Chicago's tooling job shop workers and the owners of these shops. The workers resented the low wages and insecure conditions owners offered them in the Depression. They organized against the job shops in the 1940s to secure the benefits of the union for more of the enclave's workers. Yet, the increasing aggressiveness of the Machinists Union Local #113 cannot be fully understood without placing their activities in the context of the broader labor movement.

Originally (in the 1920s), tool-and-die shop workers formed an alliance with the shop owners to strengthen their returns to skill as a collective unit. Workers and owners belonged to the same highly-trained craft and derived substantial monetary returns and status from these machining occupations. Each saw collaboration with the other as the strategy most likely to strengthen the position they derived from their skill, in a broader manufacturing environment that was restructuring by deskilling. For a time, this alliance was effective. But when the CIO achieved gains for lower skilled workers that eroded the premium paid to craft workers, the latter felt cheated. Their collaborative alliance with the shop owners was not producing sufficient benefits to these skilled workers when compared with the relatively more successful confrontational approach of the CIO.

Faced with this dilemma--that is, competition from another organizing model for all workers--the Machinists Local #113 became fighting mad. It helped form the National Tool and Die Conference (NTDC)--made up exclusively of the country's elite machining craft workers--to reinstate the premium paid to skill. The NTDC--and Local #113 as one of its leaders--adopted the increasingly aggressive tactics of the CIO against employers in general. And while successful in obtaining among the highest wages in the country, Local #113's activities eventually would isolate it from the continued support of the job shop owners, their trade association, and even the IAM Grand Lodge in Washington. In the next chapter, we see that in the way that the CIO influenced Local #113 to pull away from their alliance with the job shop owners, pressure from the job shops' large customers also stimulated the shop owners to break off with the tool-and-die union. Let me now discuss these events.

CHAPTER 5--CUSTOMER FIRMS ALSO RESIST CHICAGO'S METALWORKING CRAFT ENCLAVE AND HELP CAUSE THE DEMISE OF THE LABOR-SUPPLIER ALLIANCE

Introduction

I complete a look at the external pressures on Chicago's alliance between tooling job shop owners and their workers by turning a light on the activities of the large vertically integrated customers of tooling in this period. What we see is that these customers, as mass producers of durable goods, sought to break their dependence on the skilled elite of the toolmaking firms. Customer/manufacturers wanted to achieve greater control over the toolmaking process and, at the same time, to lower its costs. In their way--much as the workers within the CIO--these manufacturers wanted to thwart the wage and profit premiums that had historically accrued to these crafts, especially in the highly organized tooling centers such as Chicago's.

That city's job shop owners and workers had constructed a collaborative enclave following World War I that could erect a "shelter" of rules and practices that would preserve their skill and craft. Large vertically integrated mass producers eradicated the control of skilled workers inside their factories by mechanizing in the first place--much as Cyrus McCormick, Jr., had done around the turn of the century. Now these firms wanted to gain control over the remaining segment of craft production that they depended upon to run their assembly lines--the custom toolmaking firms that built their specialized production machinery and tools. Accordingly, these manufacturers started to expand their captive toolrooms--originally used only for in-house machinery maintenance purposes--to take over this custom toolmaking process as well from the small outside contract shops.

This new competition in toolmaking was a more serious development, we will see in the last part of this chapter, than the new contract tooling firms that had opened during World War II. Now the contract tool-and-die industry faced "the most unusual distinction of having *its customers as its competitors*"--as two of the trade association's leaders described the situation--which proved a more difficult arrangement for the trade association to overcome (White and Sinclair, 1945: 7, emphasis in original). Thus, as we will see, the trade association and its contract shop owners capitulated to the pressure posed by the captive shops. They formally adopted an anti-union program to bring their wages down in line with their customers' expectations and with the lower cost standard of the captive shops. Cutthroat tendencies again were rampant among Chicago's contract tooling firms in the late 1950s. Having definitely broken off from the Machinists Union, job shop owners faced difficulties collaborating among themselves. They--as the small outside suppliers of vertically integrated manufacturers--had become marginalized, much in the way that the industrial dualism literature suggests. Let me then recount the remainder of these developments for you now.

I. CORPORATE CONTROL OVER TOOLMAKING AND THE GROWTH OF THE CAPTIVE SHOP

At the same time that the actions of the CIO, and even the IAM's Grand Lodge, helped to erode the agreement between the tooling job shops and their Local #113 union, the actions of the large manufacturers in the region also pressured this "enclave" agreement between craft shop owner and worker from the outside. The country's large manufacturers faced increasing dependence on the tooling produced in the small contract tooling job shops due to the increasing diversification of markets--both those for defense and consumer products--from the 1920s through the 1950s.[1] Diversifying markets signalled greater new product development and a consequent increased demand by manufacturers for tooling. Yet, tooling expenditures could be risky for the large manufacturer--especially if subsequent product sales were inadequate to recoup the tooling cost. In addition, this tooling cost escalated sharply in regions like Chicago where job shop agreements with unionized skilled labor kept both prices and wages high. Therefore, the large manufacturers looked for a solution to their tooling dilemma. This solution led to expansion of their in-house corporate-owned (or "captive") toolrooms and simultaneous pressure on the contract shops to reduce their prices and wages. Thus, as I discuss in this section, the actions of Chicago's large manufacturers in the 1940s and 1950s also led to the eventual demise of the labor-supplier alliance in precision metalworking. Let us look in detail at how these developments unfolded.

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[1] Many authors talk about how today's markets are qualitatively different (e.g., Piore and Sabel, 1984; Helper, 1990, 1991; Womack, et.al., 1991). They are thought to be more fragmented into apecialized niche markets requiring flexible producers to serve them. In other words, markets today are thought to be more diversified than during the postwar height of mass production. That may be; however, I found that mass markets were also under pressure to diversify, compared with the product offerings in the early years of mass production, as early as the 1920s. Some mass producers fought this development and some periods witnessed little new product development and a return to generic mass production offerings. This was especially true in the 1970s when, for instance, auto producers moved from a three-year model change effort to one separated by seven years (Arnett and Smith, 1975; Womack, et.al., 1991). Yet, on the whole, pressure to diversify mass markets was fairly continuous throughout much of the postwar period as I discuss.

Diversifying Mass Markets

The weakness of a mass production system--like that which reigned in the United States through the middle of this century--is its difficulty in producing products to meet varied market demands. A changing and diverse product palette not only shortens production runs and, hence, raises the cost per product made on dedicated production machinery, but more products to be produced means the manufacturer requires more tooling and specialized machinery to make these products. Large manufacturers throughout the country as well as in Chicago experienced increasingly varied market demands since the 1920s--first, with the challenge of General Motors in consumer markets and, second, the varied needs of the war department in World War II and the Korean War in the 1940s and 1950s. Consumer markets continued to diversify into the 1950s, causing manufacturers to face a problem with the high cost of tooling.

Changes in mass markets in the middle of this century are key to understanding why Chicago's large manufacturers--the customers of the tooling industry--eventually pressured the region's tooling job shops in regard to their prices and wages in the mid-1950s. How did mass markets operate in this period? As I explained earlier in Chapter 2, mass producers sought to make a standard product from very long production runs of parts that could be interchangeable when fitted together in final assembly. In this way, Cyrus McCormick, Jr., at the turn of the last century manufactured great volumes of a cheap and generic reaping machine for the mass of farmers willing to buy it in the country's hinterlands. Similarly, Henry Ford--another of mass production's pioneers--expanded the consumer market for automobiles by producing a cheap, reliable, and standardized vehicle for the masses. His generic "Model T" was extremely successful in the first few decades of this century; Ford sold more than half a million of them in 1916 (Hounshell, 1984: 224). However, this mass production strategy was vulnerable when others offered a greater range of products.

In the 1920s, Alfred Sloan did just that, almost extinguishing Ford Motor in the process. Sloan developed a strategy wherein General Motors attacked Ford by offering a slightly more costly, yet more comfortable, car to that segment of the mass market which earned slightly higher incomes. General Motors also offered a price range of increasingly larger and more luxurious models to ensure that it could not be similarly challenged from "above" by others as it had done to Ford. Sloan retained the Fordist mass production model, however, by trivializing the design differences of its various products--at least in regard to the manufacturing process. GM's different car models shared the same interior parts and components, which could be made without sacrificing throughput and large production volumes even though the exterior of the cars could not be made in this manner. From here on, GM took over as market leader in regard to autos. Ford sales drastically declined and the company required a bail out from the federal government in the 1940s to survive this challenge (Sloan, 1964; Best, 1990). GM, then, became the production model to emulate by other durable goods manufacturers. The mass production model--as an absolute philosophy of production and one based on a single inexpensive "stripped-down" product--had been successfully challenged (see Sloan, 1964; Piore and Sabel, 1984; Hounshell, 1987; Best, 1990).

Thus, in regard to autos at least, we see that the appeal of a standardized product to a stable mass market represents only an extremely short time frame in American history.

Ford's mass market strategy succeeded for less than twenty years--from 1908 to the mid-1920s. Prior to that time period, autos had been a luxury (or "class") item affordable by only the rich. Subsequent to Ford's single-product "mass" market strategy, Sloan developed GM's higher-priced models (a "mass-class" strategy)--an upmarket strategy which others then emulated from the 1920s on. Yet, this consumer market strategy, too, was relatively short-lived. From the late 1950s on, this strategy was challenged from below by foreign competitors.[2] Consumers in the 1950s and 1960s resisted the superficial product changes they had been force-fed in the name of mass production; they wanted a greater product mix to choose from (Sloan, 1964; Boyle, 1974; Helper, 1990, 1991; Womack, et.al., 1991).

Before looking at consumer markets in the early postwar period, let us consider market changes that faced metal-related manufacturers in the war years of the 1940s and early 1950s (i.e., during both World War II and the Korean War). Not only did the speed of production escalate--as the country sought to gear up quickly for the war effort to compensate for its late entry into the conflict--but the demand for new and changeable products also increased. These pressures on manufacturing stimulated the start-up of a host of smaller manufacturers to meet the increase in and diversity of demand (Wagoner, 1966). It also expanded the demand for tooling.

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[2] Womack, et.al. (1991) state that 1955 was the peak year for the U.S. auto industry and its mass production method. This year of mass production's "heyday... was also the year that the downhill slide began. ...[With import penetration] their early perfection of mass production could no longer sustain these U.S. companies in their leading positions" (Womack, et.al., 1991: 43).

William White and Stuart Sinclair (1945: 5)--associated with Chicago's metalworking trade association--explain how product demand fluctuated in the defense markets of the 1940s and the role that the contract tooling industry played in helping manufacturers to meet it.

> In the past two or three years, War Production has had many changes in products and design of products. Many of these have been brought about by facts learned on the battlefield.
>
> For example, consider the North African Campaign. In the battle for Africa, the forces of the "Desert Fox," Marshal Erwin Rommel, were steadily beating the Allies back toward the Suez Canal, the vital supply route for the Allies. The reason for the success of the German Afrika Corps was the use of a tail fuse shell rather than the nose fuse shell used by the Allied Forces. The tail fuse shell flattened out upon hitting a heavily protective armed object, exploding on the outside of a tank or protective shelter.
>
> Noting the success of the tail fuse shell, our military leaders immediately put through necessary change orders which revised the M 66 shell. The Tool and Die Industry was given the job of designing and manufacturing the necessary tools for this changeover. The job was accomplished with the utmost efficiency and rapidity. Had it not been for this Industry's knowledge, experience, ingenuity, and whole-hearted response to this challenge, Marshal Rommel would have continued his successes, reaching the Suez Canal and prolonging the present war by many years.
>
> The Special Tool & Die Industry served its Country. The speed and efficiency demonstrated by the Industry in handling this task, is but typical of the job which the Tool & Die Shops of this country are called upon to perform many times during the years, a job to which they may point with justifiable pride.

Thus, we see that production related to the war effort also pulled American manufacturers away from the long runs and generic product of the mass production model.

Finally, although the pent up demand for consumer products immediately after the war guaranteed easy sales of generic, mass produced items in the late 1940s, consumers again wanted a greater diversity in product offerings as their living standards continued to improve in the 1950s. In this decade, a much different picture of competitive conditions emerged. Markets became glutted with the huge volume of goods produced for consumers after the war, such that sales were tougher to make for each manufacturer. When consumers continued to experience a rise in their disposable income (due, in part, to the maturing of the American union movement when the AFL and CIO joined forces in 1955, strengthening labor's demands for higher wages from manufacturers and other employers), they became more choosy as to how they spent their dollars. How did the country's large manufacturers respond? Not only did they place greater emphasis on cost reduction and greater production efficiency--attempting to outmaneuver their competitors with lower priced goods (a refinement of the mass production model with the newly available automated production machinery), but they also began designing new--or redesigning existing--products to lure consumers into their fold (see, for example, AM, 10/11/54; AM, 11/8/54; AM, 5/21/56; AM, 4/8/57; AM, 1/26/59).

Editorializing about trends of the day, an observer remarked that "[s]carcely a metalworking business of any kind [i.e., including all metal-related consumer goods manufacturing industries] these days is not caught up in new designs of products, new materials and new manufacturing processes. It has no other choice... [it] cannot afford to stand still for long or [it] will be lost" (AM, 4/8/57). A McGraw-Hill Department of Economics survey reported that new product development was responsible for much of the expansion of capital goods purchases (including new machinery and tooling) in the 1950s; they projected that manufacturing capacity would grow half again as large by the end of the 1950s as it had been at the beginning of that decade (AM, 5/21/56). "[O]ne-third of the reporting companies say that a goodly portion of 1956 [capital goods] spending will be in connection with new products... [with] 11% of 1959 sales... likely to be in products not made at all in 1955" (AM, 5/21/56: 111). New product development was especially expected to occur in certain industries--instruments, office machinery, construction machinery, aviation--where it would account for more than 20% of sales by 1959 (AM, 5/21/56). The auto, appliance, and radio-TV manufacturing industries also pushed for new products and product innovations in this time period (AM, 1/16/56). All of these industries--except aviation--were prominent at that time in the Chicago region. New product development was accompanied by more aggressive sales and merchandising methods. The goal here of each manufacturer was to increase market share at the expense of its competitors--in a crowded yet growing economy.

This push for new product development in the 1950s was initially caused by smaller manufacturers trying to eat away at the market share of industry leaders, given the relatively saturated demand. Trends in the auto industry provide us with a glimpse at these pressures. GM--with over 50% of market share in this time period--was being challenged by the other two of the Big Three (i.e., Ford and Chrysler) as well as the small independents (AM, 1/28/57). Thus, for 1955--the year of great product change in this industry--AMC, one of the smaller auto "independents," came into the market with a lot of "firsts" to challenge the Big Three: unit body construction, air conditioning integrated into the autobody design, retractable rear windows for station wagon doors, and a totally revamped Rambler automobile (AM, 11/21/55b; AM, 12/19/55).[3] This innovative activity was effective. "When an

[3] The small independents also clearly worked on cutting their costs in order to stay in the game. Not only did mergers take place among them, but the newly merged independents also began discussing "product reciprocity," or the sharing of components between their models--a

independent in the automobile business steals a stride on the Big Three, you can make book that they will retaliate with a vengeance" (AM, 11/21/55b: 109). And retaliate they did--1957 cars were to be "better, flossier, finer than anything ever offered before... [so that the Big Three could] arrest and recapture a market that might be sliding a little" (11/21/55b: 109). Chrysler, third in size and fighting hard for its market share, spent significant sums retooling its 1956 models "in an off-beat year" (AM, 9/26/55: 109). Thus, the newly agreed upon two-year-facelift industry policy was soon moving toward annual product modifications.[4]

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tactic each of the Big Three employed between their separate models already. Thus, the smaller "independent" auto companies combined a strategy of greater product innovation with one to consolidate mass production gains where they could be had. For instance, AMC discussed buying V-8 engines from Studebaker-Packard; and Studebaker-Packard wanted to purchase automatic transmissions from AMC. AMC also began collapsing the models within its purview as an economy move. The Nash and Hudson models were consolidated such that AMC could build their bodies with common tools and dies (although the exterior shells would not look alike), allowing the company to eliminate 17 parts warehouses (AM, 10/25/54). However, AMC made product changes as well (pursuing a dual strategy of innovation and cost-cutting) in order to stay in the game.

[4] Product changes also started becoming so extensive that the industry's terminology for discussing these changes became inadequate. What had been called "facelifts" to acknowledge the superficial body changes made earlier, now were called major styling changes with the term facelift reserved for the in-between styling year (AM, 10/11/54; AM, 6/18/56). Ford, trying to regain its market preeminence from prewar days, not only kept its price increases low (announcing a 2.9% increase in 1957 and stimulating GM to say that it, too, would be price competitive), but "Ford has spent $209 million to produce a completely new car from the inside out... [prompting observers to say that it] may have outstyled Chevvy for the first time in many years" (AM, 10/8/56: 105). For 1958 (supposedly another "off" year in the now two-year industry restyling cycle), Ford planned to bring out a completely new car line--the Edsel--with its separate network of dealerships as well (AM, 7/1/57). Because Ford, Chrysler, and the smaller auto companies were successfully chipping away at GM's market share through its product redevelopment efforts (some of which were more superficial than others), GM responded by planning a major styling change to its Chevrolet for 1958 "to offset the inroads that Ford is making now" (AM, 1/28/57: 109).

Not only were the market leaders in America's manufacturing industries being challenged by their smaller domestic competitors in the postwar period, but foreign manufacturers started to make inroads as well. Quoting again from the American Machinist (1/26/59: 93): "Foreign competition, heretofore only a pin-prick, suddenly was painful. European-designed and built products proved to be pretty good. And the Germans in particular worked their heads off to get somewhere. And they succeeded, often at our expense." The first big challenge to U.S. manufacturers by imports occurred in the 1950s. Again in regard to cars, imports grew from a neglible amount in 1955 to about ten percent of the American market by 1959 (Womack, et.al., 1991). The American Machinist (AM, 10/21/57: 101) stated that: "Volkswagen is in such demand... [in the U.S.] that bootlegging [of VWs] has reached epidemic proportions. ...this [bootlegging] racket is a tribute to the desirability of the Volkswagen." Eventually, all the car producers introduced new products--compacts and sub-compacts--to compete with the lower-priced and economy-minded imports.[5] Increased domestic competition and imports into other U.S. industries also stimulated other manufacturers to expand the range of products they offered consumers, especially in the lower-priced market segments (AM, 5/21/56b; AM, 4/22/57; AM, 11/13/61).

These changes in the immediate postwar consumer product markets increased the demand of manufacturers for tooling--as it had earlier in the war years--and their potential

[5] Ford was considering introducing a domestically-built small car in 1957 (Ford already produced small cars in Europe at this time, see AM, 10/21/57; Womack, et.al., 1991) if "foreign car penetration of the U.S. market exceeds 5% (AM, 10/21/57: 101). AMC brought out a "Baby Rambler" in that year to compete with the foreign subcompacts. U.S. auto production and sales were lagging in 1957, except "in the low-priced field, where sales [were] running very well" (AM, 5/6/57: 101).

dependence on the highly organized and high-priced job shops, such as those in Chicago. In explaining the impact of heightened competition and new product development on the mass production of autos in the mid-1950s, an industry observer noted that "[t]he increasing numbers of sizes and types of cars on the market are leading toward a **job-shop operation with shorter runs** and more frequent die changes" [emphasis added] (AM, 11/30/59: 85). A few years later, this observer stated that:

> No longer does any single car have the tremendous production and sales volume of former days. More models by far are being built than ever before. But the industry's overall production is no greater. Each maker thus has to be content with lower production runs and is forced to base his costs on them. ... The entire automobile industry is 'all shook up' (AM, 11/13/61: 107).

Market Power and the Cost of Tooling

Thus, in continuation of trends in the 1920s and 1940s, America's mass producers of consumer products faced increasingly competitive conditions in the 1950s which forced them into more frequent and extensive product revisions in order to survive. Companies also extended their product lines with new product offerings. Yet, the pressure to bring new products to market in order to maintain sales had to be balanced against the cost of the product development activity. The cost of "tooling up" new products was often prohibitive and may have been exacerbated by the market power of tool-and-diemaking firms which represented the most skilled and custom-design-oriented segment of the metalworking industry. This produced a "tooling dilemma" for manufacturers as I will discuss in greater detail in this section.

The auto industry, again, provides us with a lens to view the tooling dilemma of Chicago's and other region's metalworking customer firms. Reassessing the dearth of sales in 1956, auto companies decided they needed to step up their restyling efforts--as suggested earlier--to persuade consumers to continue buying new cars.

> Major styling changes every year? That's the word around Detroit these days, where they're saying that the enormous resistance of new car buyers to 1956 models [a "facelift" year in the now two-year product redevelopment cycle] has sparked a turnabout in auto moguls' thinking. They want no repetition of this year's fiasco and the best way to insure that is to junk the usual two or three year styling changes in favor of a major change once a year--and that **means new tooling on a big scale every year**. Opponents of the idea say it'll be so costly the little automakers can't afford it. Others say no one in the industry could keep up yearly changes for long... Whatever the decision is, **the tooling people can look forward to more auto industry spending**--because styling sells cars, and styling required tooling. (AM, 6/18/56: 101; emphasis added).

Tooling includes such items as dies for cutting the metal shapes of various parts (e.g., auto bodies), and jigs, fixtures, and other metal pieces to hold a part in place in a machine while work is being done on it. New or redesigned products mean new metal parts and components. New and different parts require new dies and other tooling. Hence, the more frequently products are redesigned, the more frequently a manufacturer needs to produce new tooling in-house or buy it from contract metalworking shops, such as those in Chicago.

What was the short term result of more frequent product changes in the durable goods industries in the 1950s? Let us again look at the auto industry--which offers the largest market for tooling in the country.[6] The smaller independent automakers in the 1950s found themselves increasingly locked out of competition based on new product development because of the cost of tooling. Even Chrysler, the third-largest of the Big Three, had difficulty affording the expense of new tooling. For instance, the small Studebaker-Packard Co. came out of the major product change year of 1955 with low sales and already in a "fight for its life" (AM, 5/7/56: 109). Denied long term financing from the banks, the company was only able to afford minor changes for 1957 [the next major product change year in a two-year cycle] "against the sweeping changes planned by the competition. That's because the millions of dollars just aren't there for dies and tooling" (AM, 5/7/56: 109). Chrysler, afraid it would succumb like Studebaker-Packard, started cutting costs and utilizing an efficiency expert to squeeze its workforce for greater productivity; it also started experimenting with plastic dies which were much cheaper to produce than metal ones (9/24/56). Other than that, its product was not going to change much for the 1957 or 1958 model years--"the theory being that [its] 'Forward Look' [developed for the 1956 model year] is too hot to change. That's the theory. The fact is that three two-year tooling cycles in a row have cleaned out the Chrysler retooling treasury" (AM, 7/29/57: 77). Meanwhile, the Big Two--GM and Ford--were "leveling

[6] Using national input-output tables, one can see that the auto industry is the single largest consumer of tooling and precision metalworking products. In 1982, for instance, auto companies bought 4.8% of all tooling (SIC 3544 and SIC 3545), followed by the aircraft industry which bought 4.5%, and the precision metalworking industry itself which bought 3.8% (machine shops, also part of metalworking consumed another 2%). Various sectors within the primary metals industry were also big consumers of tooling and precision metalworking, purchasing in total a comparable amount to autos and aircraft (for instance, the aluminum rolling and drawing industry purchased 2.3%, steel wire producers bought 1.7%, and makers of aluminum castings bought another 1.7%) (U.S. Department of Commerce, 1991).

haymakers of new design and red-hot research at each other" in the mid-1950s, spending huge sums to keep up with this competition (AM, 5/7/56: 109). In 1955, for instance, "the biggest year [at that point] in automotive history in terms of overall expenditures for new machines, tools, fixtures, handling equipment and preparation for production," the auto industry planned to spend $1.1 billion (excluding Ford's plans) on tooling (AM, 11/8/54: 118).[7] Other industries besides auto, were following suit and investing heavily in new tooling and machinery to churn out new products. Because of this, "tool and die people expect[ed 1956] to be the biggest year [yet, since 1953 at the end of the Korean War.] ...Where is the golden harvest coming from?... the tool and die industry's old standbys--automotive, electrical, electronics, ... appliances,... color television, ... and the farm equipment industry" (AM, 5/7/56b: 183). All of these "customer" industries had a significant manufacturing presence in the Chicago area in this period.

Not only were tooling costs expensive for automakers and other durable goods manufacturers which were redesigning their products, but this cost in some regions may have been driven even higher due to the market power of the small independent tool-and-die-making shops and their highly-skilled and knowledgeable craft workers. Chicago was one such region. Although industry observers "predict[ed] a tool and die boom for 1956," Chicago area shops were the last to partake of this business. For instance, while some other Midwestern auto parts makers were "'loaded to the gills' with orders" in 1955, Chicago's tool-and-die shops faced "keen... competition" (AM, 4/25/55: 166). Many felt this was due to

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[7] This amount, of course, included new "dedicated" mass production equipment along with other tooling (i.e., dies and machine fittings) to make the new products.

"high Chicago area production costs... [which were] driving some tool and die business out of town" (AM, 4/25/55: 166). "Chicago wages", said others, were to blame; they were "the highest in the U.S." (AM, 5/23/55: 176). Furthermore, when a strike occurred in that year by the IAM against the leading tool-and-die shops in that region, shop owners were accused of giving in too easily. In part, the high production costs in Chicago's independent tool-and-diemaking shops reflected the high level of skill and expertise embodied within these "highly diversified shops" (AM, 4/9/56: 115). In part, they also reflected the past market success of the tooling industry's interfirm guild network and its alliance with craft labor. Pushed by a strike, Chicago's shop owners--albeit reluctantly--decided to satisfy the demands of the highly-skilled workers that they trained, were loyal to, and on whom had come to depend. Furthermore, the wages paid in Chicago's tool-and-die shops carried significance for the whole Midwest in that they served as the pattern for gains by toolmakers and skilled craft metalworkers in other surrounding cities and metalworking centers.

Thus, durable goods manufacturers in the United States not only felt the need to increase their product efforts and investment in new tooling, but faced a powerful metalworking supplier industry, at least in Chicago, when bargaining for this tooling. Powerful supplier networks could push their tooling costs even higher. Let us look at the solutions that America's large manufacturers developed to deal with this "tooling dilemma"--that is, their increased dependence on the contract tooling and precision metalworking industry which in Chicago had grown much stronger over the preceding decades.

Customer Firm Strategies and the Choice of the Captive Shop

How did manufacturers around the country respond to this dilemma in tooling? What solutions presented themselves that would ease their need to increase the pace of new product development and afford the cost of tooling? In this section, I discuss how American manufacturers pursued three different strategies in response to these postwar pressures. Each of these strategies carried distinctly different implications for the contract tooling and precision metalworking industry, as outside suppliers to manufacturing. Some firms ignored the push toward increasing product offerings and instead retreated to early mass production strategies (e.g., they produced a single, low-cost, standardized product or made minimal and superficial product changes).[8] Consequently, their use of the contract precision metalworking industry remained minimal. Other firms followed an opposite tack--they collaborated closely with the independent metalworking suppliers to help them innovate a new product with minimal development time and tooling cost. This strategy resembles that of flexibly oriented manufacturing economies of today and of much of America's manufacturing past when reliance on outside contractors for engineering assistance was greater. (For instance, Helper, 1991, reports that the auto industry was highly supplier-dependent for much of its expertise in the early years of the industry around the turn of the century. As I reported in Chapter 2, the

[8] Although I present these as three distinct and exclusive strategies, they were not. Corporate manufacturers in auto, appliances, and other metal-related manufacturing industries may have employed a combination of these strategies to hedge their bets against the uncertainty of whether high-volume mass markets could again be established or not. They also may have pursued different strategies in different locations (e.g., in their domestic plants versus their overseas subsidiaries). Manufacturers also followed different strategies over time, depending upon the success of the various paths chosen and on changing environmental conditions.

McCormick reaper factory was highly supplier-dependent early in its history as well.) A third strategy employed by U.S. manufacturers offered a middle way. It involved attempting to increase innovation and product development activity within the managerial structure of the mass production corporation. In this way, large manufacturers could control the tooling industry by integrating it within its fold rather than having to deal with an unruly and often demanding set of outside suppliers as manufacturers had to in the past. It would also use the threat of the captive shop to discipline these outside, or contract, tooling suppliers. How did these three options unfold in the postwar United States?

Two contrasting strategies from the auto industry highlight the range of options firms were experimenting with to solve the "tooling dilemma." The first of these strategies was a return to the superficial product changes practiced by GM earlier. As early as 1956, auto industry observers wondered how long automakers could keep up this pace of product restyling and redevelopment. At that point:

> various schemes ... [were] studied... to arrive at an **economically feasible major styling change every year**. One group favors complete overall change each year, while others advocate a major facelift. It is agreed that if you really catch the public fancy the tooling cost is not problem--but if you miss! The solution... emerging now... [is to do] a major facelift every year on a body that can be retained for three, four, or even five years without tooling expenditures for the basic shell. The body shell will be the much-discussed unitized body. The safety feature will be played up by the advertising men but economy will be the real reason behind its acceptance" [emphasis added] (AM, 7/16/56: 101).

So, while the pace of product redevelopment continued to heat up after 1956, the industry was already discussing ways to hold back the cost of this activity while making product changes more superficial. This option necessitated minimal new tooling requirements.

Studebaker-Packard offered another option for solving the tooling dilemma in product redevelopment efforts that looks much like the flexibly oriented, collaborative manufacturing solution that the Japanese especially have engaged in today but that American manufacturers on the whole did not embrace in the postwar period. Facing extinction coming into the recession year of 1959, the small independent automaker pared its budget to survive after weak sales and, thus, had not changed its auto designs for several years. It had been unable to afford the tooling cost. Then the company took a chance on introducing a new compact car, the Lark, in 1958 and made a comeback because of it. Once it decided to focus on one model, it scrapped its other car lines, and worked round-the-clock to produce the new Lark. In doing this it worked closely with its suppliers so they could help cut costs in production and went "sole source" (ie: with a single supplier for many of its parts) for the first time ever when subcontracting out all of its metal components. The following quote from the American Machinist (6/15/59: 99) gives the details of this story.

> Studebaker comeback... Everybody knows the startling success story of the "common sense" Lark, which is still humming off the South Bend lines at the rate of 84 units per hour, but few outside of the company's 16-man administration committee know the tooling facts behind it.
>
> Purchasing Director John Soelch recently told AMERICAN MACHINIST a few of them. In the dark days of January 1958, Styling had just finished rehashing the obsolete line of Champions, Commanders, Presidents, Hawks and Packards in the not-too-certain hope that there would be use for 1959 models. The Lark at that time was nothing more than an idle sketch on a piece of paper.

> By March the others were dumped and the Lark was it. Soelch says "We worked 24 hours a day, Saturdays and Sundays." As soon as Styling completed clay models, vendors were brought in to work directly from them. Their cooperation with Styling, Engineering, Manufacturing and Purchasing was critical to keep costs down. Budd, which supplies body stampings, figured a way to use a single roof to fit two- and four-door sedans as well as the hardtop. Another supplier helped Styling work out a bumper that was interchangeable front and rear. An electrical manufacturer suggested a simple socket relocation so that taillamp assemblies would also be interchangeable.
>
> But perhaps the biggest single cost-cutting idea came from Soelch himself. Though Budd has been the historic supplier of body stampir ıling, the company usually farmed out fenders, hoods, and other misce. ːms to several other tool makers.
>
> Why not, Soelch asked himself, give the whole works to one supplier so that engineering changes (there turned out to be over 200 of them) could be coordinated under one roof?...
>
> Their estimates were in line. The result was that when Budd delivered the first 100 car sets of stampings on pilot day in September, those 100 cars rolled off the line on a regular production schedule. This has never been done before or since in the industry.

Studebaker-Packard had cut itself down to a new "lean, hard core" and was very successful with this strategy in the short run at least (AM, 6/15/59: 99). The "Lark was tooled at a total cost of $4.5 million [compared with $250 million for Ford's Edsel, also a new model, that Ford produced in the same model year] (AM, 6/15/59: 99; AM, 7/1/57). It couldn't happen in any other company nowadays", cited one observer (AM, 6/15/59: 99). Except, perhaps, at AMC (American Motors). This other small auto producer "even in prosperity has never deviated from the paying principle that suppliers can satisfactorily perform a large percentage of the design function" (AM, 2/20/61: 77). AMC employed 25 creative engineers in the early 1960s, compared with Chrysler's 5200, which is why "AMC

[can] make a fat profit on sales of between 300,000 and 500,000 cars annually, whereas Chrysler has in the past lost money selling twice as many" (AM, 2/20/61: 77). Although these two "independents" in the auto industry are today defunct, at that time, they were thriving while Chrysler was sinking in overhead costs. Why didn't all companies go the way of Studebaker-Packard in producing its Lark? What other options were available to postwar manufacturers in solving the "tooling dilemma"?

With the heat up in product development efforts in the mid-1950s, large durable goods producers developed a third option mid-way between superficial design changes and the highly-supplier dependent Lark example. They increasingly brought work inside into newly formed captive toolrooms. Having their tooling facilities inside the company gave the automakers--and other durable goods manufacturers--greater control over the toolmaking process and its cost while affording manufacturers the ability to make product changes more frequently without having to rely on the cooperation of outside suppliers. Thus, this third way option allowed the large manufacturers to compete on the basis of new product development without having to depend on the small contract tooling firms nor their "elite" craft labor. How did this captive toolroom strategy come about?

Consumer durables manufacturers purchased the bulk of their tooling and precision metal parts on the outside prior to World War II. In its effort to gear up for the war effort, the federal government assisted large manufacturers to establish captive toolrooms and other parts production facilities inside their assembly plants (White and Sinclair, 1945; Arnett and Smith, 1975). Coming out of the war years, manufacturers of autos, appliances, agricultural machinery, and other durable goods began to expand their captive shops. The auto industry, for example, added substantial captive capacity in toolmaking and precision machining in two bouts; the first of these was following the Korean War in the mid-1950s (Arnett and Smith, 1975). (The second expansion took place in the 1960s with the help of numerical control technology, which I describe in the next chapter.) This initial expansion of the captive toolroom entailed a duplication, in-house, of skilled metalworking capacity which manufacturers earlier purchased on the outside from the independent tooling job shops.[9]

Manufacturers felt the captive toolrooms, first of all, gave them greater control over the toolmaking and parts production process while weakening their dependence on the expertise of the outside shops and their workers. Secondly, the captive shops were also cheaper from a labor standpoint. In regard to the first point, manufacturers could more directly specify the speed at which new tooling was developed, delivered, and integrated into the production process by using the captive toolroom. This became critical when producing new products. The competitor which brought its product to market faster often reaped the bulk of sales. Thus, in the heightened period of new product competition, the auto companies, for instance, were "pushing local tool-and-die shops hard... to get 1957 models ready for an early showing" in the market (AM, 1/16/56: 109). Individual manufacturers also

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[9] Manufacturers always maintained in-house tooling and precision machining facilities. Prior to the expansion of the captive shops, however, these in-house facilities were utilized only for tool and equipment maintenance and repair work. The expansion of captive facilities allowed manufacturers to begin to design and build new tooling, precision parts, and special machinery--custom work which was previously purchased on the outside (White and Sinclair, 1945; U.S. Congress, 1970; Arnett and Smith, 1975).

could assure an adequate tooling supply, with the captive toolrooms, to meet their needs versus a competitor's during peak tool-up periods (U.S. Congress, 1970).[10]

Captive toolrooms also helped manufacturers lower the cost of tooling. Although many large manufacturers were unionized by the CIO in the 1930s and 1940s and under pressure to increase the wages of their production workforce, their skilled labor costs--required to produce precision metal parts--remained lower than the contract shops until much later (IAM/T&D, 1952; U.S. Congress, 1970; see Arnett and Smith, 1975, in regard to Michigan). This pay gap **within skilled machining occupations** (such as for the tool-and-diemaker), between those that worked in captive toolrooms versus the small contract job shops, had many causes. Initially, skilled labor in the captive shops was paid less than in the independent shops because such labor was also often less skilled and used in a more specialized fashion (e.g., for the maintenance of machinery, not its customized construction). The craft unions (e.g., the Machinists Union) also historically had their strength in the small independent shops rather than the toolrooms of the large production plants of the durable goods manufacturers. Even though the CIO brought union representation to these large plants from the late 1930s on, its unions focused their efforts on helping the unskilled worker to the detriment of the skilled hands in their jurisdiction. The skilled wage differential always existed between the craft and industrial unions (since the CIO unions' founding in the 1930s and 1940s). In fact, observers predicted problems with the merger of the AFL and the CIO in

[10] Automakers initially also developed captive toolrooms to protect their styling secrets. By the early 1970s, this issue was no longer important when one of the Big Four contracted for and purchased tooling from the captive toolroom of another (Arnett and Smith, 1975).

1955 for this very reason (ie: the "AFL's skilled men always made more than the CIO's", AM, 12/19/55: 93).[11]

In the boom of the World War II years, this gap in skilled wage rates produced problems for the large manufacturers. Although they achieved savings on their wage bill by utilizing their newly-expanding captive toolrooms rather than the services of the independent job shops, they faced difficulties retaining their skilled help which was in short supply. All firms were restricted on raising wages during the war (price and wage levels were frozen by the federal government's War Labor Board), yet many small contract shops clandestinely offered their workers--on whom their craft labor process and livelihood depended--exorbitant wage rates to retain them. As an IAM working paper (IAM/T&D, 1952: 2; emphasis added), based on information compiled by Sidney Rolfe of the U.S. Office of Economic Analysis, reported:

> During World War II the shortage of skilled labor to meet expanded demands upon the tool and die industry was acute. Labor pirating from "captive shops" (i.e., tool rooms of integrated companies) to small, often newly established "job shops" was widespread. Labor was attracted to the job shops by extremely high wages and other

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[11] Later, when this differential between the captive and contract shops switched, firms had to battle for the right to begin outsourcing skilled work. For instance, in 1961 a test case came before the National Labor Relations Board (and subsequently the Supreme Court) regarding the right of a firm to outsource its in-plant construction and maintenance work. The argument pitted the steel, auto, rubber, and other industrial unions against the craft-organized building trades for union jurisdiction over these jobs. "Employers are caught in the middle--in part because of new efforts to economize by shifting work practices. [Such employers] decided to use subcontractors in maintenance work as an economy move" (AM, 4/17/61: 97). The industrial unions argued they handled this work in the past and insisted on "no-contracting-out" contracts from the firms (AM, 4/17/61: 97). A similar prohibition against outsourcing was negotiated by the UAW in regard to auto parts production in the early 1970s (Arnett and Smith, 1975).

> inducements. Labor brokerage companies were established to recruit skilled workers for job shops. The Tool and Die Commission of the War Labor Board was established in 1942 to deal with the consequent wage instability in the Detroit area. The Commission introduced a uniform rate range of $1.40 to $1.60 per hour for captive shops, and a maximum rate for job shops of $1.75 per hour. The termination report of the War Labor Board indicates these steps were to some degree successful in stabilizing wages and in reducing **undesirable labor mobility among firms** [i.e., from the captive to the contract shops][emphasis added].

In setting these wage levels, the War Labor Board's Tool and Die Commission, in fact, helped ease the gap for Detroit's larger manufacturers by setting their wage levels higher than historically and bringing those of the job shops down. I quote from the First Annual Report of the Tool and Die Commission (as cited in a petition by the Industry Members of the National War Labor Board in Region XI, for the Detroit area)(IAM/T&D, circa 1944: 4):

> To stabilize this chaotic situation [of skilled workers leaving captive toolrooms to garner higher wages in the smaller job shops], the National War Labor Board issued its Directive Orders of October 23 and December 11, 1942, which set maxima wage rates for the various classifications in the tool and die industry and prescribed rules to prevent labor pirating. The Board set maxima rates for the key classifications of tool maker and die maker at $1.75 in the jobbing shops and $1.60 in the captive, or manufacturing shops, thus maintaining the traditional differential between the two...
>
> The maximum hourly rate of $1.75 for tool and die makers in jobbing shops fixed by the Board in October, 1942, was deliberately set below the rates then being paid. Most jobbing shops had some workers to whom they were then paying well over $2.00 per hour. In setting a maximum of $1.75 the Board expected that this rate would tend to become the hiring rate and the going rate. That is exactly what occurred. As of September 1, 1943, the overwhelming majority of journeymen tool and die makers in jobbing shops were receiving $1.75 per hour. Workers receiving less than $1.75 were mostly upgraders.
>
> In the case of the manufacturing plants, however, the Board deliberately sought to raise wage rates, on the ground that the traditional differential between jobbing shops and manufacturing shop rates had become too wide. In the case involving General Motors, Ford, and Chrysler, the Board ordered the minimum rate for tool and die

makers to be raised to $1.40 per hour, and the maximum to be fixed at $1.60 per hour. The three large companies immediately raised many of their tool and die makers to the new maximum, but they also kept some at lower levels of the rate range. Other companies, following the pattern, established rate ranges from $1.40 to $1.60 per hour. The present average is only 5 cents above the mid-point of the stabilized rate range.

In the Chicago area the gap in skilled wage rates--between the captive and independent contract toolrooms--was perhaps exacerbated during the war in that the parties before the War Labor Board there could not agree to a set of "stabilization" rules as had been done in Detroit (see IAM/IL T&D, 2/3/44). In fact, the low tool-and-diemaker rates in the captive shops significantly biased federal statistics downward in regard to this occupation. As the IAM's economist, A. Epstein reported to the union's director of research in Washington, Carl Huhndorff, in an internal memorandum in 1947 (IAM/T&D, 3/4/47):

> Subj: Average Hourly Wage Rates for Tool and Diemakers in Chicago, Ill.
>
> As you are aware, I have checked with Miss David of the Wage Analysis Division of the Department of Labor in regard to the very low wage rates reported in their preliminary study of February 14, 1947. This survey of "Average Hourly Earnings for Four Machinery Occupations in Forty Cities, October 1946" lists $1.59 as the average hourly rates paid to tool and diemakers in Chicago. IAM agreements in that state have a $1.75 minimum. Miss David called on March 4th and informed me that she had checked this rate with the Chicago office of the Bureau of Labor Statistics and found this to be the correct rate. She attempted to explain the difference between the Bureau's wage rates and ours on the basis of the differences between job shops and other manufacturing plants.[12]

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[12] I found a similarly low wage rate for Illinois and Chicago machine tool firms (which include the region's tool and die shops) when compared to the wage rate for the country in this time period. As seen in Appendix 5-1 where I utilize Census of Manufactures data, Illinois machine tool firms, and Chicago firms even more so, paid higher wages to their production workers than comparable firms in the U.S. during the 1920s and early 1930s; however, these wage rates converged from the mid-1930s onward into the 1960s, when the

Thus, we see that coming out of the war years the captive toolroom offered Chicago's large manufacturers a middle road between ignoring consumer demands for greater product diversity and serving that diversity with increasingly expensive tooling. Furthermore, the captive toolroom would lessen the manufacturers dependence on the skills, high prices, and cohesiveness of the contract tool and die industry, such as the highly organized shops in Chicago represented--a dependence they found problematic in the build-up of the war years. The key weakness in this solution to their "tooling dilemma" was gaining access to a sufficient number of skilled workers as the postwar economy heated up. Chicago's job shops were used to paying extremely high wages to guarantee the loyalty of their workforce and would likely continue doing so into the 1950s. How might these large manufacturers alter the situation to their advantage? By breaking the trade association's alliance with skilled labor and pressuring tool-and-die wage rates, for the region in general, downward. Any downward pressure on wages would certainly alienate the feisty tool-and-die Local #113 and break any collaborative leanings apart. In fact, this is what happened. Let us see how these developments came to pass.

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bulk of captive toolrooms were established. Yet, wage rates recorded in IAM contracts indicate that Chicago tool and die firms paid much higher wages, than in the country as a whole, throughout the 1940s and 1950s. I would conclude, as did Miss David, that the inclusion of captive shop rates in the census statistics biased Chicago's machine tool rates downward for the industry as a whole and hid the much higher wages paid in the trade association and contract tool and die shops in the war years and postwar period.

<u>II. THE LAST STRAW--THE RIFT WITH THE MACHINISTS UNION AND ACCOMMODATION TO THE CAPTIVE SHOP</u>

As mentioned in the previous section, Chicago's durable goods manufacturers in the 1950s faced both increasing pressures to diversify their product offerings and the highest job shop rates in the country for the tooling required to bring out these new products. This stimulated the manufacturers to purchase tooling from contract job shops in outlying towns and rural regions that offered lower prices for tooling. It also pushed them to expand their captive, or in-house, toolrooms. Chicago's tooling job shops, in turn, experienced increasingly more aggressive tactics by their elite skilled craft workers and their union, Local #113 of the IAM, who felt their skilled wage rates were not rising fast enough to keep pace with the gains made by the CIO. Worried that such high labor costs would ruin Chicago as a tooling center and facing direct pressure from their large customers to lower their wage rates, Chicago's independent job shops capitulated to the demands of their customers. This entailed holding firm against future demands by Local #113, which eventually broke the historic alliance the job shop owners had with the craft union. In summary to this chapter, I describe these events briefly.

<u>An Historic Reversal in the Wage Gap Between Captive and Contract Toolrooms--Except in Chicago</u>

As I discussed earlier, the cost of tooling up for new production runs could be substantial for America's mass producers in the 1950s. Yet, these large manufacturers could produce tools and dies at a lower cost in their captive toolrooms given an historic wage differential for skilled toolroom workers between captive and contract job shops. This differential was especially sizeable in Chicago. Coming out of the Korean War, however, this differential in favor of the captive shops reversed itself in many regions of the country--due to the organizing gains of the CIO and the pattern set by the War Labor Board's Tool and Die Commission in Detroit. Thus, in the early 1950s, in many regions of the country, contract job shops now represented the least cost option for obtaining tooling. I quote again from an IAM working paper on the tool-and-die industry prepared with information gathered by the federal Office of Economic Analysis (IAM/T&D, 1952: 2, 12; emphasis added):

> The tool and die situation today [in 1952] is largely similar [to that during the earlier World War II boom]. Once again an industry-wide shortage of skilled tool and die labor exists. However, currently the captive shops are the successful claimants for the labor supply in some areas, while job shops are experiencing pressing labor shortages. Some pirating also exists among job shops but the major problem is the **strong movement of labor to captive shops.**
>
> There are several reasons for this reversal. Wages in job shops are no longer better than those in captive shops; in many cases the opposite is true. ... Employment in job shops is furthermore less secure.
>
> Since captive shops are usually part of large manufactories, mainly automotive corporations, their workers received wage, cost of living, productivity, pension and other benefits which accrued to all automobile corporation workers. Most job shops did not increase their wages as much. Job-shop wages are now restricted by Regulations 5 and 6. However, some of the new plants can establish more favorable rates by virtue of Regulation 9. Many of the captive shops, moreover, h[illegible] nefitted from the "escalator" and "productivity" provisions of contracts wh[illegible] been approved even though they exceed the allowance permitted by Re[illegible] 6.
>
> ... to the degree there is a reversal, it is due to gradual changes, stemming from improved wage, cost of living, annual improvement and fringe benefits in the captive shops, rather than to any sudden post-Korean developments.

This pattern should have held up the flow of business out of Chicago's organized contract tooling job shops except for the fact that contract job shops in this city--along with those in Detroit and Providence--bucked this "historic reversal" of wage rates and still paid more than the captive shops. Pulling from sampled Bureau of Labor Statistics on hourly earnings for tool-and-die workers in 36 cities, the IAM working paper (IAM/T&D, 1952: 11) states:

> The superiority in job shop wages extant immediately after World War II for the bulk of the industry... had narrowed markedly by 1949. ... Reference to Appendix II[13] indicates that in those cities for which job shop and production shop rates are available, the differential had actually gone against job shops in Cleveland, Hartford, Indianapolis and Newark. The differential in favor of job shops had narrowed to 5c/hr or less by 1949 in Boston, Buffalo, Syracuse, Milwaukee and New York. In Detroit, Chicago, and Providence the differential remained markedly in favor of job shops. This is in marked contrast to the situation in 1945, when the job shop differential had been strong in all cities.

Chicago's job shops, such as those in the trade association, faced significant pressure by the union, Local #113, to maintain higher returns to their craft workers rather than capitulate in favor of the captive shops as toolmakers had done in other cities. These job shops also, however, experienced loss of business both to the captive toolrooms (e.g., Ford Motor built a new 1,000-employee captive toolroom in suburban south Chicago in 1953 to service its auto body stamping plant there) and job shops in lower cost regions of the country (Arnett and Smith, 1975; TMA Board minutes, 1950s).

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[13] Both Appendix I and II from this report are copied as Appendix 5-2 to this dissertation.

Strike Action By Local #113 Starts the Break-Up

Pressure by the Machinists Local #113 exhibited itself in increasingly more frequent strikes against those job shops in the trade association that were unionized. The union wanted to maintain the wage differential in favor of the job shops; the employers were now under great pressure by their large customers to hold wages down. These unionized job shops, often the largest among the group, set the pattern of wages, benefits, and working conditions for other shops in the Chicago region and the wider Midwest. With the advent of frequent strike action, the relationship between the union and trade association--which had been severely tested in the Depression and the upswing in organizing activity in the 1940s--now definitely soured.

For instance, Local #113 called strikes, or readied itself for strike action, against the trade association shops in 1950, 1953, 1954, and 1955 (IAM/Harig, 1941-54; TMA Board Minutes, 1950s). This increasingly aggressive posture not only produced higher wages for the craft workers, but at the same time it began to anger the job shop owners. After the initial strike in 1950, the association, which had been participating with the union on a federally organized apprenticeship training committee, decided to opt out of this program and provide training on its own (TMA Board minutes, 1952).

Facing another strike by Local #113 in 1953, Karl Harig, president of Harig Manufacturing Co., past-president of the trade association, and de facto leader of the association shops expressed his dismay to A.J. Hayes, the IAM's international president in Washington (IAM/Harig, 4/20/53):

While we have met on several occasions you may not remember me. I have been a member of your Union which I joined in 1912. If my memory serves me correctly my card number was 277602.

I was also a charter member of Local 113 and the first President of the Machinist's Society and had been an active member until 1928. Today I am the President of Harig Manufacturing Corporation, the largest tool jobbing shop in Chicago which is also a union shop, and has been one for many years with the best labor relationship anywhere.

Two years ago we had a four week strike for no good reason. This was the greatest disappointment in my life. We are now facing the same situation over again. This has called for joint negotiations of about twenty-two jobbing shops, who for many years have set a pattern for Chicago. The Union has refused to meet the conciliator as requested by the twenty-two companies.

Realizing the seriousness of this situation, I have personally met Mr. B.F. Hanley, [Business] Agent of Local 113 in his office at the Machinist' Building and pleaded with him to meet with the cociliator [sic] and have promised that we would make a fair offer in the wage increase, but he refused and demands individual negotiation with all the companies.

Willing and foolishly he has created a situation the same as two years ago, when he sent a letter to all its members in our plant with the instructions - NO CONTRACT, NO WORK - You and I know it does not require any special talent to call a strike.

I have followed your career in the Machinists' Union for many years and have admired your business like approach and do hope you will give this matter your immediate attention. May 1st is the deadline.

Writing to Hayes again, subsequent to the initiation of the strike Harig further states

(IAM/Harig, 5/15/53):

I received your letter which was in answer to mine of April 20.

Since you advised me to contact Mr. Siemiller, I tried on two occasions without the courtesy of a return call. The result - a two-week strike and no end in sight, and it appears to me that the fine relationship that existed between the Chicago employer and the International Association of Machinists will be jeopardized beyond repair.

A number of employers with approximately 350 employees have signed for the unreasonable demands of 30c, under duress.

Besides the 27 companies on strike many more contracts are running out by June 1 and July 1 by companies who are not in a position to afford paying the 30c demanded by Mr. Hanley.

In my many years of affiliation with the I.A. of M. and in my dealings with the union as an employer, I found that either an ambitious labor leader or a ruthless employer had made mistakes and someone else had to step in and correct the damage inflicted. I believe the Chicago situation demands that kind of action. Yet - I believe if you could come here yourself we could end the strike. I assure you my fullest cooperation.

For his part, Siemiller, general vice president under Hayes and head of the Machinists' regional office in Chicago, felt caught between the job shops' use of not-altogether-trustworthy tactics and the unreasonable militance of Local #113. Explaining the situation in some detail to the Machinists President Hayes, Siemiller writes (IAM/Harig, 6/16/53a):

This will acknowledge receipt of your letters dated April 24, 1953 and May 18, 1953, regarding the above-named subject matter, in which you request that I call Mr. Karl Harig and have a discussion with him.

Al, it would have been most disastrous, I felt, if I had followed through with your request. Old man Karl Harig is a nice old gentleman, a former member of Lodge 113 and in the days when he was a member was an active participant in the affairs of that Lodge. I have met Mr. Harig personally several times and during the strike of Lodge 113 against the job shops represented by the Tool and Die Institute two years ago Mr. Harig came to this office and discussed the situation with us, later going out in negotiations and making some remarks and unfortunate commitments that aroused our membership against both Grand Lodge Representative Bjurman and the undersigned, which destroyed some effectiveness that we might have had.

In the instant case, during the recent strike, he attempted to go down the same path again. I have always felt that one should not be bitten by the same dog twice and this time we deliberately stayed away from Mr. Harig. The strike in his plant has now been settled and our members are back to work. The fact of the matter is, if Karl

Harig had not been obstinate there would not have been a strike among the Tool and Die Institute Shops [i.e., the metalworking trade association], as they look to old man Harig as sort of a leader and usually follow his lead. He was very adamant that there should not be more than 15c per hour increase granted. The strike wound up in his plant by him agreeing to a 32c per hour across-the-board increase to the toolmakers, to be put into effect during the year 1953.

Lodge 113, particularly its Business Representatives being led by Berwyn Hanley, are becoming rather difficult. They are a group of youngsters who feel that they have the answers for all the problems and can cure all the ills of the world, and while they do not take that kind of position when I am around, it is always being reported back that they are constantly ridiculing Grand Lodge and this office. Some day in the not too distant future there is going to have to be a showdown and change in the course of the thinking of the representatives of this Lodge. At the present time, it is about the most troublesome spot in Chicago.[14]

Chicago's Metalworking Trade Association Responds

Thus, in 1953, the unionized job shops capitulated to Local #113's demands for higher wages but vowed internally never to deal with this situation again. Presenting the union situation to the board of the trade association, Harig, as reported in the board minutes of the association (1954), suggested that the union shops:

> ... are now confronted with the problem of how to create a strong militant group to confront successfully the management of 113... unless drastic steps were taken, the

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[14] Hayes answered Siemiller by having another IAM vice president, Roy Brown, reply in a subsequent note. As part of this letter, Brown suggests (IAM/Harig, 6/16/53b):

> Your comments about this situation has been noted, and I agree with your reasoning under the circumstances that influenced your decision not to visit Mr. Harig.
>
> As soon as the situation has died down to a point that no harm could come from a contact with Mr. Harig, I suggest that you drop in on him unostentatiously for an old fashioned 'bull-session'. It will probably pull the barbs out of the old boy's hide and get him back in a healthy, cantankerous humor again.

> situation was getting completely out of hand and ...Chicago would be ruined as a tool and die center if these annual high increases were to continue without interruption...

Furthermore, both he and George Rockwood, the association's secretary, recommended that the association deal with the union issue more directly, even though only about 30 of its 326 member firms in 1954 had ties to the Machinists Union, because the "open shops were vitally concerned with the wage pattern set by the union shops" (TMA Board minutes, 1954). The board agreed that the "labor problem" [was] to be [its] #1 priority" (TMA Board minutes, 1954). Accordingly, it hired legal advice to craft a group negotiating stance for the union shops and discussed employing peer pressure and disciplinary action against any shop that broke ranks and agreed with the union's terms individually.

This wage pressure and the new competition from the captive shops stimulated a break down in the trade association's interfirm solidarity, as well. Although unionized job shops capitulated to union demands for higher wages in the strike atmosphere of 1954, a Board member stated that "it was not felt that many of [the association's] open shops had followed the lead with increases given by the union shops in the early summer"--in other words, they had broken the wage "pattern" that the unionized job shops traditionally had set (TMA Board minutes, 1954). Furthermore, the association's new attorney for labor matters chastised the group regarding their ineffectiveness in standing up to the union: "if the union shops had stayed together in meeting union demands [he stated], their bargaining would've been better and if they had greater cooperation from the unorganized group" (TMA Board minutes, 1954). In addition, throughout the entire tool-and-die industry locally, instances of increasingly cutthroat behavior mounted. As Secretary Rockwood of the association reported--there is the "matter of price cutting and low bidding in the tool-and-die industry... one of our members complained bitterly over the phone that if it did not stop he would be forced to go out of business in several months" (TMA Board minutes, 1954). All Board members present agreed that low bidding was "widespread not only in Chicago... but all over the country" but at the same time the lower wage rates outside of Chicago were" quite a factor in underbidding Chicago tool and die shops" (TMA Board minutes, 1954).

Accordingly, the association capitulated to these cutthroat tendencies and the new competition from the captive shops--that represented a group of toolrooms that was not "inside" Chicago's trade association and that had not agreed to its collaborative rules, especially in regard to cutthroat behavior. The association worked to achieve a more united stand against the next strike wave and also informed their large customers of their resolve to lower their wages and costs. The association's Labor Relations Committee, as Herb Harig (Karl Harig's brother) reported, met with two representatives of each of several key captive shops to outline its "current program" (TMA Board minutes, 1955). These captive shops included: Automatic Electric Co., Croname Inc., Hotpoint, International Harvester, Stewart-Warner Corp., Sunbeam, Webster of Chicago, and Zenith Radio Corporation. As the Board minutes (1955) describe the purpose of this meeting:

> Herb said he believed [our Labor Relations] program was made clear to these representatives, all of whom expressed approval of it. They said they would keep us advised as to their own individual negotiations and be happy to exchange pertinent information. Herb pointed out that he thought the meeting did much to convince these captive shops that we are in earnest as to what we want to do and are going about it right.

However, this program did not deflect another strike in 1955. When this strike was over, Herb Harig suggested that the "only chance of [the association] establishing a master contract with 113 is to work through higher ups in the union" (TMA Board minutes, 1955).

Local #113's business agent, Berwyn Hanley, on the other hand, became even more committed to breaking up the trade association's hold on the job shops--a stance in direct contrast to that of his CFL predecessors who helped in the trade association's founding. Writing the Machinists Washington headquarters in early 1954, he states (IAM/113, 1/25/54): "The remnants of the Tool and Die Institute [i.e., the trade association] have contacted my office in an effort to negotiate a semi-association contract. They have introduced as their spokesman one, Jim Moore[15]... [Mr. Moore] is obviously free lancing, and sees a lucrative potential in the tool shops who have never been adequately represented by the Tool & Die Institute." Hanley again moved to organize a strike against the trade association for later in 1954 when their contract ran out to push harder for higher wages for the union's skilled tool-and-diemakers (see IAM/Harig, 6/2/54). Although Hanley and Local #113's other leaders may have been impossibly unreasonable to deal with--both from the perspective of the Grand Lodge of the IAM and Chicago's tooling job shop owners--their reputation among skilled

[15] Moore--responded the IAM's research director, Carl Huhndorff, to Hanley's request for information--was reported to have "the reputation of dealing very fairly with Labor Unions and [was] retained by the Folding Paper Box Association as a Labor Consultant [previously]. In this capacity, he assists members in the solution of labor problems, answering questions on NLRB wage and hour and other related matters... He has an industrial relations consulting firm in Chicago..." (IAM/113, 2/4/54).

workers, angered at the declining status of their craft, was much lauded.[16] Nevertheless, the union's stridency eventually resulted in a hardening of the trade association's stance against dealing collaboratively with the union again. And, confronted with a worsening shortage of skilled labor, pirating by captive shops, and continuing pressure to reduce costs and wages by their larger customers, the trade association's shops turned to immigrant German labor much as they had historically. They investigated importing German "expellees" as early as 1951, after World War II was over and Germans were finding the revitalization of their economy slow-going. The federal government assisted "in getting some of this skilled help into this country," as one Board member stated, as long as the manufacturer guaranteed employment, arranged for housing, and covered travel expenses (TMA Board minutes, 1951). At this early date, however, the association still contacted the Machinists Union for their cooperation on bringing in German immigrants. Yet, a few years later, the German connection surfaced

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[16] As a group of toolroom employees at the Goss Printing Company, who were petitioning the IAM's President Hayes to switch their representation from the IAM's District #8 to Local #113, argued (IAM/113, 1/26/54):

> We, the undersigned constitute the entire toolroom work force of the Goss Printing Press Company at Chicago, Illinois. We are all members of Die and Toolmakers Lodge 113 and have received all the benefits of membership in Lodge 113 except that which we consider the most important - representation by the Lodge in the form of an agent with authority to negotiate an agreement that will **reflect the standards established by Lodge 113** [emphasis added]. District 8 is the bargaining agent for all the employees at Goss except for the recognized trades... We are now on strike... [We] of the toolroom, have more pickets out than the rest of the membership at Goss which numbers in excess of 800 men. This despite the fact that we know no effort of value will be made to get for us the pattern of a 27c increase for toolmakers that Lodge 113 has effected for our other shops in the area. In the past five years we have watched our relative position to other toolmakers in the Chicago area deteriorate to the extent of almost thirty cents per hour. As long as we are unable to demand and get the pattern established by Lodge 113, we appeal to you to prevent a worsening of our relative position.

again. This time, one of the association's Board members reported to a meeting that a German representative of a group of tooling shop owners in Berlin had contacted the association because these shops were interested in obtaining business from America. The German shop owners, through their representative, stated they felt it was better to contact tooling shops in Chicago directly to obtain subcontracts from them rather than to contact the customers of the Chicago shops and take their business away. These German tooling shops were "attractive because of cheaper wage rates in Berlin... [with] an hourly rate 50% of the Chicago shops" (TMA Board minutes, 1954).

Local #113's Berwyn Hanley got wind of this proposal, in notifying his superiors within the IAM, brought the State and Commerce Departments in to investigate this matter. As he writes the IAM's P.L. Siemiller and Carl Huhndorff (IAM/T&D, 2/12/54):

> We have come across an interesting setup in the tool and die field in Chicago. We would appreciate any information that you may have concerning the above company.
>
> We have reason to believe that this name [Nation Bilt Products Co.] is a front for a combine of 115 die shops in Germany. The proposition being made to our employers is that these die shops will do the same job that is being done by our die shops for 50% of the amount being charged locally. The work is transported by air freight. ...They are going so far as to offer transportation paid to investigate the setup in Germany for any interested parties...

There is no clear indication of how many Chicago job shops acted on either of these "German solutions"--either importing immigrants or subcontracting work out to Germany. But clearly, pressure on Chicago's wage rates and the shortage of skilled labor presented significant problems for Chicago's contract tooling shops to deal with in this period. And, once and for all, the "German connection" between Chicago's tooling shop owners and their often of German-heritage workers[17] was broken in favor of a German connection with the home country where wage rates were more favorable.

Conclusion

As we have seen in the material presented both here and in the previous chapter, collaboration between actors in Chicago's metalworking industry broke down significantly by the mid-1950s. Serious rifts had developed between workers and shop owners, and between contract shops themselves, that could no longer be resolved cooperatively. Because of this, these actors could not act in concert to stabilize the industry, much as they had done in previous decades. Cutthroat behavior had become rampant in the early postwar period, and as shop owners bid each other's prices down furiously, they could not afford to pay the high wages to their skilled workers as previously. Thus, cutthroat bidding and the sweating of skilled workers could now be expected to result in a downward spiral for this small-firm-oriented supplier industry. Decreased profits would mean a cessation in firm investment and decreased wages would lead to a diminution of skill and product quality. A low road of marginalization of these small metalworking shops was occurring. A pattern of industrial

[17] A list of American workers who were employed at the Goss Printing Press Company and who were members of Local #113 include such German-sounding names as: Bernard Lohbauer, Aubrey Schilling, Paul Braun, and Jerry Strombock (IAM/113, 1/26/54). Another list of Local #113 representatives to the NTDC provides a similar conclusion that many, if not all, of the workers in this industry in Chicago were still ethnic Germans even in the 1950s.

dualism, with smaller shops at the high risk, bottom-of-the-pile was occurring in Chicago as it was throughout much of American manufacturing in this postwar period.

I have tried to show in these last two chapters how internal stresses to maintaining a collaborative venture certainly weakened the manufacturing alliance that the Machinists Union and contract tooling job shop owners had set up in 1925. Yet, these tensions were exacerbated by the actions of others outside Chicago's collaborative metalworking enclave who objected to the gains this enclave had achieved for itself over the intervening decades. Lower-skilled production workers--annoyed at the historic wage gap between themselves and craft workers and the frequent reluctance of the latter to help in the organizing drives of the unskilled--finally developed their own style of organizing through the CIO and began to increase the relative returns to the lower-skilled mass production worker. The large multinational customer firms of Chicago's small tooling job shops also resisted the gains made by this enclave and the craft model in general. Mass producers, as customers of metal tooling, started to expand their captive, or in-house toolrooms, to not only lessen their dependence on the skill of the outside contract shop but also to try to obtain this metal tooling more cheaply. Mass producers also objected to the high wages paid to the tooling job shops' craft workers.

Through pressure on both sides--a competing labor movement (i.e., the CIO) and an alternative set of suppliers of tooling (i.e., the captive shops)--Chicago's precision metalworking job shops capitulated. They resisted their workers' demands for higher wages in order to preserve what business they could from their much larger customers. Yet, by shaving their prices and wages to suit these customer firms, Chicago's job shop owners gave up their ability to stabilize conditions in their industry collectively. I continue with a history of this industry in the postwar era to determine whether this downward spiral continued on toward the marginalization of these suppliers--as the industrial dualism literature suggests--or whether another solution presented itself to these shop owners.

CHAPTER 6--THE "INDEPENDENT CHICAGOANS" ESTABLISH A NEW BARGAIN WITH THE CAPTIVE SHOPS

Introduction

Up to now, we have seen how Chicago's small precision metalworking suppliers joined together, with the help of the Machinists Union, to stabilize market forces and the conditions of the metalworking industry. These actors consciously constructed a governance structure for themselves that emphasized interfirm collaboration, the sharing of information and resources, and maintenance of craft skill and quality workmanship for this industry. To achieve these goals, it was equally important for these shop owners to avoid cutthroat behavior, severe price cutting, and the sweating of labor. This stabilization was sought through a series of mutual support activities, peer pressure, and peer discipline, and effectively resulted in both high returns for and high quality in this industry. The "high road" also benefitted from the organizing tactics of the Machinists Union which brought firms in outlying suburban areas into the pattern of higher wages for craft labor.

But this collaborative network was not maintained. The "shelter" of rules that the shop owners and their workers constructed to achieve the high road was not strong enough to resist the pressures that "outsiders" put upon it. Both the CIO and the captive shop tried to break down the success of this craft network. Production workers through their new CIO industrial unions wanted wage gains like the skilled job shop workers. They employed aggressive tactics against large manufacturers to reach this goal. The manufacturers, on the other hand, objected to the metalworking industry's guild network for other reasons. They resisted the high prices of Chicago's job shops and wanted to increase their control over the toolmaking process. Expansion of their captive shops helped them achieve these ends. Thus, the CIO and large manufacturers struck a new bargain that resulted in the eventual marginalization of the contract shops and their collaborative network.

From the history of this network so far, must we conclude, therefore, that collaborative small firm networks are too fragile to survive over the long run? Will they always be undermined by larger, more powerful actors in an economic complex (e.g., the multinational manufacturers)? Are small firms doomed to play a marginal role in a local economy except in anomalous regions of the world? To answer these questions definitively, I follow Chicago's contract precision metalworking shops further through time--into the 1960s. A surprising result occurred. These small firms that capitulated to their large customers' demands in the 1950s and gave into cutthroat bidding, reorganized themselves into a new alliance and set of partnerships to resist these unstable conditions by the 1960s. They recreated a collaborative network to counter the new challenges of the postwar environment by employing a series of organizing strategies that eventually increased their power in the complex and share of returns. This new network turned on a new set of expectations and rules. It involved a new set of partners--the captive shops--while jettisoning the old (i.e., the Machinists Union). In this chapter, I look at the organizing strategies and ground rules supporting Chicago's new collaborative metalworking network. To build this profile of the 1960s and 1970s, I pull again from TMA documents, industry reports, other historical and published accounts, and census data. First, however, let me reacquaint you with this region's metal-related complex in the postwar period.

I. A STATISTICAL PROFILE OF MANUFACTURING IN THE CHICAGO REGION IN THE EARLY POSTWAR PERIOD

Before discussing the rebirth of Chicago's precision metalworking trade association in the post-World War II and Korean War period, let us take a look at the manufacturing complex of the Chicago region in this era. How large had manufacturing grown by the late 1950s and what sectors dominated this complex? How large had the new tool-and-diemaking industry become after the boom years of the two wars and to what extent had the captive shop phenomenon overrun this industry? What place could we expect this small association of precision metalworking firms to play in this postwar boom era? To answer these questions, I will again present some statistics for manufacturing within the state of Illinois, as a proxy for the Chicago region. I will adjust these figures for the Chicago metropolitan area as applicable.[1]

According to the 1958 Census of Manufactures, manufacturing in Illinois had grown to approximately 1.1 million jobs in that year--which was a recession year--up from about 828,000 jobs in 1929. As could be expected, the major growth in manufacturing occurred during the war years with the defense build-up (manufacturing had hit a peak of almost 1.2 million jobs in 1947 and had declined slightly since then (see Table 6-1). The Chicago metropolitan area showed a similar pattern (high growth in manufacturing during the war and

[1] I again focus on Illinois statistics because it allows me to make comparisons between the manufacturing complex in this state versus other states in the country. The wider Chicago metropolitan area, as defined in the 1958 Census of Manufactures included Lake and Porter Counties in northeastern Indiana as well as several counties in Illinois (Cook, Du Page, Kane, Lake, McHenry, and Will).

a levelling off since then, especially during the recession year of 1958). The metropolitan region offered over 900,000 manufacturing jobs to its residents in 1958.[2]

The defense build-up of the 1940s and early 1950s only strengthened the dominance of metal-related sectors to this region's manufacturing profile. The machinery, primary and fabricated metals, and transportation equipment industries were among the largest industries in 1958. Together they comprised just over one-half of all the manufacturing activity, both in terms of employment and value-added, in Illinois (see Graph 6-1 and 6-2). Non-electrical machinery and electrical machinery producers topped the list, providing over 164,000 and 162,000 jobs, respectively (see Table 6-2). Fabricated metal manufacturers offered almost 128,000 jobs, primary metal producers (e.g., steel plants) provided almost 90,000 jobs, and auto and other transportation equipment manufacturers provided almost 45,000 jobs. Other historically significant industries--for example, meatpacking and other food processors, printing and publishing houses, and apparel--also retained a strong presence in the postwar economy. But that metal and metal-related activities represent a major comparative advantage of this region versus other parts of the country stands out clearly by looking at the location quotients for these industries, both for employment and value-added. Of the eight

[2] Although the wider Chicago metropolitan region provided about 912,000 manufacturing jobs in 1958, only about 814,000 jobs were located within the state of Illinois. More than 98,000 of the total number of manufacturing jobs in the metropolitan region were located in northeastern Indiana--just over the Chicago line. As such, the Chicago metropolitan region (i.e., only that portion belonging to Illinois) comprised approximately 73% of all manufacturing jobs in the state in this year.

manufacturing sectors with employment location quotients over one, four (or half) belong to metal-related industries (see Table 6-3).[3]

By disaggregating these metal-related industries further, we can begin to discern the role that tooling and precision metalworking firms--that is, those firms that founded Chicago's metalworking trade association--played within this complex (see Graph 6-3 and Table 6-4). In terms of employment size alone, the region's machine tool and machine shop industries (which included tooling and precision metalworking firms such as those belonging to Chicago's trade association) were the fourth and twenty-fifth largest metal-related sectors, respectively, in 1958. (The machine tool and tool-and-die sectors are classified under "metalworking machinery," or SIC 354; this industry offered about 27,000 jobs in 1958. Machine shops are classified under SIC 359; this industry provided about 8,600 jobs in 1958.)[4]

Only manufacturers of communications equipment (SIC 366), construction machinery (SIC 353), and iron and steel products from blast furnaces (SIC 331) offered more jobs than metalworking machinery (SIC 354) in this period (about 53,000, 45,000, and 38,000 jobs,

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[3] Typically, one constructs a location quotient by comparing one ratio--of an industry's employment to employment in the region at large--to the same ratio for the country. Thus, one compares the share of an industry's employment in that region to its share in the country. Should this share be greater in the region than the country, the location quotient will register as larger than "1". I have computed location quotients for Illinois industries using **all manufacturing employment**, instead of **total employment**, as the base in both the regional and national share. However, the outcome should be approximately the same.

[4] Figures for SIC 359 were not reported in 1958 for Illinois, although unofficially estimated employment was in the industry segment of the census. This industrial category was being significantly redefined in this period and the Illinois statistics were especially problematic.

respectively). The makers of tractors and farm machinery (SIC 352) offered slightly fewer jobs in 1958, at 26,700. Other significant metal-related sectors are shown in Graph 6-3. Thus, in this list of the twenty-five largest metal-related industries in Illinois, we have represented the various stages of the durable goods manufacturing chain--from the backend of raw metal (e.g., blast furnaces and other steel producers) to the intermediate products of metal parts (e.g., tooling, stampings, and screw machine products such as bolts) that are subsequently assembled into final durable goods for sale in the marketplace (e.g., construction machinery, telephones, autos, tractors, and household appliances).

As before, these top metal-related sectors diverge as to their average firm size and the labor process they adopt inside the plant (see Table 6-4). In this way, the average Illinois steel producer in the late 1950s employed 627 workers whereas the average machine tool plant employed 34. (Tool-and-die shops (SIC 3544), as a subset of the machine tool and metalworking machinery industry (SIC 354), were even smaller at 13 workers on average per plant.) The average Illinois auto and auto parts plant employed 133 workers in contrast to the average metal stamping shop, which employed 50. Likewise, the average farm and tractor assembly facility, and construction machinery plant, employed 226 and 267 workers, respectively. This compares with the average screw machine shop at 50 workers and the average machine shop at 42 workers. Thus, the picture that emerges in the 1950s is similar to that for the period between the world wars with the small firms comprising the region's machine tool, machine shop, and other metalworking supplier industries playing a dominant role alongside other large-firm-oriented metal-related sectors, located both at the backend (e.g., steel) and frontend (e.g., farm machinery) of the region's production complex.

Yet, as I indicated in the previous section, the small firms comprising these contract metalworking supplier industries were in danger of becoming eclipsed by the "captive," or in-house parts facilities, within large integrated manufacturing corporations. How prevalent were captive shops for making the complex and skill-intensive tools and dies, as compared to the independently-owned shops in the contract tooling industry? To what extent were captive toolrooms becoming the wave of the future for obtaining the average manufacturer's tooling needs rather than those small "outside" contract shops that made up Chicago's metalworking trade association? Unfortunately, there exists little historical data for answering these questions. Census records did not distinguish (nor do they today) between independently-owned versus subsidiary operations within an industry. Furthermore, if the captive toolroom is located within the same physical plant along with an auto assembly facility, for example, all of the jobs therein--both skilled toolroom and lower-skilled assembly work--are classified as belonging to the primary product of that particular establishment (i.e., with SIC 371 for motor vehicles). In spite of these data problems, however, we can estimate the relative size of the captive and contract shop sectors using special sources. For instance, the Census of Manufactures did publish a separate metalworking report[5] from 1947 to 1963 to try to

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[5] The census in several years produced a special report--"Selected Metalworking and Related Operations"--to provide a measurement of metalworking capacities inside integrated manufacturing facilities. These reports surveyed manufacturing plants in industries SIC 33 to SIC 38 (and including ordnance) as to whether they also included the following metalworking and related manufacturing capabilities: forging; electroplating; galvanizing and other hot-dip coating; heat treating or annealing of metals; automatic screw machine operations; machine shop; tool and die shop; pattern shop for foundry patterns; plate or structural fabrication; metal stamping, blanking, or forming; painting, lacquering, and enameling; plastics molding; product assembly; and shipping. These reports were produced for the census years, from 1947 to 1963.

uncover the amount of metalworking "supplier" functions (i.e., those intermediate in the production chain) that large manufacturing corporations were subsuming in the name of vertical integration. I will not attempt to track the prevalence of the captive-shop phenomenon in all "intermediate" metalworking activities (e.g., screw machine products, stamping, plating) here but will instead focus on the tool-and-die function as an example.

The tool-and-die industry (SIC 3544 and 3545)--that is, those establishments where tooling was the primary product made--provided almost 125,000 jobs nationally in 1958 of which almost 98,000 jobs were in production (the rest were in management and overhead-related jobs). Almost 6600 tool-and-die plants operated in this year. (These statistics come from the standard industry reports of the census.) However, after surveying other related industries (SIC 33-38) in its special metalworking report as to the existence of captive toolrooms--that is, those shops manufacturing tooling as a secondary operation of the establishment--the census found that over 7200 toolrooms existed in the United States. These provided more than 161,000 total production jobs in toolmaking. Thus, for the country at large, at least 63,000 toolmaking production jobs (i.e., the difference between 161,000 and 98,000 production jobs noted in the two separate reports--or 40% of the total industry existed in captive shops outside of the tool-and-die industry--and this share may have been even greater as we see below.[6] Where exactly were these captive shops and how large were they compared with the traditional contract shop that produced exclusively tooling?

I have provided an industry breakdown of all too and diemaking jobs drawing from the 1958 Census of Manufactures special metalworking report (see Table 6-3). As would be expected, the bulk of toolmaking jobs occurs in non-electrical machinery (SIC 35) of which the tool-and-die industry is a subset (SIC 3544 and 3545). Almost 59,000 tooling jobs were offered by machinery makers of various kinds. Close behind this in terms of the incidence of toolmaking jobs, however, is the transportation equipment sector (SIC 37) at about 50,000 tooling production jobs. Transportation includes autos and aircraft manufacturers which are significant producers of tooling as we will see below. Finally, firms in fabricated metals also produce a significant amount of their own tooling--these firms provided about 27,000 tooling production jobs in 1958.

Of these broadly defined industries, the following sectors were the top producers of tooling in 1958, as noted by the number of tooling jobs they offered in their in-house, or captive, toolrooms: auto producers (SIC 371) at about 26,000 toolmaking jobs, aircraft manufacturers (SIC 372) at over 22,000 jobs, metal stampers (SIC 346) at over 8600 jobs,

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[6] The census here can be very unclear in its reporting. It does not actually distinguish whether a toolroom is captive (i.e., the subsidiary of a larger corporation) or not as it reports industry statistics. For instance, if a toolroom is a subsidiary of a larger firm but is housed at a separate address, it would be reported along with the contract shops under the tool and die industry (SIC 3544 and 3545) in the regular industry report of the census. Furthermore, although the special metalworking report more directly disaggregates contract from captive facilities (i.e., according to whether a function such as toolmaking is occurring as a secondary operation in other industries), this report is a survey that lacks full coverage especially of smaller business units. It supposedly represents about 90% of existing firms in the country, yet since it is biased in favor of reporting the activities of large firms, it may seriously underreport small shops in the contract tool and die industry.

structural metal fabricators (SIC 344) at about 7300 jobs, and machine shops (SIC 359) at almost 4900 tooling jobs (see Table 6-6 for other industries producing tooling). This compares with the contract tool-and-die industry itself (SIC 3544 and 23545) which offered over 29,000 toolmaking jobs according to this special report of the census--on par in terms of total employment provided with the captive shops of the auto and aircraft industries. Thus, from this picture of the tool-and-die industry in the special metalworking report, only 18% of all toolmaking jobs were provided in the contract shops of the tool-and-die industry (SIC 3544 and 3545). The actual ratio of captive versus contract shops in toolmaking, therefore, lies somewhere between the 40:60 % and 80:18 % that these two data pictures offer.[7]

Yet, these captive shops varied greatly as to size and labor process for these industries. Toolrooms in the contract machine shops and stamping plants were small, 14 and 13 production workers on average respectively, like the primary shop they complemented. Furthermore, the contract tool-and-die firm would as likely have its own captive machine shop or stamping facility as vice versa. The census classification for these shops (e.g., whether tooling and stamping) depended as much on the owner's view of himself as it did the

[7] The 29,297 jobs that the census metalworking survey indicated as belonging to the toolrooms of the tool and die industry (SIC 3544 and 3545) in 1958 compares with the total of 98,220 production jobs offered by the tool and die industry nationally, as reported in the regular census. This 68,923 job discrepancy could occur for several reasons: (1) as a survey, the special metalworking report undercounts all firms (and the jobs they provide) across the board, but especially small firms like those in the tool and die industry, (2) the regular census, with its full coverage of firms, reports all production jobs--not only toolmaking jobs--found in the tool and die industry, including those in the "captive" shops of tool and die firms (e.g., in other secondary functions for them, such as metal stamping, machine shop work, screw machine operations, and so forth), and (3) establi .hments reported as belong to the tool and die industry in the regular census could be subsidiaries of larger corporations in other industries but maintain a separate address as a toolroom.

breakdown of products made within these versatile and highly skilled contract metalworking supplier firms. Toolrooms in auto, aircraft, appliances, and other durable goods manufacturing plants, however, were often huge by comparison (having, on average, 74, 31, and 71 production workers respectively). Thus, the captive toolroom phenomenon was significant in size by the late 1950s--and growing, if the Chicago trade association's board minutes are an accurate indication. Let us look at events of that time period, to see what the trade association did about this trend--and threat to the livelihood of the contract tooling industry.

II. THE 1960s--RECREATING A NEW METALWORKING ENCLAVE WITH CAPTIVE SHOP PARTICIPATION

Although Chicago's contract tooling shops faced a formidable challenge with the expansion of the captive toolrooms, they were able to meet this challenge head on. As we saw in the last chapter, initially the contract shops capitulated to the demands of their larger customer firms--which had developed the captive toolrooms, in part, to replace them. The contract metalworking shop owners reduced their prices and the wages of their skilled workers to attempt to attract back the business they had lost to the expanding captive shops. In the short run, this strategy may have helped some of the small firms; in the long run, it could prove disastrous as cutthroat bidding would reduce returns and the ability of the contract shops to invest in their future. These shop owners required a long-run strategy that would allow them to rebuild their industry. The key to this strategy lay in their possession of skills and use of this expertise to strengthen the bargaining power of the contract shops vis a vis their large customers.

What we see is that the large manufacturers also faced problems in regard to their strategy of the captive shop. The customer/manufacturers experienced a dilemma of how to obtain a supply of skilled, yet cheap, craft labor. If they "bought" skills in the open market (i.e., "pirated" skilled workers from the small shops which had trained them), the manufacturers would again be bidding wages (and the cost of tooling) up. Manufacturers could train such workers in-house, but most lacked sufficient expertise as their toolroom staff had, up to now, concentrated only in machinery maintenance rather than building machinery and tooling. Without access to sufficient skilled labor, the quality of the captive toolrooms' products would also drop. The contract tool-and-die industry, however, possessed such expertise. Thus, the conditions for a new bargain and the establishment of a new metalworking network with a new set of partners were evident. Furthermore, this situation offered an opportunity for the trade association, qua interfirm network, to regain its leading position within the complex at large and to again rebuild the quality of this industry over the long run.

How did the association recreate its collaborative network in this period? How did it simultaneously increase the power of the contract shops vis a vis their new competitors--the captive toolrooms--and their parent multinational corporations? It entered into a new skills-based bargain with the captive shops that had two components: (1) the trade association's training program and (2) the activities of its Technical Committee. Through these activities, the trade association re-asserted its leadership in the region in terms of metalworking skills and expertise. Furthermore, it assured that the manufacturers' captive shops would grow increasingly dependent on the independent suppliers for this expertise and their production problem-solving skills. Hence, the relative power of the captive shops would diminish. In return, the association and its small-shop members would agree to hold prices and wages in line (i.e., to "accommodate") for a time. Through these measures, the small metalworking suppliers could maintain a degree of interfirm collaboration, while avoiding cutthroat pricing of a more absolute sort. The suppliers could also strengthen their bargaining position vis a vis their much larger customer firms. How did the association's new skills-based bargain unfold?

Seeking Power by Gaining Control over Craftworker Training in the Region

Faced with both heightened competition from the captive shops and their need to access skilled labor, Chicago's metalworking trade association devised a new strategy to hold its interfirm network intact. It would establish its leadership in the area of craftworker training and trade this expertise to the captives for their continued use of and support of the contract metalworking shops. In this way, the trade association negotiated with its customer/captives to continue employing the shops in the contract industry; it also began to again increase the dependence of the customer/captives on the skills and knowledge of the contract shops. How did the trade association bring this new skills-based bargain about?

In the Chicago region, the trade association had been providing craft training to the workers in the industry since the 1920s (with a hiatus during the depths of the Depression and the World War II years). The small shops had individually trained their workers earlier than that and, as a group, represented the greatest repository of precision metalworking expertise in the region.[8] Starting out providing seminars on how to accurately estimate costs in bidding for jobs (i.e., how to accurately make dies and calculate the appropriate amount of labor time that would be required), the association expanded such seminars into formal evening classes in the mid-1930s, which were held in and partially-subsidized by the City's public school system. Having established a working relationship with the federal apprenticeship agency in the early 1940s, the association was the logical party to work with this federal agency in setting up an areawide apprenticeship program for the tool-and-die industry in Chicago in 1958. Since Chicago was chosen as a "test site to develop a program of promotion... [of the federal agency's apprenticeship training efforts so that they could] develop bigger and better training programs nationally", the Chicago metalworking association--rather than the national tool, die, and precision metalworking association--took the lead in developing a training curriculum for the industry nationally in the late 1950s (TMA Board Minutes, August, 1958).

The association continued to work closely with the City's Board of Education in significantly expanding its training program in the postwar period (e.g., by identifying potential apprentices from the technical high schools, negotiating for renovated classroom space and equipment, and obtaining a City subsidy for teachers' salaries)(TMA Board Minutes, 1950s). The Korean War also gave the association's training activities a boost--apprentices in the skilled trades received exemptions from the draft (Rockwood, n.d.).

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[8] The contract shops routinely took on the production of metal parts and special machinery that were too complex for the mass producers' in-house toolrooms in earlier decades. Therefore, these small suppliers knew the most about metalworking production problem-solving in the region. See White and Sinclair (1945) for a description of the early labor process and market niches of these contract shops.

Because of this, the association's training program grew "to amazing proportions"--in the words of its early director, George Rockwood. The association's training program increased, for instance, from two classes in 1952 to seven or eight in 1953 during this early Korean War period, "and", continued Rockwood, "in the twenty years following became one of the [association's]... largest activities in size and importance" (Rockwood, n.d.: 7; TMA Board Minutes, August, 1953, 1950s). Enrollment increased from 35 apprentices in 1946 to over 300 in 1953--and subsequently to over 1,000 by the mid-1960s (Rockwood, n.d.; TMA Board Minutes, August, 1953, 1950s; TMA Stats, 1994). Furthermore, as Rockwood reminds us, "[a]ll of this was being offered the membership at no additional charge, regardless of how many apprentices a member might have enrolled" (Rockwood, n.d.: 14).

Also in this period, the Chicago association surveyed other tool-and-diemaking training programs in the region--both privately provided and those offered by the City's Board of Education--so that it could establish one of the most "well-rounded program[s] of apprentice training" (TMA Board Minutes, April, 1951). With an eye to its competition in the training field, the trade association did just that. The association expanded its tool-and-die training program from one to four years--it took four years to fully train the highest skilled occupation, a tool-and-diemaker--and extended the curriculum to include formal theory, math, drawing, and other phases of apprenticeship instruction including advanced tool-and-die design work. Some in the association, such as Karl Harig, even wanted "apprentices... [to be] made to go to school in order to wind up as better mechanics"--in other words, the association would mandate its training program for all of its member shops' workers (firms did their own less formal or on-the-job training as well) (TMA Board Minutes, August, 1951).

Although mandatory training never came to pass, the association continually urged its members to train their personnel, while improving its classroom offerings (TMA Board Minutes, 1950s).[9]

The trade association worked to control the training that was being done in the industry in this postwar period. Not only did the association improve its program to become one of the best in terms of quality in the region--the association drew on the personnel in its member shops for the most knowledgeable instructors in the industry--but it also shunned the training efforts of others in order to maintain control over metalworking training locally. For instance, initially, the federal Bureau of Apprenticeship Training (BAT) agency wanted both union (i.e., IAM) and industry (i.e., the metalworking trade association) involvement in setting up its metalworking apprenticeship program. As things soured between the association and the union in the mid-1950s, the association's Board members expressed great reluctance to work jointly with the union on an areawide training committee. When the union jointly sponsored a metalworking training program in the City's technical high school, Washburne, utilizing federal training funds that became available in the mid-1960s,[10] again the association avoided sanctioning this program or getting involved. When Illinois Congressman Pucinski touted the union's role in establishing in this new metalworking training program,

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[9] Some of the impetus in urging member shops to train, of course, was to help alleviate a growing shortage of skilled labor in the late 1950s; another motivation was to improve the quality of work coming out of member shops.

[10] The Manpower Demonstration and Training Act of 1962 for the first time offered federal funds to subsidize the expense of training apprentices, sparking a "training explosion" by the mid-1960s in the U.S. (see the American Machinist, June 6, 1966, the entire volume of which describes this explosion).

this spurred the trade association toward greater efforts to publicize their own already existing program (TMA Board Minutes, 1950s-60s).

In a similar fashion, Chicago's trade association attempted to minimize the national metalworking trade association's training efforts and/or keep the national association out of the Chicago region and Chicago affairs. As already mentioned, Chicago's metalworking association started systematically training craftworkers in the 1930s. The national association did not enter the training sphere until the federal MDTA (the Manpower Demonstration and Training Act) legislation came along in the 1960s. At that point, the national metalworking association's program eclipsed the Chicago association's in terms of national prominence (TMA Board Minutes, 1960s). Yet, these "independent Chicagoans... [who] 'were the fustest [sic] with the mostest'" in the training arena, according to the American Machinist (6/6/66: 131), were proud that their training program was "practically as big number-wise" as the national's (in the words of one Chicago association Board member) in the mid-1960s and that the association had been able to offer all this training without federal government support (TMA Board Minutes, August, 1965; AM, 6/6/66).[11]

In fact, a committee was formed to compare the training curricula of the Chicago and national metalworking associations at this same time. Much discussion took place between the two groups as to whose program and texts be followed for training efforts in the industry across the country. This comparison brought an admission by the national association "that

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[11] Yet, the American Machinist estimates that the Chicago association was only training about 8% of the country's apprentices in the mid-1960s (6/6/66). However, firms from other regions often raided Chicago to entice skilled workers that the association, in part, trained to move and work for them (Rockwood, n.d.; TMA 50th Anniversary, 1975; TMA Board Minutes, 1950s-70s).

[the Chicago metalworking trade association] was tremendously advanced and has an outstanding [apprenticeship training] program and inasmuch as the National does not have a complete program that the committee dispense with the analysis of their [the national's] curriculum until such time as they have a complete program" (TMA Board Minutes, May, 1965). Yet, the national association wanted the Chicago association to use the national's texts in its training program. The Chicago group resisted. Instead, the national asked to use the Chicago group's diemaking curriculum in the national's training program--the Chicago association agreed as long as they could assure they would get credit for it (TMA Board Minutes, 1960s).

Clearly, control over skilled metalworking training in Chicago and even more widely was an issue to the Chicago association. It wanted to be the site of metalworking expertise to attract the captives' cooperation and business[12] while also maintaining the region's competitive advantage. This rivalry also occurred, in part, because of the national association's and Chicago association's ongoing conflict over who would organize the tool-and-die industry in Chicago. The Chicago group aggressively maintained its independence from the national in the postwar period and effectively prohibited the national from recruiting member shops in the Chicago area to its association from 1957 up to very recently. The Chicago association decided not to affiliate with the national for much of this period, fearing they would be "gobbled up", "diluted", or made to merge with the national if they decided to cooperate with them (TMA Board Minutes, May, 1965, 1950s-60s).

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[12] Captive toolrooms could outsource their work to the contract shops depending on management decisions.

Finally, when Chicago's metalworking trade association decided that college credit would lend status to its training efforts and help attract a higher quality of student to the metalworking occupations, the association worked with community colleges to offer this new training package. However, again the Chicago association ensured its control of the reconfigured program--its Board members worried whether "we can maintain the clout to administer" the new training program (TMA Board Minutes, November, 1972). The community college assured the association that it could retain this administrative role. Thus, while a few large manufacturers (e.g., Western Electric and International Harvester) took the lead in training skilled metalworkers earlier (prior to the 1950s), Chicago's metalworking trade association assumed this role in the postwar period.[13] The trade association--not the union nor other local actors (e.g., large manufacturing firms, the vocational school district, community colleges, and other private training schools)--controlled much of the metalworking training in the region and access to it in this early postwar period.[14] I believe, in all these

[13] The trade association initially used training texts from Western Electric and International Harvester in its classes; soon it wrote its own. The association's dominance in the training field was also helped along by Western Electric's downsizing of its captive toolroom in the early 1960s--before other captive shops did the same in the 1970s and 1980s--and early reliance on suppliers for their tooling (TMA Board Minutes, 1950s-60s; Interview: Braker).

[14] With the entrance of many other actors into apprenticeship training in the late 1960s and 1970s due, in part, to the greater availability of federal funding for such training, the association changed its tactics to maintain this control. Now it partners with community colleges to jointly offer training, it has coordinated apprenticeship training conferences statewide, and it has developed a multi-million-dollar Education Foundation to fund experimental programs in apprenticeship training. Through a new set of tactics, the association still retains leadership in metalworking skill training and expertise into the 1990s (TMA Board Minutes, 1960s-91).

efforts at maintaining control, the association wanted to solely represent the repository of up-to-date craft skills in the region at large. By assuming this leadership, the captive shops would have to come to the association (i.e., the contract supplier shops) to access this skill for their own shops. Similarly, the captives would still rely on the contract shops for problem-solving in conjunction with more hard-to-produce parts. Thus, the captive shops would not be able to replace the contract industry nor its high skill/high quality philosophy by duplicating it in-house because they could not catch up with the contract industry's development of a sophisticated skill-base for the industry.

Training as a Mechanism to Entice the Cooperation of the Captive Shop

Given its prominent position in training, the trade association decided to make a deal with the customer firms which were expanding their captive shops in the 1950s and 1960s. The trade association would open its training facilities for use by the captives, if the latter would join the association. Not only would the small firms collectively gain income from the captives (either as dues or, later, payment for the training services), but they would also have the opportunity once the captives were inside their membership to instill in them the collaborative ethics of their interfirm network. These ethics would remind the captive members of the association that if they wanted to achieve high precision in toolmaking, it made good sense not to completely exploit the workers on whom one depended to produce this quality. Similarly, the association's ethics would teach its captive members that if they wanted to support a skilled workforce and up-to-date machinery to achieve such quality, it also made good sense not to bid each other's prices down ruthlessly so that no one could invest in the long-term future of the industry.

Although the dues of the captives were not insignificant (they eventually helped make the association quite wealthy and to subsidize services to other more marginal producers in the industry), I believe they were incidental to this initial bargain between the suppliers and the captive shops.[15] The trade association could have sold its training services openly like any school and received the income without inviting the captives into their organization as members, much as the national association did in its training efforts later on. (This would have given the association extra income and ensured that the captives trained their own and did not "pirate" the valuable skilled workers of the small contract shops.) But, it was important that the captives also learn to live up to the association's interfirm agreements--to share information openly, to curtail competitive bidding and standardize costs,[16] and to share the workload (e.g., through subcontracts) in order to prevent overcapacity in the region--even if the bargain with labor had to be curtailed.

The association initiated this new skills-based bargain with the captive toolrooms in the late 1950s after the federal apprenticeship agency (the Bureau of Apprenticeship Training

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15 Later, these dues received from the captive toolrooms took on their own importance, overshadowing earlier reasons for inviting captive members in the association.

16 This turned out to be critical. A main point of argument between the national and Detroit metalworking associations and the auto companies' toolrooms was how costs (and, hence, prices) were calculated. In a set of Congressional hearings that the national and Detroit associations called, these associations testified that the auto company toolrooms did not include overhead charges into their calculation of costs so were in effect "dumping" their tooling in the market at unrealistically low rates. This made it difficult for the contract shops to compete with such low prices (U.S. Congress, 1970).

or BAT) selected it to push skills training in this--and, by extension, other--regions. At BAT's request, the metalworking trade association contacted 1,000 Chicago-area firms "to urge them to train more apprentices or take an interest in apprenticeship training" (TMA Board Minutes, December, 1958). At a membership of only about 470 firms at that time, this organizing activity helped the association to acquaint the larger manufacturing base in Chicago with itself and its newly strengthened role in skills training. The trade association also started its efforts to recruit certain key captive shops' direct participation in its training efforts and other affairs of the organization at this time. This participation by the captives in the association's activities deepened throughout the 1960s (TMA Board Minutes, 1950s-60s).

In 1957, for instance, the association recruited a representative from Bell & Howell to sit on its first apprentice contest committee and get involved in evaluating and selecting the "best" trainee in the region. Subsequently, Bell & Howell joined the association as a member in 1961 (through its captive toolroom) and its CEO, Charles Percy, gave the keynote address at the association's annual meeting in 1964 (at the time, Percy was also running for governor of Illinois, giving this connection added cache)(TMA Board Minutes, 1950s-60s). A similar pattern occurred with other influential captive toolrooms. In 1965, Motorola joined so that its toolroom supervisor could get advice on starting a training program in nine of the company's facilities. Robert Galvin, Motorola's CEO, later spoke on several occasions such as at the association's apprentice graduation ceremonies and other functions (TMA Board Minutes, 1960s-70s).

Through these activities in the early and mid-1960s, the association started to become flooded with new captive members which wanted to access its training program. Firms such as Honeywell, Ecko Housewares, Borg-Warner, Continental Can, and Schwinn Bicycle joined as well as the captive shops of smaller, less prominent manufacturers. Apprenticeship training enrollment continued to grow in this decade as well. By 1964, the association hired a training director and began talking about establishing its own school. Not only did the association's training activities lend it greater recognition within the region, but this program helped it gain prominence at a wider level. For instance, other tooling centers in the country began contacting the association for copies of its curriculum after the association's training program was highlighted at the national tool, die, and precision metalworking association's conference in 1963 (TMA Board Minutes, 1960s). Additionally, the association's training activities began to act as the glue which would bind these new partners, the contract and captive shops, together into a common future--as a German ethnic heritage had bound the owners of the small shops and their workers together into an alliance in earlier decades.

In the 1960s, then, we see that the association invited the captives to become members, while also controlling access to metalworking training in the region to entice them to join. Labor, significantly, was now left out of this new metalworking network bargain. The association planned to lower wages somewhat with a tough stance against the union and through stepped up activities to increase the supply of such labor through training. The association no longer would cooperate as fully with skilled labor as it had in the past. Neither, however, did the association expect to squeeze labor perhaps as hard as the manufacturers wanted them to; this, they still thought, would induce poor quality. How effective was this new bargain for both the contract shops and their new captive members? Were the contract shops able to maintain the interfirm collaboration embodied in its earlier craft bargain? What happened when the smaller metalworking suppliers had to face the growing obsolescence of their craft labor process? Let us follow Chicago's tool, die, and precision metalworking industry later into the 1960s.

The Captive Shops Test Their New Relationship with the Metalworking Supplier Industry

As soon as the trade association mounted its successful strategy to attract captive shops as members and network partners in a new skills-based bargain, this bargain came under attack. The challenge to the skills-based bargain originated from technological quarters. With the application of computers to metalworking machinery and the advent of numerical control (NC), the knowledge of skilled craftworkers could be built into the computer's programming. Because of this, some observers predicted that NC would significantly lessen the demand for such craftworkers, while also causing the traditional small job shop to become obsolete. Not only would the large manufacturers' captive shops not need to draw on the Chicago metalworking association for training, but they could be expected to pull more and more of the work into their now "high-tech" shops rather than rely on the small contract shops for metalworking expertise. Both the association and its small-firm constituency were threatened by this development. As we will see, however, the association successfully turned this situation around and regained its role as the repository of metalworking knowledge through its Technical Committee and other activities.

How did this threat actually come about? Throughout the late 1950s and 1960s, skilled metalworking craftworkers were in high demand. Both the postwar boom in manufacturing and the decline in the wage premium paid to skilled workers contributed to this short supply. One strategy for keeping skilled wages low and meeting the demand for the services of skilled workers was to increase their supply--i.e., through apprenticeship training programs such as the Chicago trade association's new postwar strategy. However, another strategy was to mechanize the work of the skilled worker as much as possible. Firms could do this by employing the new technology, numerical control (NC). As some predicted, "[w]ith numerically controlled machine tools, the machining skills are supplied by the machine itself and by the control tapes; therefore, many of the skilled machinists now operating conventional metal-cutting machine tools will eventually be replaced by much less highly skilled machine operators" (IIT/Corplan, 1964: 48). The demand for skilled workers would be further decreased because of NC's greater overall productivity--therefore, fewer skilled machinists could produce the same level of output as before using conventional machinery. I have drawn these predictions from a report of the Chicago-based Research Institute at the Illinois Institute of Technology (IIT), but this view was also more widely held by other industry experts (see, for example, AM, 1/18/65).

Not only would NC obviate the need for skilled metalworkers, the IIT report held, it could also be expected to cause the "demise of the traditional small job shop" (IIT/Corplan, 1964: 45). Since NC cost two to three times as much as conventional metalworking machinery, and since the typical small machine or tool-and-die shop experienced declining profits in the early postwar period compared with the earlier wartime era (1940-53), few such shops would be able to modernize and invest in the latest computerized metalworking machinery, the report argued. The IIT also contended that "the introduction of numerical control requires such dramatic changes in management and operating practices and procedures that many of these small companies will be unable to cope" (IIT/Corplan, 1964: 45). Instead, the traditional job shop--often operated by former skilled craftworkers who "rely heavily upon their own background, experience, and personal contacts" in running their businesses--will be replaced by a "new breed" of high-tech precision metalworking companies that will be "owned and operated by people... [with] a high degree of technical training and education" who can maintain tight management control of the costly and highly sophisticated new technologies which they will adopt readily (IIT/Corplan, 1964: 45).

These findings corroborate an earlier report by the national precision metalworking trade association which foretold problems for tool-and-die shop owners maintaining their profitability in the face of increasingly competitive conditions, given that most owners were skilled at the precision metalworking craft but not at management and finances. This report also predicted a decline in the demand for tools and dies, in part, because of this new technology. (NC reduced the amount of tooling needed for machining operations because of its use of universal tooling thus making the product--i.e., custom-built tooling--obsolete along with the craft labor process that small outside shops used to produce it.)[17] If small tool-and-die firms did not acquire additional management expertise and/or specialize in certain market niches of toolmaking and other precision metalworking, this report continued, they would not

[17] The national association also did not expect the toolmaking industry to keep pace with the growth of manufacturing or the national economy in the 1960s for other reasons: (l) an increase in imported products containing "hidden tooling" produced by foreign tool and die shops and (2) the increasing standardization of interchangeable parts in products in the auto and appliance industries--due to a return to a mass production philosophy--which would result in decreased demand for tooling overall (AM, 11//13/61b).

survive (AM, 11/13/61b). Not only will the skill of the machinist be replaced by this new technology, but similarly the problem-solving expertise of the metalworking shop owner will also be rendered obsolete. Armed with NC, the captive shops could seriously weaken the bargaining position of the Chicago trade association and its small-firm constituency in the new skills-based bargain they had made.

Were Chicago's large manufacturers and their captive toolrooms investing heavily in NC to decrease their dependency on the skilled machinist and the association's training expertise as the IIT predicted? While it is difficult to answer such a question definitively, some statistics prove suggestive. In 1963, for instance, the American Machinist surveyed manufacturers throughout the country as to their utilization of NC and other new metalworking technologies. The findings of this survey showed that manufacturers in the Chicago area were adopting NC at a faster rate than anywhere else in the United States (AM, 7/22/63b). (Detroit's auto industry, however, did not respond to this survey for confidentiality reasons; however, observers knew the Big Three automakers were experimenting heavily with NC in diemaking so that this region might also have shown a comparable growth rate regarding NC adoption as did Chicago; AM, 2/4/63; 12/20/65; U.S. Congress, 1970). Furthermore, the American Machinist survey also showed that large firms were more likely to invest in NC initially, and they were increasing this lead (compared with smaller firms) over time (7/22/63b).

Interestingly, the Chicago Association of Commerce and Industry (CACI)--an influential group of larger manufacturers in the region, sponsored a conference on the impact of technological changes on apprenticeship programs in the tool-and-die industry. (CACI and the City of Chicago--along with the foundations of many large firms[18]--also provided funding for the IIT study that saw NC in the captive toolrooms as replacing the small craft-based precision metalworking shop.) Chicago's metalworking trade association--supposedly the spokesperson for the tooling industry--was not initially invited to the CACI meeting and had to wangle an invitation to it through some individual association members who were invited (TMA Board Minutes, February, 1965). The point here is that the association was caught unaware in regard to these technological developments such as NC and to how the large manufacturers planned to use them (i.e., replacing the skill of the contract shop). The metalworking trade association had not anticipated how the NC challenge would weaken its skills-based bargain and negotiations with the captive toolrooms. Instead, the region's large customer firm--still uncomfortable with their dependence on the skills of the contract shops--and their business association, the CACI, pushed for the investigation of NC application to solve their tooling needs.

The Association's Technical Committee and the Fight Against Supplier Obsolescence

How did the Chicago association react to this challenge posed by the new technology and its larger customer/manufacturers' adoption of it? On one hand, the NC challenge made the association "dig in its heels" deeper in order to stand by its high-skilled and craft-oriented production philosophy. The association continued to invest heavily--both in time and resources--in training high-skilled craftworkers. On the other hand, however, this challenge

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[18] These included the Inland Steel-Ryerson Foundation, Ford Foundation, People's Gas Light and Coke Co., Commonwealth Edison Co., and Harris Trust and Savings Bank (Lynn, 1963).

forced the association to reassess its hold on metalworking expertise in the region. In many ways, the association became all shook up in dealing with this challenge and started a host of new technologically-related network activities. Through these changes, the association reasserted its claim and that of its member firms as metalworking problem-solvers for other manufacturers in the region while accepting a redefinition of the traditional metalworking craft to include use of these new technologies.

More specifically, when one of the association's Board members was interviewed as to the impact of NC on the current skilled labor shortage, he replied that "NC would only be an aid in the alleviation of the tool and die and mold employee shortage but would certainly not do the trick by itself" (TMA Board Minutes, February, 1965). The association felt there would still be a great need for skilled craftworkers in the industry--even alongside the use of NC. To support this stance, the association continued to invest heavily in its training activities in the late 1960s. The training budget grew substantially--from 15% of the association's total budget in 1965 to 23.5% in 1969. Annual enrollment also grew--from 500 in 1964 (the year that IIT released its report predicting the replacement of skilled machinists by NC) to around 1500 by the end of that decade (TMA Board Minutes, 1960s). Enrollment increased, in part, because of the Vietnam war and the draft deferral that trainees received (much as the association's training activities initially took off during the Korean War). Threat of the draft attracted potential apprentices even though the wage premium to craft workers had not been restored. However, enrollment also increased because of the expansion efforts of the association in the training arena. By the end of the 1960s, the association offered apprenticeship training programs at four public school sites and at one community college (up from two public school sites in the early 1960s). Member firms on the far south and west sides of the Chicago metropolitan area could now easily access training for their workers in addition to the near northside and city-located companies that had received it earlier (Rockwood, n.d.; TMA Board Minutes, 1960s).

In addition, the association planned ways to improve the quality of its training programming. It hired a training director and assistant director to keep better tabs on the program. It discussed founding its own training school which could employ full-time instructors. It revamped the mold and diemaking curriculums in this period to include instruction in new technologies; talked about offering additional advanced subjects in a fifth-year curriculum; and created a theory curriculum for lessor-trained metalworking machinists (broadening the range of occupations in the industry that could utilize training). It co-sponsored the newly-formed Illinois Apprenticeship Conference in 1970 to bring all management, labor, and government actors involved in apprenticeship training in the state together. Lastly, the association discussed mechanisms for upgrading the status of the skilled metalworker from a trade to that of a profession--such as by offering college credit for apprenticeship classes in conjunction with the area's community colleges. The association's craft training program reached such high quality at the end of this decade that the Machinists Union--which co-sponsored another training program at a different public school site--highly praised the association's program. Captive toolrooms and precision metalworking shops continued to join the association at a high rate through the end of this decade to access the association's training programs (TMA Board Minutes, 1960s). This fact along with the high NC adoption rate in the Chicago region indicate that the trade association may have succeeded in promoting its high-skill philosophy in spite of NC. Instead of employing the new technology to "deskill" the labor process in captive shops, Chicago's manufacturers may have been learning to "upskill" with NC. This tension of deskilling with the new technologies, however, has resurrected itself in the most recent period, as we will see in the following chapter.

However, instead of merely confronting the NC challenge by standing firmly behind its craft-training philosophy, the trade association also underwent much soul-searching and self-examination because of this challenge which resulted in several new and important initiatives. These included establishing a Technical Committee and subsequent public relations efforts to upgrade and promote the technological sophistication and expertise of small firms in the tool, die, and precision metalworking industry. Although the association had held technically-oriented luncheon seminars earlier, the NC challenge and reports predicting the demise of the small tool-and-die shop (such as those by IIT and the national trade association) stimulated much activity in this area. The association's board members urged its small shop members not to "panic [in the face of this challenge] and feel the situation is useless, but [to] plan, look around and take advantage of training programs and services such as those of" the association (TMA Board Minutes, September, 1966). These services included those of its Technical Committee,[19] created in 1965 and soon pursuing an extremely ambitious program. This committee chose as its theme--the "Pursuit of Knowledge as it Applies to Our Industry" (TMA Board Minutes, May 1966). One of the first activities

[19] The full title of this committee was the Technical and Business Resource Information Committee; I have shortened this to the Technical Committee.

the committee sponsored was the creation of a "business skit" to report on and answer the national's and IIT's reports. Looking at the themes of "Modernization, Numerical Control and the Future of the Industry," this skit was presented at a dinner meeting of the full membership; it quite successfully rallied the membership to action in confronting the NC challenge rather than having this membership succumb to despair.

The association's Technical Committee engaged in a variety of other activities and services for the association's membership. It planned a series of annually-held technical conferences. Called the "Technical Travelogue," these conferences pulled together hundreds[20] of member firms in discussions of new technologies and production methods. The third travelogue, for instance, covered such topics as: NC machining, grinding and stampings, electrical discharge machining (EDM) electrodes and materials, the use of EDM in die and mold shops, die and mold design, inspection methods, short run machining, and so forth (see TMA Board Minutes, April, 1969). The association published the proceedings of these conferences. The committee also developed and held a "Business Travelogue," or seminar for shop owners on management and finance issues that was also highly successful (TMA Board Minutes, 1960s).

In addition to its seminars, the association's Technical Committee developed a long-term relationship with the IIT Research Institute (IITRI) and other consultants who had authored the initial NC report. IITRI's interest was to promote the use of NC more widely throughout industry in the Chicago region. IITRI partnered with Chicago's metalworking trade association in order to disseminate information about this technology among the smaller

[20] Attendance reached 500, for example, in 1968 (TMA Board Minutes, 1968).

tooling and precision metalworking shops. To this end, the two organizations undertook a study comparing the performance of machining parts on conventional versus NC machinery, they hosted tours of IITRI facilities and seminars on NC at the IIT campus, and they developed other training programs on NC and other new technologies for metalworking shop owners. IITRI also developed a training program on NC for all manufacturing industries in the Chicago region and, "since the [metalworking trade association] was the most instrumental force in getting them [i.e., IITRI] to disseminate information on NC," a staff person of IITRI stated, IITRI wanted the association "to share in the promotional efforts of this [wider regional] program" (TMA Board Minutes, September, 1966). Thus, through its partnership with IITRI, the Chicago trade association began to take a lead role in the region, in general, in disseminating information about the new metalworking technologies. It was regaining its position as the repository of metalworking expertise in the region. This joint IITRI/trade association training effort received both state and federal support. The association also pursued working relationships with other area universities (e.g., Purdue, the University of Illinois, the University of Wisconsin, Northern Illinois University) to channel their technical and management expertise to the association's member companies (TMA Board Minutes, 1960s).

Other projects the Technical Committee discussed and/or implemented included establishing a technical resource library at the association, setting up field trips to technical centers such as the National Aeronautics and Space Agency and Argonne Laboratories or to key leading customer firms such as Motorola, conducting membership surveys of NC usage, organizing an information exchange mission to precision metalworking centers in Europe, and publishing a technical journal.[21] The committee also entertained a joint project with Hughes Aircraft Corp.[22] to set up an NC machine tool control center (for programming) with a time sharing plan for use by the association's membership. (Access to mainframe computer time was the critical issue obstructing NC use by smaller manufacturing firms in this time period.) Although the association decided to backburner this project due to concerns about liability and cost (the project would cost the association almost $300,000 for its initial planning stages alone--an amount three times its annual budget in 1969), that it engaged in initial discussions with Hughes indicates how quickly the Technical Committee learned to keep up with the cutting edge of technological developments in this period (TMA Board Minutes, 1960s).

Key to this committee's success was the energy of the metalworking shop owners that chaired and pushed for the committee's various projects. Their vision set the course of the association in this period as well as its ability to confront the NC/technological challenge, and other issues that could bring about the obsolescence of the contract metalworking industry. For instance, the Technical Committee wanted to conduct a special study on how metalworking shops had been changing in this time period--that is, the committee wanted to confront head on "the disappearance of the per se tool and die shop" that recent reports predicted, rather than shrink from this reality (TMA Board Minutes, March, 1967). After discussions of this project idea, the association's board reformulated this project into something much larger. It set up a Long Range Goals Committee to undertake the

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[21] The European mission and technical journal were never carried out, in part, because of the upcoming recessions in the early 1970s.

[22] Hughes was a major developer of the new NC systems at this time.

association's first long range plan for Chicago's metalworking industry and to study a whole range of trends expected to affect shops in the tool, die, and precision metalworking industry. The head of the Technical Committee, Paul Prikos, moved over to chair this new effort. He brought in outside experts (e.g., a banker, an economist, a trade journal publisher, and representatives from other related trade association like the machine builders) to advise the work of this committee. The association charged this committee to investigate "every facet of the [precision metalworking] industry" to include such topics as: markets, educational needs, a comparison of costs in captive versus independent tooling job shops, "the trend toward specialization" in the industry, "manpower needs", the lack of government contracts, "the role of the [association] in helping the industry", and the industry's future potential (TMA Board Minutes, February, 1969). Published in the early 1970s, this study brought to light difficult issues for shop owners to deal with and stimulated an ongoing long range planning effort that the association has continued up through the present day (TMA Board Minutes, 1960s). In the mid-1970s the association started a regularly-held "officers' brainstorming session" where current and past Board presidents and officers could discuss and set up an institutional capacity for dealing with key issues affecting the industry. The association also continued to develop long-range plans for itself and the industry on a frequent basis (e.g., in 1979, 1983/84, 1987)(TMA Board Minutes, 1970s-80s).

The Technical Committee's efforts in upgrading the expertise of Chicago's metalworking shops also stimulated the association to expand into a public relations campaign for the industry for the first time. Wanting to deal with customers' and others' perceptions that traditional job shops were lagging in technology, management, product quality, and metalworking expertise, the association decided to undertake a public relations program to emphasize the association's activities to the contrary and what the shop owners perceived as a "bum rap" against their industry. Kicking off these efforts, the association adopted a resolution of Board President Buhrke's in 1970 that urged both the association and its members to stop referring to themselves as "shops" from hence forth. I quote the entirety of this resolution because I believe it summarizes clearly what the association was trying to accomplish in the 1960s with its skills-based bargain, training program, Technical Committee, long-range planning efforts, and finally its public relations campaign. The association was re-asserting its eminent role as the repository of metalworking expertise in the region.

> WHEREAS, the [association] is comprised of highly trained personnel, highly sophisticated machinery and are problem solvers in metal fabrication, we suggest that members of this industry should be referred to as tool and die plants, firms, installations, facilities or other suitable designations given to industrial companies and corporations.
>
> WHEREAS, the common acceptance of the word "shop" connotes a retail or other non-industrial establishment, we propose that from this date forward the [association] initiate and promote a campaign to eliminate reference to the word "shop" in verbal and written communications regarding firms in this industry.
>
> WHEREAS, this industry is a vital contributor to America's Mass Production Capabilities and is a substantial segment of the country's economy, we would hope that more sophisticated terminology would be adopted in reportorial description of the many modern and unique firms that make it up.
>
> WHEREAS, this industry is a conglomerate of experienced skills supplying the demands of a variety of end-product manufacturers varying from basic metal products to sophisticated plastic missile components, we urge that the physical facilities of the industry be accorded their just respect.
>
> WE, The Board of Directors of the [association], do unanimously resolve to urge our members to begin this campaign in their own places of business, and in their own conversations in business and at home. We subscribe to the philosophy that "ideas

> have consequences" and it is our hope that this humble but directed effort will be another stone in the foundation for building the image of this industry to the position it deserves (TMA Board Minutes, March, 1970).

Subsequent public relations efforts hammered home a similar theme in order to reach metalworking suppliers, their customers, and potential apprentices. These efforts would start with "communications to [metalworking] employers [themselves] showing them that public relations to elevate the image of the industry must start with the plant owners. We must stop 'bum rapping' or 'bad mouthing' ourselves and accentuate the positive", one board member stated (TMA Board Minutes, June, 1970). The association entitled it's first public relations release: "You Should be Proud to be a Part of the Tool and Die Industry" (TMA Board Minutes, June, 1970). The association was clearly forging an aggressive path--with all of its efforts in the 1960s to uphold a, now more broadly interpreted, skills-based bargain, to rebuild the quality image of the region's metalworking industry, and to reassert its role in planning for and upgrading the industry.

Growth as a Consequence of the Supplier-Captive Shop Alliance and a Revision of the Network's Basis for Solidarity

When the skills-based bargain proved so successful initially, drawing scores of captive shops into the association's membership to access its training programs, the small shop owners who had founded the association grew nervous about this alliance. As early as 1959, for instance, the association's Board held a discussion of the desirability of admitting captive shops to the association.[23] In the words of Board representative Harig--who formed the organization earlier and possibly held a more traditional and confrontational view of supplier-customer relations: "if enough captive shops become members they might attempt sometime to take control of [the association]" (TMA Board Minutes, September, 1959). This issue was referred to a policy-making committee for further consideration--and it simmered underneath the supplier-captive shop relationship throughout the next decade. For example, later, in 1965, with "new members at an all time high", the association's board reopened this issue about control and the captive shops and discussed creating a special membership category for them which "may eliminate the voting rights of the captives since the association was established for the contract industry" (TMA Board Minutes, 1965). At the same time as the association worked through this issue, many of its smaller members were increasingly merging with larger corporations--in effect, they were becoming captive shops. Independent suppliers in the 1960s did this to gain access to financial capital.

These events stimulated the association to fine-tune its captive bargain and ensure that it would not be overpowered by its captive members and the large manufacturers of which they were a part. While allowing the captives' voting privileges to stand, the association's original founding members weakened the threat of a captive takeover by also pursuing a policy of growth-for-growth's sake in the 1960s. That is, at the same time that the association opened its doors to captive toolrooms, it also encouraged smaller firms from a broader range of supplier industries to join which had been previously outside the purview of

[23] Although the association decided to admit captive members as early as the late 1940s, by the late 1950s it was reconsidering this policy given the expansion of captive shops among most manufacturers in the region (TMA Board Minutes, 1940s-50s).

the trade association. Thus, spring manufacturers, mold companies (which made metal molds for rubber goods manufacturers), metal fabricators, metal services (eg: heat treaters, platers, welders), and others were targeted for membership recruitment activities--these small firms could now join if they employed at least one skilled tool-and-diemaker on their premises (TMA Board Minutes, 1950s-60s).

In this way, a small nucleus of tool-and-die shop owners in the region (the association consisted of 92 such suppliers at the end of World War II; Rockwood, n.d.) began to link a wide variety of metal-related industries together into a much more imposing regional network by using the common thread of tooling. Chicago's metalworking trade association added new members at a rate of ten percent or greater every year from 1959 to 1967 except one, growing from approximately 500 member firms at the end of the 1950s to almost 1,000 at the end of the 1960s. Although adding almost another 500 firms since 1969, the association has never again achieved an annual net growth rate as high as it did in the 1960s (TMA Stats, n.d.) (see Appendix 6-1).

Because this growth trend meant the association was diversifying away from its tool-and-die base, it required new bonds to tie its member firms together. Earlier the association's members achieved group solidarity by creating an ethical philosophy against "chiselling", competitive bidding, and cutthroat pricing. While this philosophy maintained that suppliers remain leery of their customers' intentions, it also urged the highly-skilled tool-and-diemaking suppliers to share production information and reward worker loyalty in order to ensure the high quality of the industry's products over the long run (TMA Code, n.d.). The founding firms accepted the help of the Machinists Union in order to come together and fight the "ruinous price competition" that customers hoped to stimulate in the tool-and-die industry (Rockwood, n.d.). The glue to the association's early bonds, then, was an ethical code which promoted a high-skill production philosophy; to carry out this philosophy, the industry had to enact a common stand against the region's large customer firms. That these tooling firms were able to enforce their ethical code was helped along due to the shared German/Scandinavian heritage of its owners. As I argued in an earlier chapter, although Chicago's German community was sizeable in the early 1900s, its exclusion from native institutions fostered greater cohesion among German firm owners, workers, and residents than might have been, had the group not been treated as an ethnic minority.

With the recruitment of the large customer firms' captive toolrooms--with workers and firm owners outside of the ethnic and craft-oriented enclave--into the association's membership in the postwar period, the nature of these interfirm bonds would have to change. The association's training and technological activities instead began to act as the glue which would bind these new partners--the contract and captive shops--together into a common future, much as a German ethnic heritage had bound the owners of the small shops and their workers together into an alliance in earlier decades. Through these new activities, the association and its new member firms were also redefining the meaning and identity of the precision metalworking craft community. For instance, from the mid-1950s on, training of skilled craftworkers was seen as each member firm's responsibility for building the quality of the tooling industry in the long run. Training also helped to keep wages down by expanding the supply of such labor. The "common enemy" of this period was the unions which firms thought were seeking to raise wages to unreasonable levels. Through the association, all members were to shoulder the training burden for the industry equally. Thus, although the association's training budget was increasing rapidly in the 1960s (to become almost 25% of all expenditures by the late 1960s) and only about one-third of all members trained their workers on a regular basis, the board repeatedly decided that all members would share the training cost equally (TMA Board Minutes, 1969). This meant that training firms could access training for their workers free of charge as long as they paid their membership dues like everyone else. This policy was brought up for debate repeatedly throughout the 1960s; and each time the decision stood. Each time the association's Board and members discussed the issue, they reaffirmed their communitarian bonds. Since trained workers benefitted the entire industry with quality workmanship and since such workers migrated frequently between shops, a majority of the board reasoned, all members should finance this training. Captive and contract shop alike would, in essence, train workers for eventual use by each other.

Significantly, the association's training activities began their ascent--and the captive shops' participation in them--at the same time that the association's ethnic bonds were weakening. In 1963, the association decided not to renew its membership in the Germania Club on the northside of Chicago due to its, now seen as objectionable, central city location. Almost since the association's founding in the 1920s, tool-and-die shop owners met to discuss issues and make deals with each other at the Germania Club. The association also changed its staff director in the early 1960s--pulling in someone from Chicago's Employers' Association, an organization of larger firms that, in the past, had taken anti-union positions (Cohen, 1990)--and encouraged a new young generation of shop owners to become involved in the association's affairs at this time as well. Many of the new shop owners of the period had just started in business after having been laid off from the large toolroom that Western Electric disbanded in the mid-1960s (Interview, Braker). These workers received their training as tool-and-diemakers while working in a captive shop. As a new breed of metalworking shop owner, they brought a new affinity to captive shops and large corporations versus the prior affinity that Karl Harig and other association leaders had with the Machinists Union. (As recounted in Chapter 5, Harig--as past president of the association--was a founder of both Local #113 of the Machinists Union and later of the metalworking trade association.) Therefore, the old ethnic glue was replaced by a new rationale for sparking group cohesion--a common interest in training and new technology to both hold wages down (by increasing the supply of skilled labor) and quality up, a united front against the union, plus a common understanding that the small suppliers and captive toolrooms must learn to work together in this new postwar period. In this regard, the trade association achieved success in its new bargaining strategy with the captive shops. Not only were the captives training--thus, they would not be pirating the costly-to-train craftworkers of the smaller contract shops--but they were also joining the association and could be drawn into its ongoing affairs and high-skilled production philosophy. How well did this new enclave agreement survive the recessions of the 1970s?

III. THE 1970s--THE EROSION OF THE SKILL-BASED BARGAIN IN THE FACE OF RECESSIONS AND IMPORT COMPETITION

In the 1970s, manufacturers suffered a prolonged recession (from 1968 to 1976), compared with the expansionary environment of the 1950s and 1960s. An influx of new foreign competitors in manufacturing accompanied the recession. While Chicago's large manufacturers recognized the high quality of these imports, they also worried about the imports' lower cost. Given the high cost of the new NC technology, a high inflation rate, the tight money policy of the Federal Reserve, and the still experimental nature of the new metalworking technology, American manufacturers delayed investment in their captive shops. Large manufacturers also focused on reducing costs, lengthening product cycles, and reducing their demand for tooling and precision metal parts. Thus, they retained work inside their captive shops and/or pressured the prices of the outside contract metalworking suppliers. The association's small-shop owners should have feared a resumption of ruinous price competition among each other in this period. What actually happened to the trade association and its collaborative model in the 1970s?

Changing Macro Events Produce a Cost-squeeze in the 1970s

Several macro-level events pushed Chicago's, and America's, large customer/manufacturers into developing a series of new cost-cutting strategies in the 1970s. These included the following: (1) repetitive recessions and the subsequent slow growth of the domestic economy, which was worsened by external shocks such as the oil crisis, (2) continuing and staggering rates of inflation and the tight money policies the Federal government developed to deal with it, and (3) a change in the global competitive environment in manufacturing. The 1970s was for the most part characterized by recession--with the slowdown starting in 1968 and full recovery not coming until 1976. Thus, for almost a decade (1968-1976), manufacturers in the United States experienced hard times. This compares with a predominantly expansionary environment for most of the previous two decades (AM, 1/15/75; AM, January, 1976a; AM, August, 1982). Because of the recessionary environment of the early 1970s, unemployment rose substantially and consumer demand changed from an interest in product quality to one which sought low cost. Furthermore, the recession was accompanied by double-digit inflation and a tight money policy of the Federal Reserve (AM, 1/15/75; AM, January, 1976a; a more complete discussion of these macro events also appears in Piore and Sabel, 1984).

One could also characterize the macroeconomic environment in this period by the influx of new foreign competitors in manufacturing that occurred. By the mid-1960s, as an industry observer reported, imports had already "made substantial inroads in important industries" (e.g., radio and television, automobiles, steel)--these are the metalworking customer industries which feature heavily in Chicago's metalworking complex (Hopper, 1970). Competition from imports only worsened in the 1970s. In the auto industry, for instance, the share of imports remained small until the late 1960s/early 1970s when both the proportion of imports to domestic sales and the number of foreign competitors increased substantially. Volkswagen, the largest importer in the 1960s, lost this position by 1970 although its sales grew continuously all this time. Other imports grew even faster. Datsun and Toyota made rapid growth in the U.S. import market from 1968-1972; Honda, Mazda, and Subaru followed soon after in 1970. Imports by the "Big Three"--mostly small economy cars--also appeared in this period (e.g., Ford's Capri made in West Germany; Chrysler's Colt and Cricket made in Japan) (Boyle, 1974; Womack, et.al., 1991).

While the influx of new competitors into manufacturing should have made American firms pursue a product strategy which emphasized increasing the range of products offered, other macro conditions pushed these firms in another direction--that of decreasing the variety of products while reducing their cost. As I argued earlier, American manufacturers were already planning on increasing their product offerings in the mid-1960s by going the "high tech/captive" route. This strategy would allow American manufacturers to compete with their new foreign competitors by bringing new products to market faster. Yet the initial high cost of and rapid changes in the new technology--as well as the difficulty of proving its effect on direct manufacturing savings--made companies overly cautious in following through on this strategy.

At a cost up to several times that of conventional metalworking machinery, NC production lines and toolrooms were a risky venture.[24] The cost of the new technology was not the only factor which made this "high tech" strategy risky for both the independent toolmaking shops and their captive equivalents alike. Early in its development, as the editor of the American Machinist reported, NC became engaged in a "major war... between the two types of control"--that is, between itself as a "hard-wired" computer control (requiring access to a mainframe computer and electronic tape preparation facility) and CNC (computer numerical control) which utilized a microprocessor computer control built into the machinery (AM, September, 1976). The 1976 International Machine Tool Show in Chicago was the showdown for comparing the relative commercial viability of the two systems. CNC,

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[24] Arnett and Smith (1975) cite the cost differential of NC as three-to-five times greater; the IIT/Corplan report (1964) as two to three times the cost of conventional machinery.

promoted by machine tool companies which were also new on the scene, offered users greater "simplicity, flexibility, and economy" which NC builders were trying hard to match (AM, September, 1976). Until this "war" was settled, firms were reluctant to invest in the new technology at all. That many company decisions in this period were increasingly controlled by fiscal managers with short-term goals in mind also did not foster rapid investment in NC technology. The new metalworking technology was particularly difficult to justify to non-manufacturing staff since its contribution was often in the area of indirect savings (e.g., inventory control) rather than on the specific cost of manufacturing production (see AM, September, 1976).

In addition, while manufacturers recognized the high quality of their new foreign competitors--a feature NC would help America's manufacturers to compete against--U.S. manufacturers also began to worry about the lower cost of these imports. Manufacturers already perceived the boom year of 1967 with some worry. They saw this year as one of "nervous prosperity"--due to the growth of imports, a fear of manufacturing overcapacity, and an increasing "cost squeeze" due to rising labor and material costs (AM, 1/1/68). By 1970, manufacturers focused on cost reduction programs--ways to beat both the "cost squeeze" and the competition from "high-quality"... <u>but</u> "lower-priced, imported products" (AM, 11/2/70:81).

Given a slowdown in sales because of the recession, manufacturers pulled work into existing captive shops and sought further integration of their corporate endeavors by expanding subsidiaries to serve in growing markets overseas. The auto industry, for instance, had started to produce vehicles abroad in the 1950s. Yet total foreign production (including in Canada) remained under 24% of total production by the Big Three auto producers (excluding AMC). By the early 1970s, however, this share had risen to a high of 36% (Boyle, 1974). In the early 1970s, automakers cited the fact that the European market was growing three times faster than sales in the U.S. (Kolbenschlag, 1970). They were, therefore, building or expanding plants both in England and on the Continent to better serve these markets. Further corporate integration and expansion of captive tooling and other parts facilities were part of this overseas strategy. "Hidden tooling"--both that of American manufacturers' subsidiaries and foreign tooling bought and used by foreign manufacturers--began to erode domestic tooling sales as early as the 1960s (AM, 11/13/61).

Although American manufacturers expanded their parts facilities offshore, capital investment in existing captive shops was delayed. Contrary to the mid-1960s, when large American manufacturers pinned their continued ability to compete on their heavy investment in the expensive and new NC technology, the 1970s was a period of capital disinvestment. In real terms--adjusting for inflation--machine tool consumption by American manufacturers dropped each year from 1968 to 1971; it then fluctuated for the rest of the decade. For most of the 1970s, then, "real" consumption of metalworking machinery and equipment did not come close to the investment level of 1967 (a peak investment year for the 1960s, as was 1952 and 1942 for earlier decades) (AM, February, 1978). Not only were manufacturers able to purchase fewer machines for more dollars, due to inflation, but the tight money policy of the Federal Reserve to control inflation during the period also exacerbated the efforts of those who wanted to finance machinery purchases. The American Machinist, whose periodic machine tool surveys have documented this disinvestment, also blamed the lack of capital investment in this period on several other factors: the "on again/off again" Federal position on the investment tax credit for machinery, the fact that corporate taxes increased and profits declined in this period, the low level of investment in the stock market--another source of investment funds--relative to other financial instruments, the weakening of markets for manufactured products because of the recession, and the increase in government regulations (especially by OSHA and the EPA) which diverted potential investment funds toward their compliance (AM, October, 1976; AM, April, 1978). The small independent tooling and precision metalworking shops found capital investment even more difficult to sustain in this period.

Without NC nor access to the more highly skilled labor of the independent metalworking shops, however, a competitive strategy of product proliferation requiring precision tooling was more difficult in manufacturing plants around the country. The cost-reduction focus of the 1970s, thus, led to the lengthening of product cycles and reduced demand for tool-and-diemaking for many large manufacturers. For example, Michigan's automakers lengthened the period of model styling changes in 1970 from once every three years to once every five or six. While Arnett and Smith (1975) argue that the lengthening of the body style change cycle was due to other factors,[25] they concede that the new dominance of centralized corporate purchasing departments over individual plant manufacturing personnel in make-or-buy decisions in this period also led to an overemphasis on cost rather than

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[25] They cite as reasons: 1) the need for auto companies to comply with the new Federal safety and emission regulations and (2) the shift toward smaller cars which produce smaller profit margins. In both cases fewer funds remain to purchase costly tooling required for frequent styling changes; hence, as a response, automakers lengthened product cycles.

"technical merit" of purchased versus captive tooling. The cost-reduction focus of the 1970s also led to the heightening of pressure on the prices of outside metalworking shops and the retention of work inside the captives to the extent that this was the lower-cost alternative (see Arnett and Smith, 1975, regarding Michigan's tool-and-diemaking industry).

The captive toolrooms in the leading precision metalworking centers of the country finally started to become a higher cost alternative in the 1970s.[26] Due to the effectiveness of industrial unions in the 1950s and 1960s, wage and benefit packages increased at a faster rate in the captive shops than they did among those in the contract metalworking industry. After 1970, labor costs in the independent shops began to be cheaper (see Arnett and Smith, 1975, for data about Detroit and Michigan). This development should have stimulated an increase in outsourcing by the large manufacturers. However, industrial unions fought this development; in 1973, the UAW, for example, won the right to strike over subcontracting when captive shops were not working to capacity (Arnett and Smith, 1975). Thus, large manufacturers were left with an increasingly costly captive strategy for the production of tooling and parts. Some large manufacturers started to close their now-seen-as-overly-costly domestic parts facilities and assembly plants and/or move them offshore. Manufacturers that stayed also began to look offshore for tooling and other parts from much lower-priced foreign

[26] As I recounted in Chapter 4, in the mid-1950s wages paid to skilled workers reversed their historic pattern in most regions of the country, except in the leading tooling centers of Detroit, Chicago, and Providence. Prior to that point, skilled workers in contract whops earned more than in the captive toolrooms. By the late 1950s, workers in captive shops made more, except in the leading tooling centers. Finally, by 1970--due to rising union benefits in the captive shops--this labor cost differential occurred in Detroit as well and, perhaps, even in Chicago. (I have found no data that explicitly compares wage rates in captive versus contract shops for Chicago in the period later than the 1950s.)

firms which faced lower labor costs and often received government subsidies (Kolbenschlag, 1970; U.S. Congress, 1970; Brown, 1976). By the end of the 1970s, American automakers, truck manufacturers, appliance companies, and agricultural equipment manufacturers were frequently purchasing tooling from European and Japanese toolmakers (AM, May, 1976; AM, July, 1976). Domestic metalworking suppliers now had competition from foreign suppliers as well as the domestic captive shops and toolrooms (Kolbenschlag, 1970; Boyle, 1974; AM, January, 1976b; AM, April, 1976; Brown, 1976).[27] Thus, the 1970s--in terms of its macroeconomic conditions--spelled disaster for the country's small and independent tooling and precision metalworking shops. How did these events play out in Chicago? Did the conditions of the 1970s cause the undoing of the region's collaborative supplier-captive shop alliance?

Continued supplier-captive shop collaboration in the slowdown of the 1970s and enhanced power for the metalworking enclave at large

Instead of a slowdown weakening the metalworking trade association, the opposite occurred. The association improved its financial position in spite of repeated recessions, it increased its political savvy, its widened its geographic scope of operations, and it began

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[27] This development was perceived as so threatening to the domestic nuts, bolts, and fasteners industry that it petitioned for import protection from the U.S. International Trade Commission in 1975 under provisions of the Trade Act of 1974. Relief was denied. The majority of commissioners saw the industry's poor performance record in the early 1970s as due to cyclical factors and expected it to improve following the recession. Dissenting commissioners, on the other hand, interpreted the industry's peak profit years of 1973 and 1974 "as an aberration in a longer-term downward trend" (AM, January, 1976b: 41). In the midst of these changes, those in business were having difficulty discerning cyclical from structural trends which confused their development of effective strategies.

marketing the services of this diversified metalworking enclave worldwide. In other words, the collaborative network between supplier and captive shop gained significant power in this period such that it could influence the actions of other actors in the region greatly. In this section, I discuss how Chicago's metalworking network appeared to counteract the recessions of the 1970s and grow strong through collective action in the face of adversity. Yet, much as the Depression weakened this network in an earlier incarnation, the events of the 1970s exacted a cost on the metalworking shop owners, as well. I describe this cost in the following section. Yet, the lesson that emerges from the experience of this decade, as a whole, is that the existence of Chicago's collaborative metalworking trade association clearly mitigated cost pressures for these small shops, while allowing them to retain their high-skilled, high-quality, craft-oriented production philosophy--albeit weakened--into the 1980s. Let me recount the challenges of the 1970s for you here.

Chicago's metalworking trade association upgraded its standing in the 1970s along many dimensions. For instance, it enhanced its financial position in several significant ways, such that by the early-1980s, one Board member complained that it had become "excessively wealthy" (TMA Board minutes, 1983). These measures effectively taxed the association's larger and captive members and allowed it to subsidize services to the smaller, more marginal, and independent subcontracting firms. What financial measures did the association adopt? First, it increased its revenue simply by attracting many captive shops as members. Rather than make do with the support of a few hundred firms, as it had prior to World War II, the association now received this support from almost 1000 firms by the end of the 1960s (TMA Stats, n.d.). Secondly, the association changed its dues structure in the 1970s to draw more income from members that operated large production plants. Traditionally, the association levied dues based on a firm's use of skilled toolroom labor--since its services initially benefitted such labor (e.g., the association's training program) and the association originally included only shops that exclusively manufactured tooling. When captive toolrooms joined which were attached to much larger production facilities, the association felt it made its services available to a much larger workforce. The owners of small independent toolrooms now felt they paid more dues relative to their overall size than did the captive shops and that they were, in effect, subsidizing association services for these larger captive toolrooms and their parent corporations. Because of this, the association began assessing dues on both skilled toolroom and non-skilled production labor in a member firm's overall plant. The contributions of captive shops grew because of this change (TMA Board Minutes, 1960s-80s). The association also increased its dues--across the board for all members--several times in the 1970s. Thus, in addition to its captive shop members, all of the association's members willingly contributed to its increased wealth and ability to provide services during this period of slowdown.

Lastly, in regard to its finances in this decade, the association modified how it supported its training program. In the past, the association provided all of its services to member firms collectively as public goods (i.e., each firm paid dues to support the network as a whole--regardless of its use of particular services--on the theory that this would benefit the common good of the industry). However, when the training budget sharply escalated in the late 1960s--a service utilized primarily by the captives which were expanding in this period--the association changed its traditional policy (TMA Board Minutes, 1969). It charged a training fee of the trainers--e.g., the captive shops--rather than have the smaller shops continue to subsidize the training activities of the former. While the intention of the association's board, here, was to cover the rising cost of its training budget, the effect that the board also recognized was to increase its income from the larger and captive shops. In these ways, the association reaped increased income from its captive shop members which allowed it to expand services to its smaller members, helping them to survive through this era of slowdown (TMA Board Minutes, 1960s-80s).

Not only did Chicago's metalworking trade association strengthen its financial position in the 1970s, but it increased its political influence as well. With its growth in the mid-1960s, the trade association aspired to a wider influence. These aspirations led the association to compete with the national tool, die, and precision metalworking association in the area of policymaking, to consider reorganization as a statewide--rather than merely metropolitan--trade association, and to beef up its political activities and clout. Chicago's metalworking trade association had always worried about the encroachment of the national association into the Chicago area. Since the late 1950s, it effectively kept the national from recruiting local firms as members. In the 1960s, Chicago's trade association--at a membership of about 1000 companies compared with about 3000 in the national at that time--already began to test its influence (TMA Board Minutes). It wanted to accompany the national's staff when it met with federal policymakers in Washington on legislation of interest to the tooling industry; the national agreed (TMA Board Minutes, November, 1965). Throughout the 1970s, relations between the uppity Chicago group and its national counterpart deteriorated. In 1979, when the national decided to open a chapter in Chicago without the Chicago association's sanction and involvement, the two organizations parted ways. The national now had a separate organization to work through in Chicago (which never grew very large) and the Chicago association independently continued to organize the tooling industry in the region (TMA Board Minutes, 1950s-80s).

Although the Chicago association mostly drew its membership from firms from the Chicago metropolitan region, it flirted with the idea of widening its geographic scope to gain greater influence in the 1970s and 1980s. While some on the association's board worried that widening its borders beyond the Chicago region would be "an affront to the [national association]," the majority of the board felt this consideration should not stop the association from expanding geographically (TMA Board Minutes, September, 1972). Continued requests for advice and/or membership from firms in other regions finally prompted the trade association to investigate becoming a statewide organization to represent the metalworking industry on a wider stage and to compete with other organizations (e.g., the Illinois Manufacturers Association) which carried heavier political clout. In 1976, the association's board formally considered becoming statewide. It carried out a marketing survey to determine the level of interest from other parts of the state. Based on the results, Chicago's metalworking association decided to remain open to membership by firms downstate--although it would still concentrate its increasingly aggressive membership recruitment activities in the Chicago metropolitan area (TMA Board Minutes, 1970s).

Concurrent with its efforts to organize the precision metalworking industry in Chicago without the national's assistance and to expand its base geographically, the association also increased its political savvy in the 1970s. Up until then, the trade association had participated in an occasional effort to persuade the State of Illinois to lower certain taxes (e.g., the association successfully organized legal action against a proposed retail sales tax on its members' products in the 1940s, which it frequently fought over again under new state administrations)(Rockwood, n.d.; TMA Board Minutes, 1940s-70s). The association had yet to engage in a concerted effort to monitor and influence legislation. However, given its increasing size and strength, it wanted to change this role. The association's board clearly saw its increasing size as lending it greater political clout and influence. In the mid-1970s, it started to tally its membership's employment totals since the "size of [its] skilled labor force and production labor force [could be used] for purposes [of showing the association's] legislative strength" (TMA Board Minutes, December, 1975). Its captive shop members, of course, brought its employment totals up considerably. The association formed a Legislative committee in the early part of that decade to exert greater influence in the state and federal legislative arenas. While the association had "shied away from involvement with the 'political area'" in the past, it now wanted to "become a better watchdog, for the Chicago industry of legislation which can affect the business climate" (TMA Board Minutes, March, 1970). The association issued policy stands on certain pro-business issues; it joined in the efforts of other associations so that it could become legislatively more effective (e.g., the Alliance of Metal Working Industries--a coalition of mostly national trade associations interested in influencing national legislation); several of the association's staff members registered as lobbyists to reflect their growing involvement in state legislative affairs; and the association met frequently with its Congressional and state legislators to influence policy, especially in regard to the concerns of small (rather than large multinational) manufacturers (TMA Board Minutes, 1970s-80s).

The enhanced financial and political position of the trade association in this period also enabled it to develop a broad-based marketing effort for the region's supplier infrastructure at large; this effort countered the effects of the slowdown and forged alliances with powerful actors which were regionally-based. Since the association had grown to over 1200 members in the 1970s, it could market an entire regional complex of skills to both a local and distant pool of customers--informing them of the "desirability of industry remaining in or coming to the area because of [Chicago's] metalworking availability," (so promoted the association's Board president) (TMA Stats, 1994; TMA Board Minutes, 1978). The association constructed its new marketing effort around promotion of Chicago as the "metalworking capital of the world" (TMA Board Minutes, 1978). Symbolic of this effort, the association worked closely with the City and several influential and regionally-tied corporations (e.g., Ryerson and Inland steel companies, the Marshall Field retail corporation) to develop a sculpture for the central business district attesting to the region's metalworking skills and diversity. This four-year project was followed up with a bevy of public relations and marketing activities to promote "Chicago area capabilities and capacities" to metalworking customer industries (TMA Board Minutes, 1984).

Instead of seeing cutthroat practices among the region's independent metalworking shops run out of control during the slowdown, this collaborative network came together and announced its quality and presence to the world in big bold capital letters.[28] The association galvanized a group of actors--whose activities in various ways tied them to the region--to act on behalf of the region's interests in a period that was becoming increasingly characterized by the capital flight of multinational manufacturers. Thus, in the 1970s, Chicago's metalworking trade association reaped the benefits of its skills-based bargain with the captive shops. In a period of slow growth, when captive shops threatened to pull work back in that had been let to the contract shops during the postwar boom, Chicago's trade association turned to its captive members for extra support in maintaining the region's supply infrastructure. The new collaborative supplier-captive shop alliance matured past the testing phase into one of comfortable cooperation. What trade-offs has the Chicago metalworking industry had to make in order to pursue collaboration with its larger customer/manufacturers and seek their continued support?

The Cost of Collaboration with the Globally-Oriented Customer Firms

The association's alliance with its customer/captives in the postwar period was not without its disadvantages. The association had to make a series of trade-offs in pursuing a collaborative path with these larger firms. These trade-offs represent the fact that attracting captives into its membership placed limits on the strategic maneuverability of the trade

[28] The 1970s was a period of slow growth for these precision metalworking shops. Illinois' tool-and-die sector (SIC 3544), for instance, dropped 11% of its jobs in the 1970s, as compared to a growth in employment of 38% in the 1960s and 12% in the 1980s. However, this decline of 11% was about on average for the region's manufacturing industry as a whole at an eight percent decline. Some underbidding did occur, as I state in the next section. Yet, it did not appear to escalate into as serious proportions in this decade judging from the record in the trade association's Board minutes.

association. Such limits fostered tensions among the smaller contract suppliers that had to be dealt with. Thus, we begin to already see that collaboration with globally-oriented customers can undermine the collaborative ties among regionally-oriented suppliers--a "divide" that has increased today, as I discuss in the next chapter. A few examples will illustrate these tensions.

When the association shifted from providing its services as public goods to providing them for fees from users, it gained income from the captives yet weakened the industry's collective identity. In regard to training, for instance, the association's members traditionally all paid for this service regardless of their usage because they expected craftworkers to migrate between shops, eventually carrying their expertise to all in the industry. When the association started charging fees of the training program's users, however, it encouraged the "trainers" to hoard their skilled labor rather than share such skills. The hoarding of skills undermines the network's ethic of sharing information about production expertise. Paying for training as a fee-for-service might also be expected to lesson the captives' loyalty to the overall community of precision metalworking firms and its broader set of goals for the common good. Captives then "purchase" only training and nothing else. Yet, without this fee, the small shops were subsidizing the operations of their much larger customers in an era when prices were squeezed.

A second tradeoff produced a similar destabilizing effect. Once the association invited captive shops (i.e., their customers) into their network, the association was prohibited from standardizing customer practices as it had in the past (i.e., developing rules to inhibit the ability of customer firms to exploit individual suppliers). United States antitrust law also prohibited the association from developing such collective practices. The association was left with its persuasive powers to hold back customer attempts at exploitation. Yet, occasionally supplier "sweating" occurred which fragmented the trade association and threatened collaboration among the smaller shops. For example, in the early 1970s, the mold-building niche of the metalworking industry faced the organizing campaign of a craft union at the same time that its customers demanded serious price cutting. The mold companies--many of which belonged to the trade association--wanted the association to help it hold the line on unionization (which the association did); they also wanted to standardize customer practices to prevent cutthroat bidding which the association drew back from. The mold builders organized their own association which did not include large firm participation (e.g., captive shops). The metalworking trade association had to scramble to deal with these industry divisions or face the undoing of its collaborative supplier network (TMA Board Minutes, 1970s). It did scramble. It lent support to the new mold association but attempted to discourage them from pulling away from the larger metalworking trade association. It also discussed various ways to allow the subspecialties within its ranks to meet and develop their own separate agendas. But organizing this now much larger and diversified metalworking network was proving an increasingly difficult task.

A third example also shows how the association's captive shop members, in turn, influenced the high-skilled suppliers' production philosophy. In the 1970s, when large manufacturers emphasized cost reduction rather than quality due to market pressures from lower-cost imports, their metalworking suppliers began to replace generally-trained "all-around" machinists and tool-and-diemakers with lessor-skilled specialists. The association changed its training program to reflect the increased use of lower-skilled workers by adding a track for specialists alongside that for the highly-skilled toolmaker (McCormick, 1993, 1994). The contract shops were responding to changes in their market (i.e, their customers) in a flexible manner. However, while the association continued to emphasize training and quality workmanship, it modified its standards significantly away from its earlier machinist craft tradition in order that the association and its supplier shops remain competitive (i.e., retain contracts from the large manufacturers). Thus, while recruiting captives into their association allowed Chicago's metalworking suppliers to encourage the large firms initially to upskill with the new technology, the captives pushed the independent suppliers to deskill their labor process eventually. Chicago's metalworking network survived and grew powerful by negotiating with its larger customer/captives, yet it also compromised its more traditional craft production ethic.

To recap the events of the 1970s, we see that, surprisingly, Chicago's metalworking industry maintained its collaborative ethic throughout the cost-squeeze environment. Not only did the industry hold its interfirm network intact, but this network matured significantly throughout this decade. The collaborative interfirm metalworking network (i.e., the trade association) grew large in membership, politically involved and influential in both national and state-level issues, and financially wealthy such that it could subsidize services especially to its smaller, more marginal member shops. Furthermore, the association--especially its contract shops--had grown in power relative to their customer firms--the region's large multinational manufacturers. This is witnessed by the ability of the trade association to "tax" the captive shop members and their parent firms through a variety of mechanisms (e.g, a training fee, a higher dues schedule for the captive shops).

Yet, in spite of this rosy picture, there were trade-offs to this supplier-captive shop survival strategy. Primary among these was that as manufacturers lengthened their product redevelopment cycles and focused on a low-price/low-cost/standardized product strategy again in this period, they pushed the contract shops in the direction of deskilling their labor process. While the contract shops were quick to focus on low (labor) cost as their customers wanted, they were equally astute at developing a mechanism to control access to a lower-skilled metalworking labor supply through the association's apprenticeship training and recruitment programs. Yet, responding quickly to market changes (i.e., their customers' new interest in low-cost over "high tech" in the 1970s), both the metalworking trade association and its large customers may have sown the seeds of the quality problem of the 1980s.

Conclusion

In this chapter, we discover how Chicago's small metalworking firms were able to reinvent their collaborative network after its seeming demise in the mid-1950s. At that point--as we learned in the last chapter--these small suppliers capitulated to the demands of their larger customers for lower prices and costs. These customers were expanding their captive toolrooms as a lower cost and more controllable alternative to the highly organized contract shops. The expansion of the captive shops--a set of firms which acted as both competitor and customer of the contract shops--was the final stimulus that pushed the metalworking trade association to break with the Machinists Union. At that point, neither stabilization of the industry nor the assurance of sufficient returns was guaranteed to these shop owners. Capitulation to customer demands and the formal break off with the union could have pushed these small firms into eventual disinvestment, quality problems, disintegration of their craft expertise, and their marginalization as a complex of small firms and suppliers.

Yet, surprisingly, by the 1960s, this group of entrepreneurs had resurrected a collaborative interfirm compact to turn this situation around. By undertaking a critical set of organizing strategies within this new environment, they were again able to shape market forces and contractual terms to protect themselves as small craft producers. The network's goal this time was the same--to stabilize market forces and prevent cutthroat behavior, thereby stimulating long-term investment in metalworking skills, expertise, capital, and the excellence of this craft industry. However, given the changed environment, these metalworking shops employed different mechanisms and partnered with different actors to bring this about. More specifically, these shop owners engaged in a series of organizing strategies--to entice an alliance with the captive shops rather than union as in the past--to reinvent their network. They: (1) recruited the customer-owned captive shops as partners, members in the trade association, and fellow collaborators in a new craft community; (2) reclaimed the trade association's leadership in metalworking training and skill development thereby increasing the bargaining power of this group of suppliers within the complex at large; (3) revised their hold on metalworking expertise by actively disseminating information about new technologies that were changing the nature of the traditional metalworking craft and, thus, might have brought about the trade association's obsolescence; (4) upheld and continued to promote quality standards among all metalworking suppliers in the region; (5) "taxed" the customers' captive shops at a rate that would allow them to subsidize services to the association's smaller, more marginal members--a strategy that ensured sufficient returns to many in the supplier network, especially during the cost-squeeze of the 1970s; and (6) rebuilt the trade association to become large, politically influential, and fiscally sound throughout the postwar period including the during the slowdown of the 1970s such that it assumed the role of "lead firm" in managing knowledge, interfirm relationships, and planning for the metalworking industry at large.

However, this new struggle against their exploitation as smaller firms was not without its setbacks and trade-offs. Shop owners could no longer strictly adhere to the traditional machinists' craft model, that depended heavily on the expertise of the skilled craft worker as well as the shop owner, if they wanted to retain work from their larger customers. That they broke their wage bargain with unionized craft workers meant it became increasingly more difficult to recruit sufficient trainees into tool-and-die apprenticeships. And, while shop owners initially urged the use of craft workers in manning the newer computerized metalworking technologies, by the 1970s shop owners began to experiment with utilizing lessor-skilled and cheaper employees (e.g., semi-skilled specialists and lower-skilled immigrants) as a means to deal with the recessions and cost-squeeze environment of that decade. Shop owners and their trade association were flexible in adapting to these changing conditions, yet were not totally able to avoid a diminishment of traditional craft standards. Finally, the absorption of new partners--the captive shops and their parent firms, the large manufacturers--into the association produced constraints as well as opportunities and benefits for the smaller contract metalworking suppliers. Suppliers could not longer assume an aggressive stance customer-induced cutthroat behavior and overly competitive bidding, but had to rely on subtle persuasion instead. Furthermore, as suppliers increasingly adopted their customers' anti-union attitudes, the metalworking industry developed a more "arms-length" relationship with their workers compared to the pre-World War II period while, at the same time, becoming closer to the customer-owned captives. Thus, although the trading of partners may have ensured the continued viability of the metalworking network as a collaborative, this meant that the benefits of collaboration were not spread equitably nor as widely as might have been within the region at large. Partners within the network prospered; those without did not do as well. This story of collaborative manufacturing, thus, is not as regionally pervasive as accounts in the literature have led us to believe. Yet, the benefits of collaboration have clearly been beneficial to Chicago's small metalworking shops. Let us see whether these institutional practices mediated the crisis of American manufacturing in the 1980s. I turn now to the current period in assessing these network relations.

CHAPTER 7--CHICAGO'S METALWORKING ENCLAVE AT A CROSS-ROADS

Introduction

What difference did it make for Chicago's manufacturing complex that it's precision metalworking trade association reorganized itself in the postwar period to become larger, wealthier, and more influential? Did the existence of a well-organized and collaborating supplier network in this region position it to deal better with the restructuring crisis that hit American manufacturing in the 1980s? In other words, did this region's collaborating interfirm relationships allow its manufacturers to make the transition to flexible production more quickly than other American regions, or did the deindustrialization crisis of the 1980s signal the failure of this small-firm network in metalworking? How can one interpret the events of this decade? In this chapter, I offer two interpretations, based on different pieces of evidence and different points of view of the actors involved.

On the surface, looking at the performance of the region's various industrial sectors in this period, we see a manufacturing complex that is in trouble. Massive plant closings and job losses in the recent period spell disaster for a once vibrant industrial hub. This has stimulated many large manufacturers to significantly restructure, among other things, their supplier relationships. These major manufacturers want to utilize outside suppliers more in the manufacturing process, yet will not do so unless suppliers improve what is seen as their traditionally lagging and low quality performance. Through a range of new demands, large customer/manufacturers are pressuring their smaller suppliers to make costly improvements in their operations. But these large firms will choose only a fraction of all the region's metalworking suppliers at large for inclusion in their "customer-sponsored supplier networks."

By implication, the trade association has done little to ensure a top quality metalworking supplier pool in this region. Therefore, it is up to these large and leading manufacturers to take on the role of "lead firm," in the words of Harrison (1994) and others, in promoting performance standards and ranking the abilities of various actors (e.g., metalworking suppliers) in the industrial complex at large. This is very much the top-down model of customer-supplier relations that Japanese firms employ to improve manufacturing operations in that country versus the horizontal and more egalitarian model of other interfirm networks (e.g., the industrial districts of southern Germany; see Sabel, 1994, for this distinction).

Delving deeper into the events of the 1980s, however, one can put forth a different interpretation. What we see is that while most of the region's manufacturing complex performed dismally in the recent period, there were bright spots including many of Chicago's small-firm-oriented, metalworking supplier industries. Tool-and-diemaking firms, metal stampers, and firms in other supplier sectors with strong representation in the metalworking trade association performed better than the average manufacturing firm during the postwar years and into the decade of the 1990s. Thus, the collaborative metalworking network appears to have made a positive impact, if only for its core sectors. However, the existence of its past record has not assured a smooth future for the metalworking trade association nor the small supplier firms that primarily comprise its membership. Several key changes in the production environment threaten the metalworking trade association and its collaborative craft ethic.

For instance, the imposition of new demands by this industry's multinational customer firms has increased costs for the average small metalworking shop without a guarantee of sufficient returns to recoup the investment it made in management improvements. Customer demands are also increasing cutthroat behavior and weakening "horizontal" collaboration among suppliers at large in the region. Customer firms appear to be interested more in strengthening "vertical" collaboration between themselves and their preferred suppliers. Thus, the small firms and their metalworking trade association face an uncertain future; whether a "high road" of sufficient returns to most suppliers in the region or a new pattern of "dualism" results is currently indeterminate and will depend partially on the trade association's ability to reorganize a regionally based set of interests in metalworking, much as it did in the 1950s. A second challenge to Chicago's metalworking trade association is the changing role of skill in metal-related production processes today. The demand for tool-and-diemaking, the core of the metalworking trade association, is decreasing as is that for the "all around," or highly trained, toolmaker and production machinist. The "deskilling" of the metalworking craft has been stimulated by the introduction of new metalworking technologies--as I described, in part, in the last chapter--and facilitates customer control of a "decentralized" production process. Yet, there may be a new role for metalworking skill--as embodied both in the metalworking shop owner and production worker. The metalworking trade association's ability to shape and organize this role for skill will affect the survival of metalworking craft skill in this region. A third development also challenges the future of Chicago's metalworking trade association and its constituents. This is the increasingly global nature of production today. Because of the deindustrialization of the 1980s, many large customer firms relocated to lower-wage regions such as Mexico. New agglomerations of metalworking skill, support services, and suppliers are being constructed in these new locations. Can the metalworking trade association's traditional activities of controlling and upgrading metalworking skill in its member shops turn this situation around by attracting new customers to the Chicago region or will the trade association need to become a more active player in the international economy at large?

These new developments, thus, challenge the future of Chicago's horizontally organized and collaborative metalworking network. It must respond again, as it did in the past, and strategically reorganize itself as a regionally based and egalitarian production network. Some of its recently expanded technical and educational activities suggest that this association is indeed trying to reformulate itself and offer an alternative of itself as "lead firm" in organizing metalworking supplier firms within the Chicago region. Will this region's "horizontally" organized, supplier network survive in the face of today's new "vertically" organized, customer-sponsored, supplier networks? The outcome is still "up for grabs," yet, the history of this metalworking trade association suggests it will not easily give up its role as organizer of the metalworking industry in this region. Let us look in detail then at current trends in this industry.

I. THE RECENT PERFORMANCE OF CHICAGO'S METAL-RELATED COMPLEX: ONE INTERPRETATION OF THE EFFECTIVENESS OF THE METALWORKING NETWORK

In this section, I will investigate how well Chicago's metalworking industry performed in the postwar period vis a vis the rest of Chicago's manufacturing complex and the country at large. We see that while the metal-related complex--about half of the Chicago region's manufacturing base--performed strongly throughout much of this period, it faced substantial decline in the 1980s from which it has yet to recover. Metalworking, as a subset of this larger metal-related complex, also took part in this decline. On first glance, looking at job and firm losses in these metal-related industries, one could conclude that the collaborative network in metalworking made little impact on this region. The area's large customer firms came to a similar conclusion and are now demanding performance improvements from their small metalworking supplier firms. I describe these new customer demands as well in this section.

Performance in Chicago's Metal-related Manufacturing Complex from the 1950s to the 1980s

While the last chapter looked at the growth of Chicago's metalworking trade association in the postwar boom from the 1950s on, in this chapter I attempt to determine what difference this association made on the Chicago region's industrial performance over this same time period. What was the result of rebuilding this new collaborative metalworking network in partnership with the captive shops? How have metalworking and its "customer" industries performed today? In this section, I review census data on Chicago's manufacturing complex to start to answer these questions. Overall, we see high growth in the metal-related industries for most of the postwar period. This is, however, followed by dismal performance from the late 1970s on. Let us look at the apparent demise of metalworking and the metal-related sectors to which it is linked. To draw this initial profile, I utilize the U.S. Census of Manufactures for the years 1958, 1967, 1977, and 1987. I also create this profile at the state level, as I did before. Chicago firms make more than two-thirds of all manufacturing activity within Illinois, such that state statistics are a good proxy of this region's complex. Since changing metropolitan boundaries also make constructing a regional profile a difficult task for the postwar period, the state is a more consistent geographic unit.

I look first at the entire manufacturing complex in this region from the late 1950s on; next, I position its metal-related sectors within this overall complex. How did the metal-related portion do relative to other industries? Which of the metal-related sectors showed strongest growth and which are lagging sectors? How might we interpret these findings? By looking at the industries that make up Chicago manufacturing as a whole, we see that the metal-related sectors comprise the largest and leading sectors in the region. The metal-related complex consists of the following--firms that produce:

- o primary metal (e.g., steel), or SIC 33;
- o fabricated metal (e.g., metal stampings), or SIC 34,;
- o non-electrical (e.g., tractors) and electrical machinery (e.g., radios), SIC 35 and 36;
- o transportation equipment (e.g., autos, trucks, railroad equipment), SIC 37;
- o and instruments (e.g., measuring devices, medical instruments), or SIC 38.

The metalworking supplier industry consists of part of fabricated metals (SIC 34) and machinery (SIC 35). As a whole, the entire metal-related complex has provided about half of all manufacturing jobs in the Chicago region over the entire postwar period.

Of the fourteen two-digit SIC sectors that comprise manufacturing, three of the region's five metal-related sectors listed above have been within the top five largest manufacturing sectors, in terms of employment, since the late 1950s. These three sectors include non-electrical and electrical machinery (SIC 35 and 36), and fabricated metals (SIC 34). Non-electrical machinery producers, provide the most jobs within manufacturing in the larger Chicago region; this sector offered 14% of all manufacturing jobs in 1958 and 13% in 1987. Electrical machinery firms also provided about 14% of all manufacturing jobs in 1958; this dropped to ten percent in 1987. Fabricated metal producers employed 11% of all manufacturing workers in the region in both years. The non-metal-related industries, food products (SIC 20) and printing and publishing firms (SIC 27), were as large and also among the top five job-providers. The food processing industry offered 11% of all manufacturing jobs in 1958 (and eight percent in 1987). The printing/publishing industry offered eight percent of all manufacturing jobs in 1958 (and 11% in 1987). (See Table 7-1 for these comparative sector rankings.)

In regard to the other metal-related sectors, the primary metal sector was nearly as large as the above sectors in 1958--it was the sixth largest manufacturing sector then at about eight percent of all manufacturing jobs. Primary metal producers offered five percent of all manufacturing jobs in 1987, making this the seventh largest sector in that year. Transportation equipment producers ranked eighth in size in 1958, providing about four percent of all manufacturing jobs at the beginning of the postwar period (and ninth in 1987 at four percent of all manufacturing jobs). The producers of precision instruments offered less than three percent of all manufacturing jobs in 1958 and four percent in 1987. From this profile, we see that machinery of all kinds--and related producers--continue to comprise a major manufacturing activity for the Chicago region.

How has this concentration of machinery and metal-related industries fared over time compared with other Chicago manufacturing sectors? In brief, while many of the metal-related sectors have retained their position as among the largest job providers within manufacturing in the region, these sectors experienced significant job losses over the postwar period that are worrisome. I refer to the data in Table 7-2 for the following discussion. Over the postwar period, the metal-related complex as a whole declined, both in absolute terms and as a proportion of all manufacturing in the region. For instance, whereas these six 2-digit SIC sectors comprised 54% of all manufacturing jobs in the region in 1958, they equalled only 47% by 1987 (see Graph 7-1). This share dropped only recently, however--between 1977 and 1987. By looking at job losses by two-digit SIC sectors, we see major losses occurring in the decade of the 1980s and accruing mostly to these same metal-related sectors. (Again, refer to Table 7-2.)

Between 1958 and 1987, for instance, the Chicago region included few growing industries. Only five expanded their employment--paper product manufacturers, printers/publishers, chemicals producers, rubber producers, and firms making precision instruments. I classify the latter--instrument producers (SIC 38)--as part of the metal-related complex. It is the smallest sector in that complex, yet, one of the fastest growing in the region (having experienced an employment growth rate of 17% over this period). The rubber industry exceeded this, growing 149% in terms of the jobs it provided, and printing/publishing came close with a 16% employment growth rate over the postwar years. The other metal-related sectors, by comparison, performed miserably, racking up job loss rates such as the following: primary metal declined 46%, electrical machinery by 39%, machinery by 19%, fabricated metal by 14% and transportation equipment by 10%. Other non-metal sectors performed equally dismally--such as apparel which declined by 66%, food processing by 37%, and stone, clay, and glass by 46%--yet, most of the growing industries were also in non-metal activities, as I mentioned above. Therefore, the metal-related sectors as a whole stand out as a complex in trouble.

Furthermore, these difficulties are fairly recent. The metal-related sectors expanded with very healthy employment growth rates in the 1960s. They started their decline in the 1970s when many sectors dropped back to the employment size level they were previously (in the late 1950s). In many ways, this trend is understandable. The peak employment levels recorded by the census in 1967 for these metal-related sectors reflects the buildup for the Vietnam War effort and, as such, was a temporary stimulus to this complex. (Employment growth rates between 1958 and 1967 in the metal-related sectors were stunning: primary metal grew 21%, fabricated metal 13%, machinery 36%, electrical machinery 30%, and instruments 42%; transportation equipment only added one percent to its job base, however, in this period.) However, after this growth and decline pattern in the 1960s and 1970s, due to the war "bubble," the 1980s brought further decline (again, see Table 7-2 for more detail). The rate of decline in most metal-related sectors in the 1980s significantly topped or equalled the job loss experienced by manufacturing as a whole in this region. Thus, whereas SIC 33-36--four of the six metal-related sectors--dropped jobs at a rate of between 22% and 46% from 1977 to 1987, manufacturing in the region declined by only 23%. (Transportation equipment producers, SIC 37, performed slightly better at a job loss rate of 20% in this decade, as did SIC 38, precision instruments, which dropped only 17% of its employment.) Clearly, Chicago's metal-related complex faces major difficulties in the recent period. How should one interpret this decline?

The Decline of Mass Production and the Rise of Corporate Demands for Flexible and Quality-Oriented Production

Chicago was not the only manufacturing region in trouble in the 1980s; many other mature manufacturing regions in the Northeast and Midwest were as well. Considering their difficulties in this period, America's manufacturers began looking for the cause of their demise. They investigated the decentralized and flexible manner of production of their successful competitors--often the Japanese--and are attempting to restructure their operations to catch up. Many understand that their adherence to highly integrated and mass production operations in the past led to their rigidity and downfall today. They want to decentralize operations, but regard most independent suppliers as much less than "world class." Chicago's large and often multinational manufacturers are no exception. Even those who belonged to this region's metalworking trade association feel they must construct their own supplier networks to improve metalworking quality within the region. While their "corporate-sponsored supplier networks" also include suppliers that operate in sectors besides metalworking, these networks are simultaneously eclipsing Chicago's established metalworking supplier network. Some of Chicago's large customer firms are withdrawing from the membership of the metalworking trade association, implying that this network did not do enough to keep the region's complex competitive. How exactly are these corporate-sponsored supplier networks structured? What improvements are they trying to stimulate within the region's metalworking supplier industry?

To answer this question, I draw from the field research I conducted in Chicago from 1988 to 1992. I held interviews with 60 relevant actors in the Chicago complex: metalworking supplier firms, customer/manufacturers, trade union representatives, trade associations, immigrant assistance organizations (that placed workers in the metalworking industry), and other relevant public and private sector policymakers knowledgeable about local industrial policy. (I list and/or describe the interviewees in Appendix 1-1.) I also utilize information from the Tooling and Manufacturing Association's board minutes, newspaper articles, recent reports, and other published or printed material to complete this analysis of current trends in the metalworking industry.

Since the late 1980s, Chicago's multinational customer firms--those manufacturers who purchase metal parts from the region's smaller suppliers--have begun to place a host of new performance-based demands on their suppliers. How did this situation come about? Why do the large customer firms use small suppliers if their work is not thought to be up to snuff? On what basis can these large multinational customers dictate terms at all to Chicago's metalworking suppliers? American manufacturers began to look to suppliers more and more in the late 1970s/early 1980s as a means to cut the costs and shed the risks associated with production (AM, May 1982). During this period, multinational manufacturers also began to educate themselves about the supplier networks of their successful competitors (especially the Japanese). For instance, Chicago-based Motorola's Chairman, Bob Galvin, decided to visit the company's chief Japanese competitor after rapidly losing its market leadership in pagers, cellular phones, and semiconductor chips in the mid-1980s; since then, Motorola has slavishly copied the "Japanese" style of manufacturing (Therrion, 1989; Gill, 1990). Collaboration with suppliers was "in" in the mid-1980s and much promoted in the business press and in management circles as a mechanism to help customers increase their manufacturing flexibility, problem-solving ability, product quality, and new product introduction. Yet, at the same time that these multinational manufacturers began to depend on outside suppliers to undertake a greater share of the manufacturing process, they also wanted to ensure the quality of the product that was produced. The large manufacturers were losing market share to their increasingly successful foreign competitors on the basis of both lower cost and higher product quality. How have these multinational manufacturers stimulated suppliers to produce in the manner they want? What are their demands of outside suppliers and what have these subsequently meant for supplier operations in this region? I discuss several areas in which suppliers have been asked to make improvements. These include: (1) quality documentation and control, (2) production speed and delivery time, (3) product design and engineering, (4) management capacities and overall plant operations. Let me summarize the findings of my interviews for you here.

The first major change in the way metalworking shops are doing business is in the area of quality control. In the 1980s, many American manufacturers began demanding that their suppliers--including Chicago's metalworking shops--upgrade their product quality and minimize production defects as much as possible. Customer firms now want to directly integrate purchased parts into the assembly process without having to inspect such parts first for mistakes. The emphasis on higher product quality, inspired by Japanese attention to this factor in the production of consumer goods, has become the main theme, for example, in Motorola's renaissance. Achieving "six sigma," the statistical equivalent of a perfect production process which results in products with a "0-defect" rate, is the goal this Chicago-based electronics corporation hoped to achieve by the mid-1990s (Gill, 1990). Since mistakes are costly in material wastage and labor time to correct them, achieving a 0-defect rate saves money for the manufacturer and parts supplier.

Many large multinational manufacturers have now transferred the responsibility of quality assurance to Chicago's metalworking suppliers. Manufacturers encourage their suppliers to take on this responsibility, for instance, by suggesting that they compete for the U.S. Commerce Department's Malcolm Baldridge quality award. Manufacturers have also developed their own proprietary quality rating systems which they utilize to assess improvements made in the quality area by their suppliers. Many metalworking production shops (i.e., those that produce parts in long runs such as in metal stamping operations) are responding to their customers' demands by instituting SPC (Statistical Processing Control measures) on the shop floor so that machine operators can statistically track the defect rate of each production run. SPC programs require that production workers standing at a metal stamping press (or another type of production machine) keep periodic measurements of the product as it comes off the press. These measurements track the statistical variance of a whole batch of parts from the "perfect" tolerances stated on the blueprint. Workers in non-production shops--that is, those that produce customized products or small batch runs like the region's tool-and-die shops do--also now carry out their own inspection of their work at the machine, rather than transfer it to a separate inspection and packaging area.

These changes in the area of quality assurance and inspection serve the additional function of moving work through the manufacturing process more quickly--a second area upon which metalworking suppliers are placing renewed attention. Inspection at the work station during production eliminates the removal of parts to an inspector and then back to the machine operator for corrections. Likewise, inspection inside the supplier's shop ensures that the customer firm will not waste time sending back bad parts or correcting them on-site. The pressure to shorten product cycles stems from heightened competition in manufacturing globally and the need for manufacturers to get new products to market faster. This has led some American manufacturers to demand faster "turnaround" on orders from their suppliers. Turnaround, or "cycle time," refers to the time between when the customer firm places an order for a metal part and when the customer receives it. Again, Japan has provided American manufacturers with a model. "Just-in-time" (JIT) delivery schedules allow Japanese manufacturers to demand that their suppliers provide them with smaller and more frequently delivered orders of parts and other materials in time to meet their production schedules. This allows manufacturers to reduce their inventories of stockpiled parts and other supplies, thereby reducing their production costs and increasing their flexibility to respond to fluctuations in output demand. Minimizing inventories also removes "buffers" which can hide inefficiencies and other problem areas in the production process and instead promotes their solution (Kaplinsky, 1988). All the metalworking firms that I interviewed indicated that their customers were requesting increasingly faster delivery times. Furthermore, while many metalworking shops were unfamiliar with the JIT concept in 1988--by 1990 it had become common terminology locally.

A third trend which suggests that Chicago's metalworking shops are becoming more flexible and quality-minded in regard to production is that they are assuming greater responsibility for the design, engineering, and problem-solving functions in the overall manufacturing process. For instance, some larger manufacturers are paring their engineering departments to the bone to save on labor and overhead costs. In part, this is due to an increasing trend by the large manufacturers to outsource much of the overall production and assembly process to outside suppliers. A large farm implement manufacturer, a metalworking supplier told me, asks some suppliers to make its parts and ship them to other suppliers for assembly. This multinational implement manufacturer retains a small number of engineers in-house to design the product but does not need to pay for an engineering function to monitor the production process. Chicago's metalworking suppliers are now picking up this activity. One of the metalworking parts firms I interviewed mentioned that it now supplies its customers with working drawings of the parts it produces. The supplier does this to ensure that it does not make mistakes in its production process, but the supplier sends the blueprints along to the customer firm with the parts (such that the designs now become the customer's property). This metalworking shop is also increasingly doing more prototype work, helping to come up with the final product design for its customers. This supplier is not unique. Other parts suppliers are increasingly carrying out design and engineering functions for their customers. Some are adding a toolroom to increase their own in-house engineering and prototype capacity.

Involving suppliers in production planning and engineering decisions up front can help reduce total costs of producing a product in the long run--for example, the expertise of a metalworking shop can help a product engineer design for ease of production, not only for consumer needs. This fact has stimulated many large durable goods manufacturers (e.g., Motorola, Ford, GM) to develop ESI (Early Supplier Involvement) programs--another Japanese innovation they have copied. Through such programs, customers bring in select suppliers to help design a metal part or component and to discuss possible problems with its manufacture before the customer's staff finish designing the part and put it out to bid. Again, these customer programs encourage metalworking suppliers to take a more active role in problem-solving and engineering functions.

Lastly, Chicago's metalworking suppliers have changed greatly in terms of management style at their customers' urgings. Such management improvements have made these suppliers into larger and more sophisticated operations. In the management area, some suppliers have: (1) implemented computerized billing, inventory, and production planning systems, (2) developed sophisticated bidding and contingency planning proposals, (3) established management teams to complement the production expertise of the small firm's owner, and (4) acquired debt to invest in state-of-the-art production technology and expand capacity. For instance, some of Chicago's metalworking suppliers are beginning to track the location of parts in the production process, which also helps the customer with the production planning function. If enough of a customer's suppliers take on this role, collectively they are tracking the entire product for the customer.

The way this works is that the customer firm places an order with the supplier for a projected annual usage. The customer also stipulates how much of this annual allotment it will draw down each month. To ease down the drawdown procedure, from the annual projected usage, and keep track of customer variations in actual purchase of metal parts, the more advanced metalworking shops in my sample had set up computerized billing and inventory systems. This allows them to compare, for instance, monthly shipments of parts against projected usage, notifying their customers where their projections are off as part of the monthly billing statement. This information can be fed back to the manufacturer's production planning division to correct future estimates. These systems assuredly are making the small subcontractors and their large customers more efficient producers.

Some suppliers are also improving their own production planning significantly in connection with the bidding process. Many large manufacturers today request a great deal of information from a supplier before they award a contract. Suppliers not only put together a cost estimate and quote for each job, they also now must develop contingency plans for unanticipated problems in the manufacture of a metal part which explain to their customers the corrective actions suppliers will take if such problems arise. These proposals also include the supplier's plan for ensuring quality (e.g., its inspection procedures) and other production procedures. These detailed bidding proposals that suppliers now produce are sizeable (e.g., a whole report compared with the one-page quote suppliers used to prepare for jobs) and costly to produce. Yet, they ensure that the supplier prepares for possible difficulties ahead of time so that the customer firm's production schedule is not unnecessarily slowed down.

Chicago's metalworking suppliers are also upgrading their management procedures today by hiring management teams. Previously, most owners directed their small metalworking shops by using a "seat-of-the-pants" style. The firm owner acted as production technician, engineer/designer, supervisor, and marketing/distribution/purchasing specialist. Most owners, however, are strongest in the technical aspects of metalworking--having worked their way up over the years from starting as a machinist. The other aspects of the business (e.g., marketing) often were ignored, which did not matter as long as business was brisk. Today, with customer demands for quality, speed, and engineering assistance increasing, these owners see the wisdom of diversifying their management structures and bringing other specialists on board. One supplier I interviewed--which has tripled its workforce in the last ten years--added seven new managers to assist him whereas before he had only one--himself. This business grew from 28 to 96 workers in this time period, while also adding the following in management capacity: a general manager, a plant manager, an assistant manager, and managers for quality assurance, overall quality, shipping, and inventory control.

In addition to expanding their management capabilities, some metalworking shops are also acquiring debt for the first time to expand capacity and upgrade technology. In the past, the owners of most of these firms behaved cautiously in terms of their investment decisions. They obtained bank loans for building purchases and expansion, but covered machinery purchases almost exclusively with retained earnings. When times were slow, capital investment suffered. Today, Chicago's metalworking shops behave differently. Given the rapid advancements in metalworking technology over the last two decades and the need to show customers that they have improved precision, quality, and productivity by adding this technology, suppliers are now taking on added debt. One supplier, for instance, said he became highly leveraged financially in order to grow. His expansion plans were assisted by obtaining longer term contracts with a few large prime customers. Another supplier, recognizing the need to invest in new machinery and other changes, suggested that his company's cash flow situation worsened to make these improvements. At times like this, it helps, he said, to have "an understanding bank" and to be family-owned without "a board of directors to deal with" that would worry about the bottom line in the short run rather than the necessary investments for the long term.

From the previous discussion, we see that since the late 1980s--due to the new stringent demands of Chicago's large customer/manufacturers--this region's metal-related complex has undergone (or, is still undergoing) a transformation. Its multinational manufacturers are changing from mass to flexible producers and constituting a new set of supplier relationships to achieve this end. As this metal-related manufacturing complex reorganizes itself into a "flexible" and "high quality" production system, it is influencing how the region's small metalworking parts suppliers carry out their business. More specifically, whereas most metalworking firms now aim to produce high quality products, "just-in-time," to a fewer number of more loyal customers, six years ago they were unacquainted with such goals. Significant re-education of the metalworking industry is taking place--and, seemingly, much of it is customer driven. Many metalworking shops have made important organizational advances in this recent time period. For instance: (1) suppliers have instituted quality documentation and controls systems; (2) they are cutting "cycle time," slashing inventory, and offering customers faster delivery schedules; and, (3) they are undertaking greater responsibility for product design and engineering. Furthermore, Chicago's small metalworking shops are instituting a host of other management improvements in their efforts to become "world class" suppliers. These developments are all to the good, or are they? Let us consider other aspects of these trends and the role of the metalworking trade association within them.

II. ANOTHER INTERPRETATION OF TODAY'S INDUSTRIAL RESTRUCTURING: A QUESTION OF CONTROL

From the foregoing interpretation of today's events, we might assume that the trade association's activities in the postwar period made little impact on the performance of metalworking suppliers in the Chicago region. Or should we? Large customer/manufacturers in Chicago and the country at large feel the bulk of metalworking suppliers need to improve their operations. These multinational manufacturers will not continue to do business with Chicago's metalworking suppliers (and all other suppliers in the United States as well) until they agree to meet the customers' performance standards. What I would like to offer in this section, however, is another interpretation to this rationale for restructuring customer-supplier relationships. I reached this second interpretation, first of all, by revisiting the postwar performance of the key supplier industries that have made-up Chicago's metalw[illegible] trade association over these years--the region's tool-and-die shops, stamping fi[illegible] machine shops. What we see, by disaggregating census data to pick out these supplier industries is that their performance in the entire postwar era--including the region's stint with deindustrialization during the 1980s--has been remarkably robust. This is especially true when compared to the performance of several of the metal-related customer industries in this region.

If these key metalworking suppliers continued to perform well throughout the postwar era--perhaps due to their participation in the metalworking trade association--what explains the desire of customers to quit the trade association and set up their own corporate-sponsored supplier networks? In the Chicago case, at least, I think that customers are also interested in issues of supplier control. Their vertically oriented supplier networks ensure that they will reap benefits from the new supplier relationships and increased outsourcing activity--a goal that was not necessarily achieved through the horizontally oriented trade association. Yet, increased control for the customer/manufacturers in today's metal-related complex, through their vertically oriented supplier networks, comes at the expense of horizontally oriented networks such as Chicago's metalworking trade association.

Much like its experience in both the mid-1920s and mid-1950s, this network of small firms faces its potential marginalization today. Although a set of metalworking firms are growing rapidly in the current period due to their special relationships with specific larger customers, prosperity for the bulk of Chicago's small metalworking suppliers is not assured. In fact, many are absorbing a disproportionate share of business costs and risks for the complex at large. While cutthroat pricing does not characterize interfirm relationships among these suppliers today--as it did in these earlier decades--"cutthroat" behavior of another sort is emerging. Metalworking suppliers find that horizontal collaboration among each other is weakening at the same time that vertical linkages--between a specific customer and supplier--are strengthening. As it is being replaced by customer-sponsored supplier networks today, we see that what is really in contention is who will continue to organize Chicago's metalworking industry and pay the costs of restructuring. As in past decades, Chicago's metalworking trade association must develop a new basis for interfirm collaboration among its various possible constituencies and help its small member firms build a "shelter" against accepting more than their share of risks from their larger customer firms. In other words, Chicago's metalworking trade association--as a collaborative network of supplier firms--is at a cross roads again. After laying out this second interpretation of the current period, I end the chapter by highlighting several challenges that face this primarily "horizontal" network in the current period.

A Reconsideration of Supplier Performance in the Postwar Period and the Reasons for Corporate-sponsored Supplier Networks

To begin this reinterpretation, I first reexamine statistical evidence for the postwar period. What we see by disaggregating census data further is that Chicago's metalworking "supplier industries" performed consistently better than most other industries in the region's metal-related complex. This implies that a horizontally structured collaborative network may have assisted the bulk of suppliers in this region to prosper over this time period. Today's vertically structured interfirm relationships not only threaten this horizontal network, as I argue below, but they may benefit only the slice of suppliers that customers chose to continue to do business with, while marginalizing the bulk of all metalworking suppliers at large. I examine these issues in the upcoming sections.

To look more closely at supplier versus customer performance in Chicago's metal-related complex, I have disaggregated trends to the three-digit SIC level for the same period looked at previously, from 1958 to 1987.[1] I have developed individual industry profiles for nine of the 46 sectors that comprise this metal-related complex. I summarize my findings from these profiles here. These nine sectors include both "supplier" and "customer industries" and were chosen from among the top ten largest sectors--in terms of employment--in 1958 and 1987. These nine are the "customer industries" of: communication equipment (SIC 366), construction equipment (SIC 352), steel production in blast furnaces (SIC 331), farm and garden equipment (SIC 352), consumer appliances (SIC 363), and motor vehicles and parts (SIC 371). The "supplier industries" I looked at include: metalworking machinery and tool-and-diemaking (SIC 354), miscellaneous industrial and commercial machinery including machine shops (SIC 359), and metal stampings and forgings (SIC 346).

To gauge postwar performance in these nine industries, I examined how certain indicators changed over time. Did employment (and sales) grow or decline from 1958 to 1987? Did the number of firms in the industry expand or contract? How did the industry fare relative to other industries in the complex? How did the industry's local experience compare to its performance within the country at large (i.e., what was the pattern of its location quotients over time)? By answering these questions for the nine identified industries, several general findings emerged. First of these is that the metal-related customers, on the whole, mirrored the picture of this region's manufacturing performance provided earlier.

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[1] I draw from the U.S. Census of Manufactures for the specific years of 1958, 1967, 1977, and 1987. Again, I utilize the state of Illinois as a proxy for the Chicago metropolitan region.

These large durables goods producers all experienced a significant contraction in their job base over the postwar period, with the largest losses from 1977 onward. These losses exceeded the average for all of manufacturing in this region. For instance, whereas Illinois manufacturing contracted in employment by 13% from 1958 to 1987, these "customer industries" performed much worse: communication equipment decreased in employment by 60%, construction equipment and blast furnaces each by 46%, farm/garden equipment by 63%, and consumer appliances by 56% (see Table 7-3a). Of the six customer industries, for which I prepared a full profile, only motor vehicles and parts (SIC 371) did well; it declined in employment by six percent--a rate that was better than the state average for manufacturing. These statistics apply to the performance of sectors whose SIC categories I did not adjust to reflect changes in industry classifications over time. However, the same general patterns emerge after these adjustments were made (Table 7-3b).[2] Wholesale employment losses over the postwar period meant that many of these customer industries declined significantly in ranking--that is, in their share of total manufacturing employment in the region. Looking at Table 7-4, we see that the communication equipment sector dropped from the largest to the sixth largest sector, between 1958 and 1987. Blast furnaces dropped from third position to seventh; the farm/garden machinery industry went from sixth to twenty-second in this period; the appliance sector dropped from seventh to twentieth.

[2] The federal government frequently adjusts SIC categories to reflect the changing nature of industrial activities over time and the need to regroup certain activities. Data to make adjustments for SIC reclassifications at a geographic level that is smaller than the country as a whole, however, are often not reported. Therefore, these "adjusted" statistics are also problematic and offer only a very approximate measure of the true employment changes experienced by these industries in Illinois over the postwar period.

By looking at other than their employment experience over the postwar period, however, we see that the experience of these "customer industries" diverged in important ways. This is the second finding from this data. Two main patterns stand out. On one hand, there are those sectors that declined both **absolutely** and **relatively** in employment, sales, and national standing. These include communication equipment, farm/garden machinery, and consumer appliances. On the other hand, there are a group of customer firms that performed dismally over the postwar period--that is, in an absolute sense they suffered job losses and market share--yet, they fared better than other firms within the industry nationally. Into this group fall Illinois' blast furnaces, construction machinery, and other customer-firm sectors. Thus, Illinois and the Chicago region are retaining their relatively strong concentration in this second group of customer industries (e.g., steel, construction machinery) in spite of the recent contraction. Location quotients for employment and value added show this discrepancy (see Graph 7-2 and Table 7-5). For example, in construction equipment, the location quotients declined slightly but retained their high level (indicating a substantial concentration of activity in this region even in 1987); in steel (i.e., blast furnaces), the location quotients actually grew over time although employment contracted.

A third point I want to make is that against this rather bleak overall picture for the "customer industries" in the Chicago region, we see the relatively favorable experience of its metalworking suppliers. All of the three "supplier industries" that I profiled performed better than the average for all of manufacturing, according to a variety of indicators. For instance, metalworking machinery dropped jobs at a rate of nine percent, compared for a 13% loss for all of manufacturing, during the 1958 to 1987 period; the metal stamping/forging sector expanded its job base by 35% in this period. Machine shops and other miscellaneous machinery producers also grew in employment by 23%, from 1967 to 1987, whereas manufacturing as a whole declined by 29% (see Table 7-3a).[3] (Table 7-3b, again, offers an adjusted picture of these industries' performance. The key patterns still hold after the adjustments.) These supplier industries also expanded greatly in the number of firms over the postwar period, again at a rate exceeding that for manufacturing as a whole. For example, metalworking machinery added establishments at a rate of 33% over this period, versus only two percent for manufacturing as a whole; the metal stamping/forging industry grew by 16% in its number of establishments. The miscellaneous machinery sector expanded by 23% in the number of establishments from 1967 to 1987 while manufacturing establishments as a whole declined by almost one percent (see Table 7-6). Finally, the location quotients for these "supplier industries" also indicate growth or at least a stable concentration over time--and a greater concentration in Illinois versus other regions (i.e., the location quotient is greater than "one")(see Graph 7-2 and Table 7-5).

That these three "supplier industries," specifically, are also heavily represented within Chicago's metalworking trade association leads me to conclude that this "horizontally oriented" collaborative network heavily influenced this favorable outcome. In Appendix 7-2, I show the four-digit SIC sectors that are represented in Chicago's metalworking trade association (according to the trade association's 1984 statistics). Tool-and-diemaking firms (SIC 3544)--as the founders of this association--are heavily represented; they comprise 46% of the association's membership. Tool-and-die firms in Illinois performed even better than

[3] Statistics for this industry were not reported at the state level in 1958.

metalworking machinery producers (SIC 354) as a whole--adding 36% to their job base over the postwar period, which compares extremely favorably to all of manufacturing which declined by 13%. Together with metal stampers and machine shops, these three four-digit sectors (SIC 3544, 3469, and 3599) equal almost 70% of the trade association's membership.

While there is no definitive way to link up the activities of this region's trade association with the success of these industries, the evidence surely does not rule this out. The metalworking trade association collaboratively fostered a quality standard among its members throughout much of the postwar period--as I discussed in detail in the previous chapter. Its training, technology, marketing, and other programs have been utilized by a large subset of these supplier industries within the state. Even though the trade association's traditional craft standards weakened somewhat in the recessions starting in the 1970s, rising and/or stable location quotients for these supplier industries indicate that this cluster of metalworking sectors was able to continue to strengthen its role within the United States at large in spite of this.

Why would employment be growing in these supplier industries in the postwar period? Growth could have been brought about along with the postwar boom and high demand for metal parts during the Vietnam War. This trend is easy to see in the data (see Table 7-3a) with the supplier industries growing heartily in the 1960s and declining afterward. Yet, some of these supplier industries recovered and grew again in the 1980s--during the decade when the large-firm-oriented customer industries severely contracted--or at least performed at the average rate for all of Illinois manufacturing in that decade. So the early boom does not entirely explain postwar performance in the supplier industries. Growth could be due to customers from other regions coming to Chicago for its metalworking and/or enhanced business from Chicago's customers as they downsized their local operations or moved their assembly activity out of town. My interviews corroborate both of these trends, yet, their industry-wide incidence is difficult to substantiate quantitatively. Nevertheless, one can assume that customer firms wanting to employ Chicago's metalworking suppliers were attracted, in part, because of quality. And, again, the metalworking trade association played a part in improving these same suppliers' operations.

The main critique of the trade association's contribution lies in the dismal performance of Chicago's customer industries. Although the trade association appears to have strengthened the hand of its metalworking supplier members, its involvement with customers' captive shops had not reformed--as witnessed by their weak performance--these same customer firms. Thus, the trade association's model of collaborative manufacturing did not transform an entire region's philosophy of manufacturing--did not produce a widespread acceptance of collaborative manufacturing as others have found in other regions in the world (e.g., Silicon Valley, California). Regardless, this disaggregated statistical evidence does suggest the trade association may have achieved much in building a "world class" supplier network within this region--a network that is now being contested or supplanted by its very same customer firms. How exactly have the region's customers constructed their own supplier networks? Why would they not join forces today with Chicago's metalworking trade association?

"Competitive Selection" for Corporate-sponsored Supplier Networks

At the same time that Chicago's large customer/manufacturers are encouraging metalworking (and other) suppliers to upgrade their operations, they are significantly narrowing down the number of suppliers with which they do business. Customers want to build stronger and trusting relationships with fewer suppliers to ensure their loyalty and the open sharing of information. Yet, customers' "competitive selection" of only the "best and the brightest" of the region's supplier pool is, at the same time, weakening the collaborative ties that historically have existed **among** suppliers in this region. The establishment of vertically oriented "customer-sponsored supplier networks" is having the effect of increasing cutthroat behavior among all suppliers in the region. Some large customers are building up their own supplier networks at the same time that they are withdrawing their membership from Chicago's horizontally oriented metalworking trade association. Let us see how customer demands for supplier improvement are weakening the metalworking industry's overall cohesiveness and inducing a new cutthroat mentality to emerge.

There are a variety of ways that today's large manufacturers are weakening "horizontal" collaboration among regionally based networks of suppliers--such as among the members of Chicago's metalworking trade association. We see that the selection process itself is dividing Chicago's supplier base into two camps--a set of preferred suppliers and the rest--which are "unpreferred." Furthermore, corporate selection of suppliers takes place world-wide. Collaboration among a small select pool of suppliers--and they with their corporate mentor--may be heightened, but the bulk of suppliers in regions like Chicago are pitted against lower-cost producers around the globe which pressures suppliers' margins as well. Finally, multinational manufacturers treat their preferred suppliers today much as they had their captive shops in the past. By constructing exclusive relationships with these suppliers, they close their doors to participation by the rest. All of these trends increase corporate control over the suppliers and the supply chain while eroding interfirm collaboration of a "horizontal" nature in regions like Chicago. Let me explain in greater detail how these trends are taking place.

Today's multinational customer firms are constructing their own "network strategy" by, first of all, selecting a preferred pool of firms with which to collaborate and do business from among all suppliers in the regional complex. Customer firms are weeding down their suppliers drastically to only those that meet tough standards for quality, service, and delivery.[4] While "competitive bidding"--that is, taking quotes from multiple suppliers to bid down their price--is no longer followed as it was at times in the postwar period, "competitive selection" acts to provide similar pressure on Chicago's supplier complex at large. By limiting the preferred supplier pool to a small proportion of all suppliers in the region, for example, customer firms pressure both those whom they do not chose along with those suppliers they do select. Suburban Chicago-based Motorola has cut its former list of suppliers by ninety percent--it now contracts exclusively with a chosen ten percent (Interview, Motorola official). Several metalworking suppliers that I interviewed mentioned that their larger customers in the auto and other consumer durables industries have narrowed their supplier pools down to a similar fraction (i.e., about ten percent).

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[4] Price, while not part of the initial selection criteria, is implicit. Preferred suppliers are expected to bid within the regional average; customers are acquainted with the going rate so know when a supplier is being dishonest.

These pressures on both chosen and non-chosen suppliers can be substantial. While some large customers give a measure of security to their selected suppliers (e.g., longer term contracts to stimulate their investment in new technology), this security can be fleeting. For instance, multinational customers constantly review their suppliers as to performance. If a preferred supplier does not comply with customer demands year to year, it will be dropped from the pool and replaced by a supplier willing and able to meet these demands. Thus, competition between metalworking suppliers in the region is heightened as each supplier vies to maintain its preferred supplier status with a multinational customer firm. Customer demands should improve suppliers' performance; however, "competitive selection" also induces a kind of cutthroat mentality among suppliers at large much like the bidding wars of the past. Individual suppliers that have not yet been chosen by a Motorola, Ford, GM, or other large customer firm remain worried. Many are "giving away" their tooling (i.e., producing tooling for customers at a very low cost) to entice the customer to come back with an order for the production work that utilizes the tooling; firms reported that supplier-to-supplier collaboration is at an all-time low.

A second mechanism which allows multinational manufacturers to gain greater control over suppliers' operations and costs has been to set up supplier networks which are global in scope. As one multinational manufacturer (Motorola) told me, they are establishing collaborative linkages among their suppliers--grouped together by industry. Thus, all sheet metal fabricators, for example, are encouraged to share information among themselves in order to disseminate new technology and increase innovation. Yet, the suppliers in this network are scattered globally; exchanges are carried out, for example, between one supplier firm in Chicago, one in Florida, one in Taiwan, and one in Mexico. Not only is the relevant network from which the customer draws the world, but suppliers are now also integrated into the global scene. Many of the firms I interviewed reported that they shipped their parts to their American-customer-owned assembly plants in either Canada or Mexico. While Chicago suppliers currently exceed their Mexican counterparts in metalworking skill and the ability to make more complex metal parts, all understand that once Mexican suppliers upgrade their expertise Chicago firms will lose out because of their higher labor and other costs. I will discuss this issue of globalization more in a later section. In this way, multinational customers have joined the pressures of foreign outsourcing--and competition among the world's supplier regions--to a "network strategy." Global supplier networks weaken the collective voice of a regionally-based supplier network and force Chicago's suppliers to compete with, and be compared in terms of quality and cost to, suppliers from other countries.

Not only does the supplier selection process and the global nature of supplier networks grant multinational manufacturers greater control over suppliers' operations and costs, but so too do customer expectations for the growth of their preferred suppliers. With a reduction in the number of suppliers from which they now draw, customer firms look to do "one stop shopping" from those that are selected. In the past, most metal suppliers focused on a narrow and highly specialized product niche. Customers encourage today's preferred suppliers, by contrast, to develop a wide range of product lines and multiple process capacities so that they can minimize supplier contacts and related contract administration. This duplicates existing capacity within the metalworking complex at large as preferred suppliers add functions that non-preferred suppliers are already ready and waiting to do. For instance, one supplier I interviewed started out in the 1960s as a sheet metal fabricator. Selected as a preferred supplier to Motorola in the 1980s, this firm added a metal stamping operation and most recently its own toolroom. Several other metalworking suppliers are diversifying in the opposite direction--starting with toolmaking and adding the production of precision metal parts and, later, assembly of these parts into the final product.

In many ways, customers now treat their preferred metalworking suppliers as an extension of themselves. Customers push their suppliers to upgrade and expand their physical plant and machinery, their management procedures, and their administrative bureaucracies, to more closely meet the customer firm's needs. These changes often grant the customer/manufacturer greater control over supplier operations and costs. For instance, information that suppliers collect in order to serve their customers better (e.g., SPC statistics tracking the variance of parts on a production run, or a computerized inventory listing of metal parts in the contracting and drawdown process, or computer programs of the design of particular parts) is readily available for the use of and monitoring by the customer firms. Some suppliers have actually been purchased by the large customer to ensure a steady supply of parts when the customer requires them.[5] As might be expected, this close relationship of control by the larger multinational customer can prove beneficial to the selected supplier.

[5] One firm I interviewed that produces precision metal parts was bought by a larger manufacturer in the late 1970s. The manufacturer wanted to upgrade the technology in its in-house machine shop but faced worker resistance so it bought the outside supplier instead. The outside supplier sells twenty percent of its volume to its parent firm and meets the parent's other requirements, yet it must also act as an independent profit center and pull in the remaining eighty percent of its business on its own.

The preferred suppliers I interviewed reported doubling or tripling in size (in terms of employees and business volume) within the last five to ten years by meeting their customers' demands. Parts production is the activity which attracts long-term contracts from customers. These suppliers then add subsidiary operations as they grow and are encouraged to by their customers.

The Cost of Compliance with Customer Demands: Prosperity or Dualism?

In addition to subdividing Chicago's metalworking industry into a preferred and non-preferred pool of suppliers, the multinational customers' demands on their suppliers today also confer sizeable costs and risks on all suppliers in the short run. However, only those firms which the customer/manufacturers eventually choose to do business with are able to recoup the compliance costs in the long run. As the firms I interviewed told me, most metalworking suppliers currently are making sizeable investments in new quality assurance programs, new inventory procedures, implementation of new broad-based management plans and the like. Yet, only suppliers that customers select to be among the ten percent (i.e., the preferred pool) are steered long-term contracts and expanded business volume which allow them to eventually pay back these investments. Others are making the required changes, yet are limping along finding a way to pay for them. In fact, these new customer demands and costs are marginalizing a whole segment of Chicago's metalworking industry--those suppliers which remain "non-preferred" and unselected by a major globally-based customer firm. What are some of the costs and risks associated with this new set of production arrangements?

First of all, the new parts inspection, inventory systems, and management procedures that customers now require of their suppliers necessitate substantial out-of-pocket costs to put in place. Statistical Processing Control (SPC) measures are costly, as is the training that suppliers must provide to the machine operators to implement them. Customers' quality-rating systems require an initial cash investment by suppliers in documenting and upgrading their procedures, as well as substantial time being "rated" annually by staff teams who visit from their customers.

For instance, one supplier said that GM visits his plant for a week each year, as do each of its other large customers. Each customer has their own standards--so documenting compliance can be quite time-consuming as the supplier has to prepare for each of these visits separately. Another supplier (a toolmaker and stamper) stated that it took two years of work overhauling his management structure before he satisfied GM's production certification requirements and it will cost him $50,000 more to become ISO 9000 certified to meet the specifications of another customer firm, GE Medical. (This company did $6 million in sales in its recent peak business year--in the late 1980s.) The changes he has gone through so far enabled his company to gain some contracts from large auto assemblers. Yet, he is still not a sole vendor for any of these customers and since they continue to narrow their supplier lists down, this supplier worries that his current customers will dump him. This supplier stated that Ford, for instance, cut back from 30,000 to 3000 suppliers, he estimated; it is now working to decrease this further to 1000 suppliers. While the numbers he quoted may not be exact, the idea is--customers are continuing to weed down their supplier pools to less than ten percent. Suppliers that have not yet achieved sole source status--such as this firm--state that customers dictate to suppliers their production standards, they inspect suppliers' shops and management features for compliance, and once certified for quality customers still pressure suppliers to compete on price. Other suppliers also stated that price remains a consideration. The quality and service have to be there or customers will not work with a supplier at the start--then the customer can compare among all these top quality suppliers on price.

Suppliers that I interviewed differed on how ruthless they thought customers behaved in regard to price comparison. Some customers (e.g., Motorola) remained knowledgeable about "going" or market prices for their various suppliers' work but they did not directly pressure their suppliers into competitive price bidding among themselves; other did. In fact, certain Japanese and European manufacturers require annual price reductions from their chosen suppliers, several suppliers told me. These mandated price reductions of about five percent annually were supposed to come out of the supplier's increased efficiency savings for making improvements. This proved problematic if the supplier initially obtained the bid by underbidding (i.e., below cost) to beat out his or her competition--as was often done.

Secondly, while many of these new business procedures entailed an initial cost, suppliers expect a payback once they attract increased volume from existing or new customers. Other customer demands, however, merely add to the suppliers' costs and are not recovered. In this case, the supplier is compensated by merely retaining the customer's business it had previously. For example, this can be the case with Just-in-time inventory procedures. For the JIT system to work, suppliers--such as Chicago's metalworking firms--must produce smaller lots of parts on a more frequent basis so that they do not begin holding inventory for the customer (and carrying the cost). Although working toward this goal, none of the metalworking subcontractors I interviewed have been able to achieve it and instead often hold inventory for their customers. Either the supplier's product gets tied up due to lags by their own upstream suppliers or the window for turning the product around to the customer firm is impossible to meet. For instance, one metal stamper told me that one of its customers--Motorola--had a standing order with them for 327 different parts, from the supplier's Texas plant. A truck delivered parts to the Motorola plant twice a day; the stamper would get a call two hours before this, letting it know what mix of the total 327 parts would be picked up. As the daily pick-up could include five parts, or all 327 parts, there was no way for the stamper to meet the order without having a sufficient number of all parts on hand as inventory. It would be impossible in the two hours to actually produce the daily mix of parts.

Holding inventory can be risky, as well as costly, for the metal subcontractor--as the customer firm can stop or change an order at any time. Although a customer today may agree to purchase an annual supply of parts, by the terms of the purchasing contract the customer actually only promises to buy from one to three months of the product. That is, if an order is canceled midway through the year, the customer will pay for, say, the next month of parts only. Customer firms' annual projections--the amount they supposedly "commit" to--are also known to be fairly inaccurate, say suppliers. Thus, long-term customer contracts for parts may turn out to be much less than long-term--depending on the customer's own market situation. If the subcontractor has produced in anticipation of its customer's needs but the customer changes its mind midway through the year, the subcontractor is left holding unsold inventory. However, producing a sufficient number of parts for the customer ahead of time can also lessen costs for the metalworking supplier in that it requires only one set-up (and the labor time associated with this) to get the machinery ready for a long production run compared with many set-ups for short and frequent runs. Thus, there is a storage cost to holding inventory and a labor cost for not holding it; the metalworking supplier will experience increased costs either way. So metalworking shops may not comply fully with the JIT logic because it is less costly for them to take the risk of holding inventory.

What does all the foregoing suggest? What I would argue is that Chicago's metalworking trade association is facing a set of conditions today that are similar to those it dealt with in both the mid-1920s and mid-1950s. Cutthroat behavior among all metalworking suppliers in the region is again on the rise and--while it at times focuses on low price and at other times on non-price-related supplier behavior--this new episode of cutthroat behavior dampens horizontal collaboration among suppliers at large. Furthermore, although some suppliers today are profiting handsomely by meeting their customers' demands, others may not be--depending on the position within the production chain they have been able to negotiate for themselves. One could counter that this competitive behavior is what suppliers in this region need to push them into becoming higher quality producers. But, it is exactly when competition gets out of hand that the trade association has been most effective historically. By setting a group ethic for collaboration--as well as for quality workmanship--the trade association has been able to ensure that the risks and returns from industrial production within the region are more equally distributed among metalworking producers as a group. Such ethical standards also discourage marginalization of the supplier base as a whole and instead try to raise the performance of each firm simultaneously. While the customers' vertical supplier networks and the trade association's horizontal version both try to improve performance and encourage long-term investment activity, they differ on how the returns of these activities are distributed and whether newcomers and others at the "bottom of the supplier pile" gain the support they need to progress as well. Since customers want their supplier networks to help them--the customer/manufacturer--to do well, customers only expect to collaborate with the specific supplier they need to assure them of a well-designed and quality product. In other words, customer-sponsored supplier networks aim to solve the specific production problems of a single lead firm. Collaboration within the trade association has a different goal. It is to encourage a wider spread of information, techniques, and mutual support activities among the entire metalworking industry in order to stimulate new developments, innovation, and progress in this industry over time. Hence, with the trade association acting as "lead firm" for Chicago's metalworking supplier industry, "industrial dualism" with small suppliers at the bottom of the complex is avoided or at least much less pronounced. What trends currently challenge the trade association's ability to continue to provide this function to the metalworking industry today?

III. ISSUES THAT CONFRONT THE METALWORKING TRADE ASSOCIATION IN ITS CURRENT STRUGGLE TO REMAIN "LEAD FIRM" IN THE CHICAGO REGION

I highlight two critical trends facing Chicago's craft-oriented metalworking industry today. These trends require that the trade association rethink its historical approach to organizing this industry. It must develop a new conception of the metalworking craft community and the labor process in order to continue as a reinvigorated and horizontally oriented trade association. I first discuss how cost pressures and new technologies threaten the traditional craft orientation of this trade association as firms "deskill" the labor process. Following that, I highlight how the globalization of much of manufacturing activity today is also challenging the future of Chicago as a metalworking supplier hub and requiring a new conception of local supplier networks. Let us look at each of these issues in turn.

The Pressures of Low Cost Versus Maintenance of the Metalworking Industry's Craft Heritage

Although there is much talk today about how quality oriented manufacturing necessitates a higher skilled and trained workforce, other pressures are inducing Chicago's precision metalworking shops to "deskill" their labor process. As I discussed above, in order to compete today, American manufacturers find they must adopt a flexible and quality oriented manner of production--in contrast to the low cost, lower quality, mass production model they might have pursued earlier. Flexible production is thought to require use of a wider trained and higher skilled workforce than mass production; one that is able to solve problems on the shop floor in order to create high quality and innovative products (Kaplinsky, 1988; Wood, 1989; Appelbaum and Batt, 1994). Yet, there are considerable cost pressures on today's manufacturers, like Chicago's metalworking firms, as well--both due to lower wages and costs in competitor countries (e.g., Mexico) and "competitive selection" among domestic suppliers. These cost pressures are pushing Chicago's metalworking suppliers--which had started as high-quality and high-skilled producers--in the opposite direction toward "deskilling" their labor process. As such, they are a continuation of some of the cost pressures of the 1970s. These developments threaten the craft heritage of the metalworking industry, along with the trade association's collaborative and high-skilled ethic. How can the trade association organize "skill" in such an environment? Let me briefly describe this dilemma for you here and the trade association's possible opportunities for recreating a craft community today.

Given that many metalworking suppliers are experiencing increased costs due to servicing the new demands of their customers, as I showed in the previous section above, many are reorganizing their labor process to survive in the cost-squeeze being placed upon them. These changes, in effect, shift "costs" further down the chain onto labor--a process that had started earlier as I explained in the last chapter. There are two ways in which Chicago's metalworking firms are cheapening the cost of labor. In the first instance, the high skilled tool-and-diemaking shops are shifting away from the use of highly-skilled generalist machinists or toolmakers for all jobs. Instead, they are relying on lower-skilled and lower-paid specialists. I noticed this increase in the use of specialist workers most in the highest skilled operations (e.g., tool-and-die and mold making firms). Here, the high degree of skill embodied in making a metal die, for example, requires the use of very costly and fully trained tool-and-die makers. These workers experience a long apprenticeship before they become journeymen. Whereas it may take from three to five years to train an "all-around," generalist machinist, it takes several additional years to train a tool-and-die maker--generally considered the highest skilled machining occupation. Common wisdom also says that a tool-and-die maker needs to be working for at least ten years at the craft to be fully qualified.

One firm in my sample, which credits itself with being one of the first in the Chicago region to reorganize its labor process, used to hire primarily tool-and-die makers to do everything in its toolroom. That is, the firm owner would assign each toolmaker to a particular job and expect him or her to carry out the different machining skills needed to complete it. This meant, however, that some highly paid toolmakers might spend a large portion of their day grinding or doing essentially lower skilled work as part of a particular project. Given the cost-squeeze that all metal subcontractors are feeling today, this manner of production became too expensive, and possibly too slow, to meet the customer/manufacturers' new requirements. Instead, tool-and-die shop owners now assign their toolmakers the responsibility for completing a particular job, but expect the toolmaker to distribute the various parts of the work internally to other specialist machinists and then assemble these pieces at the end into the final part. The toolmaker in many firms is becoming the head of a system of internal contracting. He or she is responsible for the work of lesser skilled and lower-paid machinists and, in return, reports to the owner or foreman of the firm. Even though specialist workers still embody much metalworking skill, this model for work organization inside precision metalworking firms partly "deskills" the traditional tool-and-diemaking craft labor process as compared to what these shops followed earlier.

Secondly, in lessor-skilled shops that do not require craft workers, shop owners reduce labor costs in other ways. In these firms, the main mechanism for deskilling a portion of the workforce (and, therefore, producing some savings on the wage bill) is through the use of computerized production machinery. Once CNCs (Computerized Numerically Controlled machinery) have been installed, the higher skills needed to plan a job (now embodied in the programming of the machine) can now be separated from the actual machine operation. As mentioned in the previous chapter, CNCs like NCs before can be employed to upskill or deskill the labor process, depending on who does the programming--worker or shop owner.[6] Some machining job shops today, however, retain the programming function to be done by the owner or other office or supervisory staff. Workers in the shop are left with the tasks of installing the program, operating the machine, and occasionally changing tools to adjust for wear during the production run. As one firm owner said--you now need only two or three good machinists to program the "smart" machines and lower-skilled people to run them. He continued by saying that firms are retaining a core group of people to keep the company running--and bringing in other (peripheral) workers as needed.

These peripheral workers increasingly are the new immigrants coming to Chicago--workers from Latin America and Eastern Europe.[7] These immigrants are lesser-skilled than their forebears in the metalworking industry--that is, the German craft workers at the turn of the century--yet they are highly suited in today's competitive environment for other reasons. They are extremely loyal, hard-working, and productive (in terms of work effort over a period of time). As one shop owner mentioned--when comparing his domestic workforce in his

[6] And even--customer versus the shop owner; some metalworking shops are merely now transferring the machining directions direct over the line from their customers' programmers. This obviates any guesswork on the part of the metalworking supplier--worker and owner alike--and minimizes the skill required in the supplier's shop.

[7] Although metalworking shops employ a variety of immigrants, Poles and Mexicans predominate as the labor source of choice. Each firm tends to specialize in one or another ethnic immigrant group as a source of production labor. Since labor is recruited by word-of-mouth, or through informal networks, once one immigrant worker is hired--for instance, from Mexico--then a continuous supply of Mexicans then becomes available.

suburban plant to his immigrant one in the city--that he thought immigrants work harder because they have fewer alternative job options than do, for example, suburban native youth.

What is the place of skill, therefore, in this environment? With the elite craft of precision metalworking (with tool-and-diemaking at its core) being eroded because of these developments, how can the trade association and its member shops continue to think of themselves as a craft community of skilled workers and shop owners constantly in search of a way to improve the groups' knowledge and quality standards? Clearly, the new metalworking technologies can be employed in a way that erodes the metalworking craft knowledge that needs to be embo in the worker.

Yet, at the same time that changes in technologies and cost pressures are inducing critical changes in the labor process--rendering the traditional craft model obsolete--other developments present new opportunities for recreating a community of "craft" workers and shop owners. This is not the first time production methods and skill have been rendered obsolete in this industry's history. In the 1920s and even earlier, for instance, the machining craft that had its home in the precision-oriented machine shops of the day faced extinction from mass production methods and technologies (including the organization of work into large integrated plants). Yet, mass production depended on tool-and-diemaking to achieve its success; Chicago's machine shop owners and workers flocked to this new skill area and resurrected a craft community around it. In the 1960s, NC (numerical control) presented a similar challenge--as does CNC and the "disintegrated" methods of production today where much of the risk is passed downward onto the small supplier. With the NC challenge, the trade association learned to embrace the new technology (and skill it incorporated) in order to organize how it was employed more broadly in manufacturing in the region. The trade association also began to control worker training and credentialling in this new technology through its apprenticeship training program. By disseminating information on the new technology to shop owners and operating training programs in it for workers, the trade association began to recruit and organize a new craft community--around this new technology-with itself at the center as the "lead firm" or organizer of this new skill and the ethics, returns, and conditions surrounding its employment.

Even in today's environment, where the labor process is "deskilled" versus previous decades--new skills are involved in the restructured production process that the trade association can organize into a horizontally oriented and collaborative craft community. At minimum, immigrant workers on a CNC production line receive training in SPC[8] production methods and, therefore, represent a more self-conscious and responsible worker than machine operators in big mass production plants earlier. To the extent they can be integrated into a craft--or apprenticeship--ladder, they can be organized to become part of a larger metalworking craft community that provides higher returns to those who work their way up this skill ladder. The trade association has recently begun to organize these new, lessor-

[8] Statistical Processing Control methods, whereby the workers measures and corrects for machine deviations from blueprint specifications. These classes are currently often held in Polish and Spanish for Chicago's new metalworkers.

skilled "rungs" on the occupational ladder[9] along with firms interested in employing the new metalworking technologies.

More specifically, during the 1980s and 1990s, the association has diversified its training activities into the screening, selection, and training of lower-skilled specialist and immigrant labor.[10] The association has also broadened its traditional apprenticeship activities (e.g., established a Metalworking Trades Foundation to foster improved metalworking vocational education in schools throughout the region). And, at the same time, the association continues to offer its training program for skilled metalworkers, and significantly upgraded and expanded these activities. Thus, for instance, the association instituted minimum entrance qualifications for its trainees; it increased math in the curriculum and decided to group its trainees by ability; it added courses on NC (Numerical Control, or computerized metalworking machinery) and EDM (electrical discharge machining) to its basic machinist apprenticeship program; and it moved its training program to a community college to raise its image in the region.

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[9] In lieu of the Machinists Union opting to focus on an industrial model of organizing from the 1940s and 1950s onward, the trade association has partly assumed some of the functions of organizing craft labor in the metalworking industry. They also assumed these functions as a substitute for a unionized, or closed, shop as anti-union sentiment grew within this craft community from the 1950s on. Hence the trade association recruits, trains, and certifies craft labor for the metalworking industry. Yet, because it is now an association of shop owners, it now plays an ambivalent role in regard to workers' welfare. It wants highly trained and responsible craft workers who, however, are not organized on their own nor militant.

[10] For example, it provides some training programs in Spanish.

In the past few years, the trade association's Technical Committee[11] has also implemented a series of projects to put the association and its members at the leading edge of new technological developments in metalworking. Rather than remain outdated, undercapitalized, and marginal players--or dependent on multinational firms for access to these new technologies--the Technical Committee attempted to control the upgrading of the region's metalworking industry on its own. Therefore, the association's Technical Committee started to hold a series on CAD/CAM (Computer Aided Design/Computer Aided Manufacturing Systems) in this period; it requested "seed money" from the association to establish a computer time-sharing and software development group; it decided to reinstate its technical seminar series on such topics as quality control, flexible manufacturing cells, robotics, and JIT ("just-in-time" inventory systems); and it conducted a joint research program with Northern Illinois University comparing productivity among various firms in its membership.

These activities of Chicago's metalworking trade association are helping the region's small metalworking shops become more flexible, quality-minded, skilled, and knowledgeable about the new metalworking technologies in order to attract multinational customer firms which operate at the level of the global marketplace. They also signal a desire of the local shops to control the new areas of knowledge about metalworking production processes, and

[11] The Technical Committee fell into relative inactivity and dormancy from the mid-1970s to the mid-1980s during the worst of the recessions when metalworking shops reverted to using the skills of their craft workers rather than the extremely costly early generations of computerized metalworking technology. However, once the economy rebounded and customers appeared interested again in product quality and innovation, this committee again "took off."

access to appropriately trained metalworking labor, by becoming a key repository of such knowledge within the region. Why is it critical for this group to reformulate the new labor process along the lines of a "craft" model and maintain its hold on craft skill and expertise? Let us look at the role of this expertise within the global manufacturing environment.

Chicago as a "Job Shop Town" Versus the Globalization of Manufacturing

There is much support for the idea that flexible production will lead to a "reregionalization of production" (e.g., Sabel, 1989). Given the shortened product runs, more rapidly changing consumer tastes, and emphasis on higher quality in production, customer/manufacturers seek to co-locate near their suppliers to draw more easily upon their engineering expertise and to organize tightly controlled joint JIT production schedules (Brusco, 1986; Scott and Storper, 1987; Gertler, 1993). Yet, in the Chicago context at least, there is simultaneously much continuing movement of manufacturers offshore to production sites such as Mexico. This is pushed by lower labor and other costs in the Mexican case[12] and the recently negotiated North American Free Trade Agreement (NAFTA). Given these twin trends, we must ask whether this means an eventual undermining of the metalworking industry in Chicago as their large customer/manufacturers build new supplier agglomerations closer to their new factories in Mexico. In other words, does the rise of corporate-controlled supplier networks and the need for co-location ensure that new supplier complexes will be established elsewhere?

[12] Mexican manufacturing wages dropped from one-third of those in the United States to about one-tenth over the early 1980s (TMA Report, 1984; Merrion, 1990).

Based on my interviews with Chicago's metalworking firms, I see two answers to this set of questions. On one hand, new supplier complexes are already being constructed further south, around large American manufacturers that have moved to the southern U.S. and/or to Mexico. Some Chicago metalworking firms have opened branch plants in these new locations to better serve their customers there; their owners foresee continual movement of supplier functions to these new locations as well. On the other hand, however, many of these same metalworking shops are experiencing a growth in sales to customers that moved away. Distant manufacturers continue to purchase parts from Chicago's metalworking firms because the parts they produce incorporate unique skills that only Chicago firms offer. To the extent that the trade association can continue to foster improvements in metalworking knowledge and expertise among the bulk of metalworking shops in this region--through its various support activities--manufacturers will continue to "shop Chicago" for such parts and skills over great distance. Again, an organizing task is required of the trade association to overcome the challenge of globalization. Let me explain in greater detail for you here how these twin pressures of "co-location" and "globalization" are affecting business in Chicago's metalworking industry.

As I have already reported earlier, the deindustrialization crisis in the 1970s and 1980s in Chicago and much of the United States stimulated many large manufacturers to close their domestic operations and relocate production to lower cost regions such as the American South, Mexico, and the Far East. The move toward U.S.-owned offshore assembly plants began its ascent in 1965 with the joint U.S.-Mexican governmental agreement for the maquiladora program. Mexico obtains low-skilled assembly jobs for its citizens; American companies are allowed to import parts for their maquiladora factories duty free (Prudowsky, 1989). Motorola, which is headquartered in Chicago, opened its first Mexican subsidiary in 1969; American auto parts "maquiladoras" opened in the late 1970s; in recent years, Chicago-based but British-owned Stewart-Warner Corporation closed down its last production facility in the Chicago area and moved lock-stock-and-barrel to Mexico (Giloth and Mier, 1989; Wilson, 1990). Maquiladoras saw phenomenal growth in the 1980s; they more than tripled their total employment since 1982 (Merrion, 1990). One researcher has estimated that Illinois lost over 20,000 jobs to "maquiladora" factories along the U.S.-Mexican border, many of these from the Chicago region (Prudowsky, 1989).

This New International Division of Labor allowed multinational corporations to site low-skilled operations (e.g., auto assembly) in low-wage regions of the globe so they could continue to successfully compete against newly industrializing countries (see Froebel, et.al., 1978). These low-skilled, low-wage foreign operations ran along mass production lines where quality of the product was ensured by weeding out defects as they occurred in the assembly line (rather than correct them). Thus, these low-skilled foreign plants were low-quality but highly profitable operations. As other competitors (especially the Japanese) invented production lines that cut defect rates drastically by utilizing higher skilled labor to correct shop-floor problems, many predicted that production would return to the United States. Yet, even in today's shift to such quality oriented and flexible production methods, many of Chicago's and other American manufacturers remain abroad to continue to take advantage of cost savings and access to the Mexican market (Interview, Motorola official, Samsonite official). They continue to assemble metal-related products overseas, while adopting flexible manufacturing techniques there, and others are still moving to Mexico (Interview, Samsonite official; Merrion, 1990). In the early 1990s, for instance, industrial recruiters regularly came to Chicago to entice manufacturers to open plants in the maquiladora border sections of the country. NAFTA is stimulating other multinational manufacturers to move "nearby" to Mexico rather than to manufacture their products farther away in the Far East (Interview, Samsonite official).

This movement abroad has stimulated some metalworking supplier firms from Chicago to open subsidiary operations in these other lower cost regions to be closer to and more efficiently service their customers who have moved there. While only ten percent of the metalworking suppliers I interviewed have opened such branch plants in the south or abroad, others reported investigating such possibilities.

Other metalworking suppliers I interviewed, however, reported that they still service many of their former customers as before but they currently ship their parts greater distances--directly into the assembly lines of manufacturers in Canada and Mexico. Why would multinational manufacturers that operate freely in a global context today--and for whom speed of delivery and proximity to suppliers for JIT is at a premium--want to continue to come to Chicago for metal parts and components? They come to tap into the engineering expertise of the metalworking industry as a whole--more specifically, its tool-and-diemaking function. To explain this, I first need to discuss in some detail how the high-skilled toolmaking function fits into the production process.

Toolmaking firms--which formed the core of Chicago's early metalworking trade association in the 1920s through subsequent decades--produce customized metal tools, dies, and machinery fittings that allow metalworking machines to do their work. Toolmaking firms also build entire customized pieces of machinery for other firms that carry out the production process. These other firms produce a variety of metal parts that later get assembled into a complete consumer product. The skill required for each subsequent phase of this process declines the closer to assembly one gets. Therefore, toolmaking is the highest skilled segment of this production process. Many of the metalworking shop owners with whom I talked explained the pivotal role of the toolmaker's expertise in running an efficient parts production line today. One owner, for instance, whose shop designs tooling and carries out some production stamping work, said that "with designing a tool, you do your best effort and get one chance to do it right... but you can always get an improvement on a tool during a [production] run." The toolmaker can always change how they put the tool in and use it in a stamping press, for instance. The more runs the toolmaking firm makes with a tool or die, the more efficient that production run gets through "fiddling" with the tool or die, or adjusting it to run faster and with fewer mistakes, this same shop owner stated. Because of this superior metalworking engineering expertise--and the fact that tools and dies are being built to be more complex--many small toolmaking shops are being asked to expand into stamping and even assembly work. The owners of one of the largest toolmaking shops in the region that exclusively builds customized tools and dies described how their customers are pushing them into diversifying. This toolmaking shop owner said that:

> The customer, on the whole, is asking for a more complicated part from us... One of our customers (a stamper for GM) wanted us to make a very sophisticated die and to run the part for them. We had to put together an SPC system just for that job... We did the tooling and then got an outside stamper to actually make the part. We

furnished the stamper with the gauges they'd need, and when the run was completed, we shipped the part with the SPC charts to GM.

When I asked this toolmaking shop owner why the customer (in this case, GM's stamper) wanted them to run the part instead of doing it themselves, since this is the stamper's line of business, the toolmaking shop owner replied:

> Because it was such a complicated die, there was a possibility for greater part changes and wear [on the die] so [the stamper] wanted us to oversee the production end too. We would know what kinds of problems to watch for [because we made the tool and know its weaknesses].

This toolmaking company has also gotten into final assembly work.

> Our customers are asking for more of this [that we do subsequent operations] because it eliminates any problems that might arise if something cracks. Customers are putting more responsibility on the toolmaker. One company even wanted us to inspect the parts that we made... but I said to them that we'd have to use the same press, metal, lubricant, and so forth, that they were going to use... we'd have to duplicate their production process to be able to say completely accurately that their tool would stand up "x" number of runs. I finally said to them, we're not inspectors... but if you want us to do this, we'll have to charge you a certain amount for this service and add it to the price.

Another company I interviewed has turned this skill of working the bugs out in the initial runs of a production process--by fiddling with the tooling it makes--into a real boon for itself. This company had one parts production and toolmaking plant in Chicago fifteen years ago. It now has two plants in the Chicago area, one in Texas, and one in Mexico. It attributes its rapid growth to servicing its customers by helping them to make their production runs, and its own, more efficient. This shop owner said:

> We are finding that our plants [in the Chicago area] are now gateways to the south. That is, the higher skilled stuff is staying here and the testing [of production runs] is done here... We do the testing of prototypes here. We also do the first production run to work the bugs out. Then we ship [the production process and] work south to our plants there. You see, we have no [tool and] diemakers in Mexico... only stamping operations.

Clearly, one would think that this skill of fine-tuning the parts production process would grant Chicago's small and highly-skilled contract metalworking shops a measure of bargaining power in their dealings with more global actors and customer firms. Yet, does it? Even though the skill of the toolmaker is critical for turning a profit on a production run, these small toolmaking shops are virtually "giving their tooling away," as several suppliers told me, in the hopes of securing more lucrative production (e.g., stamping) work. Why is this skill and expertise not compensated for at the initial stage of building the tooling? Some comments from the shop owners I interviewed again supply the answer.

First of all, it is becoming much more expensive and risky to operate a toolmaking business. Customer demand has stimulated the development of sophisticated tools and related machinery fixtures. For instance, customers want stamping dies to incorporate an increasingly greater number of stamping operations into each die; this helps reduce production time and machine operator error. Toolmaking has been able to become highly sophisticated due to the recent advances in metalworking machinery technology. Computerized technology allows toolmakers to design and produce state-of-the-art tools which were more difficult to produce previously. Because of these two features--that toolmaking requires state-of-the-art machinery and greater expertise because of the demand for more complicated tools and related parts--and because toolmaking requires specialist labor and greater resources to train this labor, it is becoming increasingly expensive to maintain a toolmaking function.

Add to this expense the fact that toolmaking is risky in terms of its ability to earn a profit, and it is easy to see why large firms are increasingly outsourcing this activity. For instance, one toolmaking shop owner I interviewed stated that:

> In regard to tool-and-diemaking, my rule of thumb is that with every ten engineering successes I have, I get wiped out on the eleventh job. ...This is because of the way [tooling] jobs are competitively bid... They are so closely bid that the best I can do is to tie... For example, I might bid 500 hours on a job with a built in profit of seven to ten percent, which I get if I come out correct on the number of hours I've calculated it will take to do the job... But the eleventh job will destroy the profit of all ten jobs ahead of it [because it took longer to make than expected]. ... Last year I made $1 million in die sales but incurred $140,000 in losses [because of this risk].

Furthermore, multinational customers today are able to get toolmakers to bid their premiums way down due to excess capacity in toolmaking currently in the Chicago region. This same toolmaker stated that: "There is unbelievable competition [in toolmaking] today... customers will bid one tool-and-die shop against another... I call it "corporate whining"... all the risk is on the toolmakers today."

One could interpret the situation facing Chicago's skilled metalworking shops in quite a negative light. Multinational firms are bidding their prices down, inducing cutthroat behavior between contract shops, and attempting to control the in-house operations of these small suppliers. Yet, these same multinational firms are becoming increasingly dependent on the variety and depth of skills that Chicago toolmakers and other metalworking shops have to offer. As one supplier explained:

> Chicago is still the metalworking capital of the Midwest. We have steel here... all the technical support services are here (e.g., heat treaters, grinders, platers, braisers, and so forth). This is most important... There are not these types of services in other locations. Around our Mexican plant, there is only one plater in town... the steel suppliers can only offer a couple of types of metals.

This dependency on the metalworking industry's skills can only increase the more the multinational firms "disintegrate" their operations and increase their outsourcing--expecting the small shops to pick up more and more of the phases of manufacturing. The real question here is who will organize this skill and the multitude of small shops in which it is embedded. The toolmaking firm faces an opportunity today to coordinate and control the overall production process, given its greater skill, as well as the threat of being exploited, given its greater risk in earning profits. This opportunity can be utilized by the skilled contract metalworking shops and their trade association to bolster their efforts to become the "lead firm" in organizing this region's industry. However, the shops and trade association must also figure out a way to minimize their threat of being exploited. Is multinational control inevitable or can these small shops employ their bargaining chip of greater metalworking skill and expertise to their own advantage? If the past is any guide, they can.

Conclusion

In this chapter, I have tried to show how even though small metalworking firms are making significant management changes today that should result in long term performance improvements, they do so in an environment that is simultaneously encouraging cutthroat behavior and renewed attention to cost pressures. While suppliers that multinational customers chose to integrate into their vertically structured supplier networks may flourish--receiving enough business from these customers to pay back their costly investments in new technologies, training, and updated managerial procedures--most suppliers in Chicago and elsewhere in the country will not. In many ways, Chicago's historic regionally based supplier network is being replaced by the globally oriented and vertically structured networks of the multinational customer firm. Chicago's metalworking trade association--as the sponsor of the regionally based and horizontally oriented supplier network--is, thus, at a cross roads again. Yet, the new challenges it faces may not be insurmountable if this group of small metalworking shop owners can reinvigorate its collective enclave of the past and, together, begin to organize the market for its skills along terms that are more favorable to the metalworking industry at large. Time will tell whether this collaborative metalworking network can recreate itself again.

CHAPTER 8--CONCLUSION: LESSONS ABOUT MANUFACTURING NETWORKS FOR OTHER REGIONS

Introduction

In this dissertation, I have argued that much of the thinking on manufacturing networks today gives us an incomplete picture of how such networks operate. Because both the flexible production literature and its critique offer stylized images of manufacturing networks that are frozen in a single point in time, their findings contrast markedly. The flexible production literature has painted a rosy portrait of interfirm networks which suggests that manufacturers that collaborate achieve higher rates of innovation, greater market share, and higher returns for all participants. Therefore, forming strong interfirm ties should assist firms, such as those in Chicago's metalworking industry, to do well today. Those who critique this literature offer another point of view. They describe how multinational firms and other global players control interfirm networks to their own advantage, enhancing their market share and bottom line at the expense of others (e.g., small suppliers) in such relationships. Industrial dualism, rather than widespread prosperity in a region is the result of interfirm collaboration here. In this interpretation, small firms like those in Chicago's metalworking industry will be marginalized in these relationships.

Compared to this debate, which has produced a dichotomous rendering of how interfirm networks operate, I have proposed yet a third view in this dissertation that builds off the work of other researchers who look at variations in collaborative practices in other settings. I argue that we must track the record of manufacturing networks **through** time to appreciate the ebbs and flows in their experiences--much as I have done for Chicago's collaborative small-firm metalworking network from the 1920s to today. A longitudinal view suggests a life-cycle pattern to the development of interfirm networks. These groupings of firms and other actors may achieve market success and higher earnings through collaboration at times. But this success also sets up a situation wherein others "outside" the network challenge it and cause its decline--much as the multinational customer firms in the auto, consumer appliance, and agricultural machinery sectors contested Chicago's small-firm-oriented metalworking network periodically over the last seventy years. Chicago's metalworking firms learned to recreate a manufacturing network in response to such challenges by building collaborative bonds among new partners. In this way, this locally tied network of supplier firms has been able to continue to mediate new and changing conditions in its larger, global operating environment.

To conclude the history of Chicago's small-firm-oriented and collaborating metalworking enclave that I offered in this dissertation, I would like to draw some general lessons about networks--as industrial governance mechanisms--as a whole. Before doing so in the latter half of this chapter, I first review how a life-cycle conception of network development allows us to more clearly understand both the past and future challenges to Chicago's locally tied metalworking industry than does the existing literature.

I. HOW A LIFE-CYCLE MODEL HELPS INTERPRET THE CHALLENGES OF THE 1990s

As we have seen in the last chapter, Chicago's metalworking network in the 1990s again faces a rise in cutthroat behavior and a threat to its existence from the vertically organized supplier networks of the region's large customer/manufacturers. The measure of its success as a manufacturing network is whether it--as a group of metalworking firms--can adapt to these changing circumstances and reorganize itself as a collaborating entity that can achieve this industry's particular goals. The outcome of today's bout with the restructuring of supplier relations is indeterminate. Yet, as I have argued throughout, this small-firm cluster's ability to recreate itself in the past heavily weights the odds in its favor today. In this section, I interpret the environment facing Chicago's metalworking industry today from several perspectives. First, I look at how current researchers in the flexible production debate understand these events. Next, I argue that a life-cycle conception offers us greater depth into today's interfirm relationships than has this existing literature. To explain this alternative conception, I summarize how Chicago's metalworking network formed, matured, and then declined in the past. I then draw parallels from this pattern of network development to the current situation.

The Flexible Production Debate and Chicago Metalworking Today

How might those who write about the movement toward flexible production in global manufacturing interpret the changes in interfirm relations occurring in Chicago today? As I have discussed in this dissertation earlier, the two sides to the flexible production debate offer highly contrasting interpretations of flexible manufacturing and the interfirm networks upon which this system of manufacturing relies to carry out and coordinate the various phases of the production process. One side to this debate highlights how multinational firms control interfirm networks to their own advantage while the other describes highly egalitarian network arrangements that foster the adherence of all participants to a "high road" of skill development, product research and innovation, and sufficient returns to all. Some contend that these separate patterns occur in different industries (e.g., Gereffi, 1994, 1995) or regions (e.g., Saxenian, 1994). However, I have found both patterns within Chicago's metal-related complex. We can only understand this by adopting a life-cycle approach to network relations--which I discuss in the next section. In this section, I briefly outline how this debate would interpret events in Chicago's metalworking industry today.

Looking at Chicago's small metalworking shops today, one sees much grounds for pessimism about their role in the production chain and ability to remain global competitors, as I discussed in the last chapter. These metalworking firms are investing significant sums to upgrade their operations and product quality. At the same time, however, each firm is experiencing significant new cutthroat pressures to lower its costs, prices, and wages in order that a multinational manufacturer will select it as a preferred supplier ahead of the rest of the pack. Those who are selected to become the large manufacturers' "quasi-captive" suppliers may grow heartily. Large manufacturers are choosing ten percent or fewer of their former suppliers to continue doing business with today. The ninety percent of Chicago's metalworking industry that these manufacturers do not select face the danger of shrinking sales and profits that are insufficient to recover the investments they have made in the race to become a preferred supplier. Therefore, this selection process may marginalize them into low volume, low return, and eventually low skill/low quality shops. These trends look as if they are producing the pattern of industrial dualism that Harrison (1994), Martinelli and Schoenberger (1991), and others predict. These authors who critique the flexible production literature cite similar instances of multinational control over supplier networks as I found among Chicago's metal-related production chain.

The proponents of the benefits of flexible production would offer another interpretation of these trends of customer-supplier relations that I found in Chicago's manufacturing complex. They would applaud the efforts that all of Chicago's metalworking suppliers are making to collaborate with and meet their customers' needs--that is, by upgrading their quality focus for, their potential to share engineering ideas with, and their ability to provide additional services (e.g., faster delivery) to these customers. This view would predict that interfirm collaboration should lead to increased flexibility in production, enhanced performance, and higher returns to all--as these interlinked firms become more competitive in the global economy. This literature either ignores the cost-squeeze aspect of today's customer-supplier relationship (i.e., it assumes that all firms will supplant their former "low cost" focus in production with an emphasis on "high quality")[1] or underplays it (i.e., theorists describe how firms engage in "competitive cooperation" where overly competitive or cutthroat strains are held in check by cooperation).[2] Thus, both literatures in the flexible production debate--its proponents and critiquers--interpret the restructuring of today's customer-supplier relations in either an overly bleak or overly rosy fashion by freeze-framing these relationships. How might we think of networked relations in a more dynamic sense?

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[1] See, for instance, Sabel's (1993) discussion of how the drive for higher quality goods has fostered a need to reintegrate conception and execution in manufacturing.

[2] For instance, see the discussion of this phenomenon in the introductory chapter in Best (1990) and in Saxenian (1994).

A Life-Cycle Pattern of Network Development Through Time

What I have found by tracking Chicago's small-firm metalworking industry over time is that we cannot automatically predict whether it will experience industrial dualism or "flexible success" in the future. Both happened at times to this manufacturing network, as it followed a life-cycle pattern of development, decline, and redevelopment. By using a life-cycle concept to help interpret events for this industry and its small firms today we can both: 1) allow that large multinational customer firms may be exerting greater oligopolistic market power over their metalworking suppliers today, but that 2) this does not necessarily have to lead to permanent exploitation of these smaller suppliers nor their permanent marginalization into "sweatshops" in the long run. Instead, it depends on how these small firms respond to these multinational customers' demands and whether they can organize a collective network or enclave to protect the industry as a whole from these extreme cost pressures. Perhaps, as they did in the past, the trade association and its shop owners could collectively gain greater control over conditions in the marketplace and terms of subcontracting today by revitalizing the collaborative bonds that historically have brought together Chicago's metalworking craft community. These firms could erect a collective "shelter" for protection against risk and excessive cutthroat behavior and stabilize their industry as before by setting a new set of rules to govern firm behavior. When a life-cycle of collaborative relationships ran its course previously, these shop owners calculated how to construct a new collaborative alliance--and with new partners--that better served them in a changing market environment. I summarize this life-cycle view of network development here and show how it emerged from the historical material presented in previous chapters.

As I explained in the introductory chapter and illustrated with historical material throughout this dissertation, a life-cycle of manufacturing network development occurs for particular reasons. First of all, since interfirm networks serve to create trusting bonds between some firms but not others--they act to exclude "outsiders" from the benefits of collaboration. These benefits may be substantial: mutual support and the sharing of work in times of recession; the dissemination of technical expertise and market knowledge in times of growth; collective protection through group sanctions against unscrupulous suppliers, customers, or competitors; common standards for work quality and ethical behavior in the industry; and protection through group norms against "destructive competition" and cutthroat bidding. Therefore, in these ways, an interfirm network acts as a "shelter" against risk for its partnering firms. I laid out how the owners of Chicago's small metalworking firms originally created such a "shelter," in conjunction with the Machinists Union and Chicago Federation of Labor, in Chapters 2 and 3 previously. We saw how forming a trade association to encourage collaboration among firm owners and workers resulted in a "high road" of skill training for workers, quality standards for metalworking production, and a Code of Ethics to prevent the exploitation of workers and peer firms alike.

Secondly, not only did a network governance structure offer protection and support to these very small metalworking firms, it also granted them enhanced power vis a vis those actors outside the network's boundaries. This set up a dynamic wherein these "outside" actors would contest the metalworking network and cause its undoing--in a life-cycle pattern--as I describe here. By establishing a collaborative network (formed as a trade association), Chicago's small metalworking suppliers and their highly skilled and AFL-unionized craft workers[3] could present a united front in the 1920s against efforts by their larger and more powerful "customer" firms to drive prices and costs to unsustainable levels. "Customer" firms made such products as agricultural machinery, consumer appliances, communication equipment, and, later from the 1940s on, autos. The increase in market power to the network of Chicago's metalworking firms and their workers translated into higher returns for them.

These higher returns, in part, allowed these suppliers to invest further in their highly developed metalworking skills and expertise but also created problems for them in terms of their relationships with others in the region's manufacturing complex. The "outsiders" to this powerful metalworking supplier network eventually challenged it. They included: 1) large customer firms that objected to the high prices of the metalworking industry's--albeit high quality--products and 2) lessor skilled workers who wanted to achieve the wage gains that craftworkers had historically in collaboration with their small-firm employers. The large customers developed a substitute mechanism for their reliance on the independently owned metalworking suppliers--they enlarged instead their corporate-owned, or "captive," metalworking shops and employed the cheaper and lessor skilled non-craft-union labor in them. The latter organized under the banner of the CIO, in part, to obtain the skills and the higher pay rates of the craft workers. Expansion of the "captive" shops took away the

[3] The American Federation of Labor (AFL) started as a federation of craft unions, organized along occupational lines, in the early part of this century. Later, this organization and its philosophy of union structure was challenged by the CIO (the Congress of Industrial Organizations)--an umbrella representing the industrial union model where workers were organized by company and plant affiliation (regardless of occupation). The AFL and CIO fought over the right to organize manufacturing companies in the 1940s but combined into the AFL-CIO in 1955 (see Morris, 1958; Galenson, 1960; Newell, 1961; Derber, 1989; Cohen, 1990).

markets of the independent metalworking suppliers--customers were making their own parts instead. Expansion also caused the demise of the metalworking network by fostering pressures on it both from within and without, as outlined in Chapters 4 and 5. Metalworking firms, and their owners and craft workers, all ceased cooperating in this contested environment.

As I also argued in subsequent chapters (6 and 7), Chicago's metalworking suppliers were able to rebuild a basis for collaboration through a set of new tactics in the 1950s, 1960s, and 1970s. These tactics included: 1) building bridges with new partners (i.e., their customers' captive shops) while jettisoning others (e.g., the Machinists Union), 2) gaining control over metalworking expertise in the region through the trade association's training and technical dissemination activities, and 3) countering industry obsolescence through industry-wide strategic planning and technical assistance activities. These tactics allowed the metalworking network to rise, mature, and gain power again. Thus, the metalworking network entered a second life-cycle that lasted from the late 1950s until the most recent period (see Graph 1-2).

Chicago's Metalworking Network Again Faces a Challenge to its Existence

Since the late 1980s, however, this collaborating interfirm network has again had to face new pressures that challenge the logic of its structure. These challenges come from its increasingly global customers who never became fully integrated into the postwar network along with their captive shops that had. Today's customer firms--as I discussed in detail in the last chapter--are being pushed by new competitive pressures in international markets to both cut costs and improve product quality. Although they are outsourcing a greater volume of their production business to firms like Chicago's independent suppliers--they are building a new "vertical" network of interfirm loyalties and collaborating bonds which seeks to replace Chicago's traditional but "horizontally" structured supplier network. Chicago's traditional metalworking network faces its weakening and demise under today's changing rules of global manufacturing. This collaborative network of firms is at the end of another life-cycle as it was previously in the 1950s. In this section, I briefly summarize today's challenges to the metalworking industry and how a life-cycle conception shapes our understanding of them.

In the 1980s, some customer firms, that belonged to the metalworking industry's network through the membership of their captive shops, withdrew this membership upon closing or downsizing these same captive shops. Customer firms were in trouble and restructuring their operations. While this may have made sense from each customer's individual perspective as they became more economically minded along with their downsizing, it also distanced these same customers from the local metalworking industry's collective voice and collaborative ethic. This made it more, rather than less, difficult to collaborate with their suppliers--an activity thought to be increasingly important as they headed into the 1990s. Into this vacuum of weak collaboration, many large customers began establishing their own supplier networks that include some metalworking shops from the trade association.

Rather than predicting that this development will automatically lead to the marginalization or success of metalworking suppliers--depending on the two interpretations the literature to date offers us--we begin to see this situation from yet another perspective.

By integrating into today's situation our knowledge of the life-cycle pattern this region's metalworking network exhibited over the past century, we come to understand the options that face this network, as an industrial governance organization. In the past with this industry, I found that its firm owners had to fight and negotiate over the outcome of changes in the environment. If Chicago's traditional "horizontally" structured metalworking network is to continue to mediate for this region's small suppliers and shape outside pressures to the advantage of its constituency (i.e., to avoid their marginalization), it must reconstitute itself today as it had in the past by resurrecting and strengthening collaborative bonds among locally tied metalworking supplier firms.

The challenges facing this region's horizontally structured supplier network today are real and significant. They are serious threats to continuing lateral collaboration in the industry and represent unique conditions this regionally based trade association has yet to confront. The extent of global manufacturing arrangements in the current period probably represents the most critical issue for Chicago's trade association--as a collection of small firms within a single region--to manage. Not only must this metalworking enclave attract multinational firms to continue to do business with it, but it must somehow figure out how to match the lower costs that other global suppliers can offer without leading its firms into a set of exploitative conditions. Moreover, this enclave must balance the centripetal pull that the vertically structured, corporate-sponsored supplier networks will exact over their preferred suppliers worldwide. For each of its member firms, it must strengthen loyalty to this region's craft community vis a vis loyalty to a key customer. Should the trade association's efforts fail, it will weaken horizontal collaboration among firms in this industry locally which, as I argue below, will threaten the long term development of the metalworking supplier infrastructure as a whole and, along with it, the Chicago region's competitive advantage in metalworking.

Should it succeed again at recreating an efficient yet also "developmental" craft enclave, it can attract multinational manufacturers to come to it--either by relocating production facilities in the Chicago region or buying metal parts and metalworking expertise from Chicago and shipping them great distances. O'Connor (1994), in his study of metal-related design and engineering firms in the branch plant economy of Australia, argues that the latter result--suppliers serving their customers over great distances today, is the likely outcome. This is especially true when dealing with more transportable items like engineering, design, and production-related expertise (what he calls producer services). In these cases, a region that is highly accessible and served with good transportation facilities will succeed, he posits. Other indicators suggest that Chicago suppliers can also continue to act as a magnet for manufacturers. Motorola, for instance, has just expanded its production facilities in suburban Chicago even though it manufactures products around the globe (Interview, Milligan). If Chicago's metalworking trade association can again strengthen interfirm loyalties among metalworking suppliers that are tied to the region, to foster their continued development rather than their marginalization, it might enter into a new life-cycle for the organization as a network of collaborating firms. The outcome depends on a set of key factors, as I discuss below.

II. CRITICAL LESSONS FOR LOCALLY BOUND MANUFACTURING NETWORKS TODAY

In the remainder of this chapter, I discuss some general lessons about manufacturing networks, that emerge from this study of Chicago's metalworking industry, and the policies to stimulate them. These lessons supplement our current knowledge of network governance systems. More specifically, I discuss: 1) the need for a more differentiated concept of interfirm networks, 2) the recognition that networks create a set of "insiders" and "outsiders" and tensions between them, 3) the role of the "organizer" in establishing and maintaining networks, and 4) the importance of building strategic capacity among the participants of locally tied networks.

Different Networks Pursue Divergent Goals and Purposes

The foregoing discussion of "vertical" versus "horizontal" networks leads me to question to what extent "manufacturing networks" or "network production" can exist as a unifying concept or class of production relationships. Much of the literature assumes there is one type of network production. All versions of it are described as looking and acting in similar ways and utilizing similar industry governance mechanisms (e.g., the building of collaborative and trusting interfirm relationships, a focus on quality rather than low cost in production, group norms for performance and information sharing). Yet, in regard to Chicago's metalworking industry today, there are at least two very distinct forms of network production occurring. While they do share a set of common practices as the flexible production literature has indicated, they also exhibit important differences in their goals, structure, and logic that the literature needs to recognize. In this section, I discuss these differences in greater detail.

Both supplier networks in Chicago today rely on strong interfirm relationships, collaboration, information and resource-sharing, and product/process engineering across firm boundaries. But these mechanisms are utilized to pursue different goals and purposes. As such, these networks also differ as to their impact on the local Chicago region in which they are embedded. (I refer to Graph 8-1 throughout this discussion.) Chicago's horizontally organized network of metalworking suppliers--that is, the trade association whose history I chronicle in this dissertation--acts as a "local developmental network" versus the "global supply networks" that the metalworking industry's multinational customer firms are erecting today. I call the trade association a developmental network because that has been the primary goal of its activities. In other words, it sought to develop the state of knowledge, technology, and the "craft" of metalworking manufacturing in a more general sense among all those who participate in this industry within a geographic boundary (the Chicago region). Its interests as a network are not tied to any specific product nor production process; it seeks to improve the craft of a broad class of metalworking manufacturers rather than only that of specific individual fir For instance, it has consistently refused to rate or recommend specific suppliers when customers call upon it but will offer instead access to all its membership (e.g., through its marketing directory). While there have been tensions at times within the network among its smaller, more marginal, and less sophisticated shops and those in its membership that are larger and technologically more sophisticated firms--the network has sought to make its services available to both groups and, in effect, even out competitive differences within the industry.

The trade association--as a developmental network--has also sought to assist its membership in cutting costs and improving overall efficiency while upgrading technical knowledge within the industry. Through these activities, collective learning has taken place between suppliers in the metalworking industry--and, at times, with customer firms that operated in-house metalworking shops and that wanted to tap into the broader knowledge base of the metalworking industry. Individual contracting relationships between different metalworking suppliers--or between suppliers and customers--are assuredly strengthened under the rubric of the developmentally minded trade association--for instance, at its educational seminars and other meetings--but this has not been its sole emphasis. Instead, a broader loyalty to the metalworking craft and other "supplier" firms (and, at times, workers) that practice it within the Chicago region take precedence. Thus, the needs of specific customers in regard to the cost, quality, and other aspects of their metalworking inputs are of secondary consideration by the participants in this developmental network. Instead, network participants strive to strengthen the competitive advantage of a particular supplier industry (metalworking) within a particular region (Chicago) vis a vis other locally tied agglomerations of metalworking in the United States and other countries. Therefore, its apprenticeship training, technological seminars, marketing activities, and other services are open to all its members and often non-member firms, as well, in the industry.

The goals of this developmental interfirm network clearly diverge from those for today's customers of metalworking. These large customer firms--in such metal-related industries of auto, appliance, and machinery production--require supplier networks that serve their specific company needs. They also require suppliers that espouse an enhanced loyalty to the customer's product line--much as the corporate-owned captive metalworking shops had in earlier decades. Therefore, although many large manufacturers today are "disintegrating" their in-house production activities and increasingly outsourcing much of this activity to outside supplier firms, the large manufacturers want to ensure that such suppliers will act in their long-term corporate interests (vis a vis other competitors who may also be customers of these same suppliers). Customers report that, when choosing who to work with among comparable suppliers, they usually select the supplier for whom their business represents a more sizeable share. The goal of these networks, then, is to improve the customer/manufacturer's product and production processes--enabling it to become a more competitive firm--along with the products/production processes of the suppliers that feed into it. Since many of these customer firms may be multi-location firms (i.e., they operate production facilities outside the Chicago region in addition to undertaking production and/or administrative functions within this region), they are also interested in establishing a collaborative relationship with their preferred suppliers regardless of the geographic location of the customer plant or supplier firm. In other words, these supply networks are not tied to a specific region, focused on a locally tied agglomeration of firms, nor interested in the competitive advantage of regions per se. Customers solely want to set up a collective learning process that assists the specific firms in a production chain. Because of this emphasis, supplier loyalty to the lead customer firm takes precedence over any interests in the progress or welfare of a geographically tied supplier industry.

Because customer firms establish these supply networks--and because the customer is often more globally oriented and sizeable than many of its supplier firms--the customer exerts significant control over how the supply network operates. As Sabel (1994) has postulated--which I mentioned earlier--the corporations that head such vertically organized supply networks have greater power to impose their ranking and reward systems on all other of the network's participants. Thus, the customer can push through demands on suppliers in its production chain that help it, especially, to cut costs and time in production. These demands or requirements ensure that the corporate customer improves its profit situation; such requirements may, however, be less sensitive to the specific needs of suppliers in the chain. (Customers admit that their demands for lower prices and improved delivery and quality--along with the awarding of substantial new business to the selected supplier firm--may sometimes overwhelm the supplier and result in bankruptcy.)[4] Thus, these supplier requirements also deemphasize the long-term developmental needs of specific metalworking suppliers and the metalworking industry. The result of this set of collaborative interfirm relationships within the "global supply networks" of specific customer firms is that the customer includes within its network only suppliers that help it solve its specific production problems and issues; this strengthens the competitive advantage of the lead customer firm and perhaps some of its closely tied suppliers. This dynamic of two competing networks of firms

[4] This finding comes from a set of customer firms interviews held in January, 1996, that are not otherwise reported on in this dissertation. At that time, I interviewed eleven multinational manufacturers in northern Illinois--in the top metalworking using industries of auto production, construction and agricultural machinery production, and communication equipment manufacturing--as to their supplier practices.

in the Chicago region today--each with a separate set of goals for its participants--may exacerbate other tensions as I discuss in the next section.

<u>**Collaborative Networks Infer the Existence of "Outsiders"**</u>

In this historical study of Chicago's metalworking industry, I argue that the creation of a metalworking "enclave" or trade association set up both an inclusive and exclusive dynamic that created a group of "insiders" and "outsiders." This dynamic created tensions that eventually weakened collaborative interfirm ties in the long run and necessitated their periodic recreation by the metalworking trade association. The literature on flexible production does not recognize this tension but assumes collaborative relationships widely diffuse throughout a region. Those who critique this literature describe such tensions but assign them exclusively to the increasing corporate control of such networks. While this characterizes some of the conflict surrounding manufacturing networks in the Chicago case, I think it is more useful to ascribe this conflict to the "insider"/"outsider" dynamic as I discuss here.

The insiders in Chicago's metal-related complex originally included the region's metalworking shop owners in an alliance with the Machinists Union. Only shop owners or supervisory personnel could actually belong to the trade association and participate in its meetings and committees. In the early years of the trade association, however, representatives of the Machinists Union helped organize the trade association and on an informal basis collaborated and consulted with the association's members. Workers, of course, have always been involved in the association's apprenticeship training classes.[5] Excluded from this arrangement were the often multinational and other customers of the metalworking industry and their lower skilled and non-craft oriented workers. This inclusive/exclusive dynamic has created a life-cycle pattern of network development in this industry as outsiders occasionally challenge the metalworking enclave and force it to reorganize itself. Conflict between "outsiders" and "insiders" has occurred periodically in the history of this network. Outsiders have not trusted the craft suppliers as a group, nor shared a common vision of the future of metal-related production in this region as a whole.

A key question that stems from this analysis is why this has occurred. Why have outsiders not been more consistently integrated into the metalworking industry's collaborative model of manufacturing over time? Why did the benefits of the metalworking industry's collaborative governance structure not extend upward into or modify the manufacturing philosophy of the region's mass producers earlier in the post-World War II period? The captive shop personnel of these large customer firms became involved in the metalworking trade association's collaborative activities. Nevertheless, this participation was not enough to reform mass production in this region earlier nor influence it to take a different path along more flexible lines as did firms in Germany and Italy, for example. Thus, when mass production hit its limits in the fluctuating market environment of the 1980s and 1990s, its adherents in Chicago (i.e., these large customer firms) were equally distressed as were other mass producers throughout the United States.

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[5] Later, in the postwar period, the Machinists Union became an excluded actor from the metalworking network.

In much of the flexible production literature to date, researchers who have studied the regions where such flexible production relations occur describe how collaborating relationships diffuse broadly throughout these local economies. In southern Germany, small and large manufacturers have practiced variants of this collaborative and flexible production arrangement (Herrigel, 1992). Small firms in certain regions of the "Third Italy" and in Silicon Valley supposedly also collaborate easily and widely (Saxenian, 1994). Locke (1994), for instance, discusses how certain regions within the Third Italy are able to maintain collaborative relations over a long period because of a civic and industrial society that is characterized by dense associationalism. In other words, regions with multiple and overlapping groups or associations are able to blur the insider/outsider distinction that characterizes the Chicago metalworking case.

Yet, here too, conflict has also emerged. Herrigel and Sabel (1995) discuss the undoing of the German craft community in the 1990s as "overengineered" products, rigid craft demarcations, and inter-craft conflicts led to declining sales and competitiveness. Others have highlighted the "reconcentration" of market power and firm ownership in some small-firm and network-production-oriented regimes of Italy (Martinelli and Schoenberger, 1991; Harrison, 1994). Even the corporate-dominated but collaborating industries in Japan--where large and small firms are able to supposedly trust each other relatively easily--require some government protections of small suppliers to ensure that large manufacturers do not exploit them but collaborate instead (Nishiguchi, 1994). Therefore, regions where collaboration occurs widely and over the long run between firms, and between management and labor, appear rarer than the original flexible production literature had suggested.

The Chicago case suggests that conflict between networks--or groups of industrial actors--may occur frequently which pushes such networks to redefine their own boundaries and goals (this produces the life-cycle pattern I refer to). I believe that the existence of very large multinational corporate actors--with an outlook that is global not local in scope--has contributed to the insider/outsider pattern I have documented here as others (e.g., Martinelli and Schoenberger, 1991; Harrison, 1994) have also suggested. Chicago's metalworking firms, by contrast, are small and locally tied. The perspective of their owners has been to strengthen the industry within a region. The metalworking industry's vision of a "common future" is much different than their globally oriented customers as I discussed above.[6] Therefore, even if Chicago's corporate and metalworking shop actors were to collaborate within certain organizational structures, their ability to construct a shared future may always be limited due to the different terrains in which these actors operate. What this suggests, therefore, is that a life-cycle pattern of fluctuating collaboration may be the norm rather than the exception. In such a dynamic situation, it is critical to understand how collaborative relationships get recreated after a lull. I turn to this topic now.

The Role of the Organizer in Network Development

A key insight we gain from the history I have presented here is the critical role that organizing plays in creating and sustaining interfirm networks. Especially in regions like

[6] Sabel (1992) discusses how divergent actors in a region must build trust among each other by identifying and discussing a common future for all involved. The Chicago metalworking case suggests that at certain times actors hold very different goals for collaboration with each other, making the articulation of a common future path impossible.

Chicago, where actors have at times experienced conflicting loyalties, leaders who represent various constituencies can step in to define how "the group," or the network, identifies itself. While many in the flexible production literature describe the role of key institutions, such as trade associations, in shaping contractual relations within an industry or geographical cluster of firms that are collaborating (e.g., see Schmitz and Musyck, 1993; Saxenian, 1994), few of these researchers have recognized the intentional and central role of such institutions or others as organizers in establishing or maintaining group loyalty and adherence to collective rules. Saxenian (1994) comes closest by describing how certain key entrepreneurs set an example for others of the possibilities that could be achieved through collaboration. (In Silicon Valley, for instance, William Hewlett and David Packard, of Hewlett-Packard, played that role.) Some of those who critique flexible production also describe how "lead firms" (i.e., large multinational entiries) control supplier relations within certain regions (e.g., see Martinelli and Schoenberger, 1991; Harrison, 1994). Yet, in Chicago's metalworking industry, the role of network organizer--that the trade association and its leading metalworking shop owners filled--played a more obvious and critical role both because of the contested terrain in which this network has operated and the multitude of other actors which compete for group loyalty. I briefly describe the role of organizer in Chicago's metal-related complex here.

In today's situation, individual metalworking suppliers in Chicago face conflicting loyalties and demands for group collaboration. Large customer firms of metalworking are identifying one "vertically structured" network of firms. They aspire to organize, direct, and control the group of input suppliers that depend on sales and a close relationship with them--including some of Chicago's metalworking suppliers. Chicago's metalworking trade association--historically led by the region's highly skilled tool-and-diemaking firms--has also identified another "horizontally structured" network of firms. Since the 1920s, it has led and wants to continue to lead, organize, and direct all metalworking firms in the wider Chicago region. Loyalty to the first "vertical" network implies loyalty to the lead multinational manufacturer (i.e., the customer firm) and efforts to improve the performance of that manufacturer. Loyalty to the second "horizontal" network implies loyalty of suppliers to a regional hub of metalworking peers who strive to upgrade the manufacturing excellence of a regionally tied and historically craft-oriented industry. These loyalties sometimes merge--but also may conflict which sets the networks up against each other. Conflict characterizes the dynamic between these two networks today since the multinational customers solely want to identify and reward the "cream" in Chicago's supplier pool. This undermines the developmental model of the trade association. In this context, the actor that is the most effective organizer can, I believe, keep its network together (or rebuild it in the case of Chicago's metalworking trade association) in the face of such conflict. I say this, drawing upon past examples in the history of this network.

For instance, a fight over group loyalties took place historically in this industry as well. In the early post-World War II period, several different actors and collective organizations emerged to compete for and shape the group ideology of Chicago's skilled metalworkers and shop owners. At that time, the CIO was pushing skilled toolmakers to identify themselves as part of a multiskilled group within the specific large factories of the metalworking industry's customer firms; the trade association wanted to continue its multiclass grouping of apprentices, journeymen, and shop owners; the Tool and Die

Conference within the Machinists Union wanted workers to create a new professional class of elite craftworkers that were separate from and not beholden to the shop owners for benefits and credentialling; and the manufacturers (i.e., customer firms), as mass producers, wanted both to deskill their toolroom workers and foster a loyalty among captive toolroom supervisors to the corporate managerial hierarchy. These various perspectives each pulled the precision metalworking craft community apart. The trade association as a strong organizer worked to reunite portions of it under a new identity and alliance between captive and contract shop. Because of this, it was able to continue to advocate for the bulk of precision metalworking shops in the region in the postwar period.

Today, multiple perspectives on production are also pulling the previous metalworking "community" apart. Those who can reorganize it into a collaborating interfirm/interactor enclave stand to achieve their specific goals in opposition to others. Hence, who emerges as the "lead firm," or key organizer of this new and reshaped community wins out.[7] Different visions of interfirm/interactor networks could result, depending on who is the most effective organizer. As Sabel (1994) points out, there are key differences between the vertically structured and collaborating networks of Japanese corporations versus the horizontally structured and craft-tradition-infused networks in Germany. Who is at the top of each network--a corporation or a craft community--develops ranking systems to penalize and reward the network's participants. The outcomes of these ranking systems differ if power is relatively concentrated or, by contrast, diffused within the collaborating network as a whole.

[7] It is also possible for a compromise to be worked out if, for example, a well organized customer supply network confronts an equally well organized trade association.

In a similar way, Chicago's metalworking trade association and various of this region's large corporate customers of metalworking would produce quite different outcomes for this region's supplier infrastructure as a whole by erecting their distinct and different models of interfirm collaboration and governance. Thus, we need to be cognizant of who organizes what types of networks for what reasons.

Building Strategic Capacity for a Collectivity of Actors

Not only did Chicago's collaborating interfirm network have a strong set of good organizers at its core, but its leaders--the metalworking shop owners--also developed a strategic planning capacity for the industry as a whole. This capacity originated in a set of conditions much like those described in the flexible production literature for other collaborating enclaves, or districts, of firms. Yet, because of the strong set of organizers in this industry and frequent challenges by other actors "outside" this enclave, it grew in its intentionality over time. Today, the trade association--as the head of the "developmental network" for metalworking firms--carries out strategic planning studies for the industry so that its small firms can collectively steer a future course for its long-term development. Building a collective strategic capacity among network participants to mediate the pressures of the increasingly global economy, such as this trade association as network leader has been doing, is a feature that has also been underplayed in the flexible production debate.

On the whole, researchers who have studied collaborative networks and/or geographic districts of networked firms discuss how collaboration strengthens the strategic positioning of individual firms that participate in such networks. Collaboration stimulates innovation by individual firms, especially among those that are small, because it promotes the sharing of up-to-date information about changing market conditions, new technologies, and other pertinent conditions related to competition. A networked firm can draw on this information readily and plan its actions accordingly. Some researchers also describe how trade associations facilitate this strategic capacity among individual firms by offering educational seminars and other services both to increase awareness of emerging technologies and to strengthen networking and frequent interactions among such firms. Saxenian (1994) most specifically talks about how geographic proximity and networking speeds the flow of market information to participating firms in the Silicon Valley case she researched and how certain trade associations (e.g., SEMI, the Semiconductor Equipment and Materials Institute, and WEMA, the Western Electronics Manufacturers Association) fostered this flow of information among firms in the electronics industry.

Chicago's metalworking trade association originally followed in a similar path to these trade associations, offering services to strengthen social and transactional relationships among the small firms in its craft community and to increase their access to market and technological information. Nevertheless, after decades of providing such services, this metalworking trade association expanded into developing a collective strategic capacity for the industry through a set of new research, planning, and committee activities. This collective strategic capacity grew out of the association's and its members' response to a set of crises that required a more intentional stance toward the development of firm and industry strategies than had been practiced before. I will briefly highlight how the trade association developed its strategic capacity here.

In regard to Chicago's metalworking industry, it was not enough to build an enclave, recruit members to it, and offer peer sanctions or support services to keep this enclave and its members going. The trade association also had to confront critical changes in its operating environment that threatened to diminish the enclave or tear it apart. Originally, it dealt with such crises in an ad hoc manner by developing specific programs or tactics as the need arose. Later, this strategy-making became a more regularized feature of its activities. For instance, initially the trade association had to reorganize the machine shop and precision metalworking industry's thinking with the onslaught of mass production in the 1920s which threatened to replace the small-firm-oriented machining industry. In this case, shop owners founded the trade association to carve out a market for precision machined products within mass production and to plan for continued skill and technological development in the industry. These shop owners collectively developed quality, cost, and production standards for the redefined precision metalworking industry and started an apprenticeship training program to strengthen the craft skills of its workers. Later, through the trade association, member shops collectively dealt with the Depression and with the wartime boom and the Department of Defense's fostering of and many multinational manufacturers' expansion of their captive metalworking shops through other ad hoc strategizing (e.g., anticipating the postwar slump, shop owners built up a transition emergency fund to assist the association and member shops survive).

With the 1960s, however, the association's strategic planning function started to become regularized after the NC (numerical control) revolution threatened the metalworking industry's craft-oriented labor process. NC, or computerized metalworking machinery, arrived on the commercial market in the early 1960s, prompting industry observer's to note that it would replace the skill of the craft worker and technical expertise of the small metalworking shop owner. Large customers of metal parts initially adopted NC technology to substitute for skill in their "captive" shops. This challenge to the continue livelihood of the independently owned metalworking industry galvanized the shop owners and the trade association into action. Not only did they begin planning a series of technological, R&D, and managerial support services for the industry, but they organized the association's first strategic planning research project for the industry. The association's leaders have completed industrywide strategic plans periodically since that challenge in order to more effectively anticipate changing market, technological, financial, and other trends for the industry. Today, the association must confront the globalization of supplier relationships, the outmigration of many of its customer firms, and the changing nature of customer demands as well. The association and its members are researching these new trends now to assist both the industry and its individual firms make the needed transitions.

Conclusion: A Call for More Nuanced Policy-setting in Regard to Manufacturing Networks

The set of lessons discussed above, about networks as institutions for industrial governance, should also inform our policymaking in this arena. In conclusion, I offer some suggestions for a more nuanced set of policies for manufacturing networks.

First of all, public policies that speak to the need for American manufacturers to increase their collaborative relationships, and collectively streamline manufacturing while increasing innovation, do not recognize the distinction in the type of collaborative relationships and networks that I posed here. All policies to encourage interfirm collaboration and the sharing of information are assumed will provide advantages to locally tied supplier and globally connected customer firm alike. All such policies are predicated on the idea that the regions in which such firms are embedded will also do well as the standard of living more broadly is raised. These assumptions may not hold. It depends on the type of networks such policies foster. It depends on whether policies to create manufacturing networks aim to pursue developmental or supply chain efficiency goals. Policymakers may also differ in their desires. Those at the national or multi-regional level may want to assist certain key firms in target industries. In this case, such policymakers would want to assist large firms to establish supply chain networks or help local suppliers to compete to be included within them. Local level policymakers, on the other hand, are more likely to want to promote regional development along with the assistance they provide firms. These government actors would support developmental networks instead. The main point I want to make here is that network policies are not generic, but assist certain firms, or groups of firms, that may or may not be regionally embedded. Furthermore, pulling together any group of firms into a network institution--that offers participants beneficial services--also implies that some firms (or potential competitors in an industry) are left out and that conflicts may emerge from a network set of policies as a result. Therefore, the "boundaries" of a network, as well as its goals, are both critical distinguishing factors that policymakers need to discuss.

A second point that emerges from the lessons I discussed above is the need to develop industrial policies at various levels of government which are themselves as dynamic as the collaborative relationships I followed. If collaboration among firms, workers, and other related actors rises and falls repeatedly, as occurred in Chicago's metalworking industry, we must recognize this fact in our policymaking. Rather than put into place industrial extension services that offer particular programs on the latest management tool (e.g., classes on SPC, or Statistical Processing Control, for workers; assistance in cutting inventory; help in conducting a quality audit), policymakers should also help firms and networks of firms enhance their strategic abilities in the long run. Policies that have been advocated to stimulate manufacturing networks and interfirm collaboration are largely silent about this dimension. Instead, they advocate public support for programmatic services that networks themselves might operate. "Network" policies often include government financing of programs for apprenticeship and other worker training, for shared infrastructure such as "incubator" buildings, and for technical assistance on a variety of technological and management topics that are especially targeted to small firms.[8] These technical assistance services and programs are critical for **today's** competitive environment, but may become ill-suited to address future concerns. It is not that such programs and services are not needed, but that firms and industries can also be encouraged through policymaking to become organizers in their own behalf and to think strategically about the rapidly changing environments in which they operate.

Both building an institutional capacity among such actors for strategic industry-wide planning and fostering the development of strong organizers or leaders within a locally

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[8] See the conclusion in Saxenian (1994) and Chapter 10 in Harrison (1994) for a discussion of some these "network" policies.

embedded industry are important goals here. Government support for developing the strategic capacity of local industrial actors may be especially important to stimulate among small firms, industries that are primarily comprised of such small firms as metalworking, and manufacturing networks whose focus is "developmental" as I discussed above. Therefore, it is logical that local and state governments would be most interested in supporting this function.

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LIST OF TABLES

TABLE 2-1: EMPLOYMENT IN THE CHICAGO REGION

	1923	1925
MANUFACTURING JOBS		
Illinois	797021	DU
City of Chicago		DU
Percent Chicago of Illinois		
PRODUCTION JOBS IN MFG.		
Illinois	645627	622368
City of Chicago		370041

* Data unreported (DU) some years for some geographic categories.

SOURCE: U.S. Census of Manufactures, 1923, 1925.
FILE: (TABLE2-1)

TABLE 2-2: ILLINOIS MANUFACTURING IN 1923--ITS METAL-RELATED COMPLEX AND OTHER PROMINENT SECTORS; A RANKING BY TOTAL EMPLOYMENT

INDUSTRIES	No. of Estabs.	Total Employme	Plant Size (In Jobs)	Annual Productio Wage*	Total Production Value*	Value Added	INDUSTRIES
ALL MANUFACTURING	14345	797021	56	1414	5041113314	2246500750	ALL MANUFACTURING
Cars/Railroad	206	71096	345	1544	288003524	130681192	Cars/Railroad
Foundries/Machine Shops	820	56717	69	1508	275955047	162113515	Foundries/Machine Shops
Electrical Machinery	212	53571	253	1534	211366206	124755896	Electrical Machinery
Printing/Publishing	2050	51665	25	1709	271746862	198683539	Printing/Publishing
Meatpacking	78	43111	553	1277	606320553	96576420	Meatpacking
Clothing/Men's	370	40848	110	1476	186683338	104873716	Clothing/Men's
Iron and Steelworks	30	25944	865	1688	213671552	82712996	Iron and Steelworks
Furniture	329	19638	60	1438	93467682	51482946	Furniture
Bread/Bakery	1779	17448	10	1468	105289516	53570830	Bread/Bakery
Agricultural Implements	42	16573	395	1367	70252898	40776880	Agricultural Implements
Boots/Shoes	60	13847	231	1043	60332201	26844953	Boots/Shoes
Steamfittings	24	11944	498	1648	55127744	34977565	Steamfittings
Motor Vehicle Parts	211	7602	36	1425	35950930	20833920	Motor Vehicle Parts
Hardware	89	6503	73	1181	28757908	17187265	Hardware
Tinware	24	5820	243	1184	37409763	13397041	Tinware
Structural Ironwork	104	5500	53	1629	39315802	16843932	Structural Ironwork
Wire/Wirework	50	5418	108	1289	37237339	12719542	Wire/Wirework
Engines	14	5349	382	1598	22292072	11844017	Engines
Motor Vehicles	32	5281	165	1394	78400075	25839926	Motor Vehicles
Stoves and Furnaces	46	4593	100	1350	18679935	11478625	Stoves and Furnaces
Instruments/Scientific	38	4142	109	1408	23997460	16235611	Instruments/Scientific
Brass and Nonferrous Alloys	106	4061	38	1424	31180198	10100021	Brass and Nonferrous Alloys
Stamped Metal	53	3956	75	1196	13933107	7758556	Stamped Metal
Copper and Sheet Iron	248	3707	15	1634	19986879	11072168	Copper and Sheet Iron
Iron and Steel/Blastfurnaces	6	3018	503	1579	106405972	23681448	Iron and Steel/Blastfurnaces
Iron and Steel/Forgings	27	2884	107	1573	19163945	8894104	Iron and Steel/Forgings
Stoves and Appliances	25	2604	104	1383	13164930	7504138	Stoves and Appliances
Machine Tools	30	2601	87	1519	11307749	8130517	Machine Tools
Plumbers Supplies	21	2452	117	1187	9933353	6366640	Plumbers Supplies
Tools, nec.	73	2363	32	1496	10783410	5739520	Tools, nec.
Washing Machines	14	2208	158	1395	13191953	6384690	Washing Machines
Sewing Machines	4	2026	507	1444	6593103	4444307	Sewing Machines
Screw Machine Products	32	1657	52	1389	6116403	3623277	Screw Machine Products
Phonographs	24	1646	69	1431	8020008	4390515	Phonographs
Iron and Steel/Bolts	16	1391	87	1259	8102141	4518527	Iron and Steel/Bolts
Surgical Appliances	16	1372	86	1126	8230057	3882052	Surgical Appliances
Cash/Calculating Machines	6	1109	185	1201	6028532	4563594	Cash/Calculating Machines
Typewriters	12	1101	92	1211	3810041	2238262	Typewriters
Pumps	20	941	47		4351149	2384915	Pumps
Springs	9	865	96	1601	4792576	2962602	Springs
Motorcycles	4	800	200	1453	4197287	1767945	Motorcycles
Electroplating	53	779	15	1772	2497278	2048666	Electroplating
Cutlery	15	755	50		2880748	2040641	Cutlery
Iron and Steel/Doors	4	539	135	1945	2499090	1633115	Iron and Steel/Doors
Refrigerators	9	445	49	1366	2442703	1195193	Refrigerators
Babbitt Metal	8	437	55	1220	7154315	1603046	Babbitt Metal
Aluminum	9	433	48	1501	2627788	1208602	Aluminum
Shipbuilding	9	268	30	1528	727628	533286	Shipbuilding
Galvanizing and Coating	10	224	22	1397	1283234	632839	Galvanizing and Coating
Iron and Steel/Processed	10	124	12	1706	488527	334377	Iron and Steel/Processed
Iron and Steel/Nails	5	71	14	1409	402783	145776	Iron and Steel/Nails
Aircraft/Parts	3	20	7	1517	86726	37275	Aircraft/Parts

SOURCE: United States Census of Manufactures, 1923 (IL23STA2).

* In 1923 Dollars.

TABLE 2-3: CITY OF CHICAGO MANUFACTURING IN 1923--ITS METAL-RELATED COMPLEX AND AND OTHER PROMINENT SECTORS; A RANKING BY TOTAL EMPLOYMENT

INDUSTRIES	No. of Estabs.	Production Employment	Plant Size (in Jobs)	Annual Production Wage*	Total Product Value*	INDUSTRIES
ALL MANUFACTURING	9334	385685	41	1482	3323341460	ALL MANUFACTURING
Cars/Railroad	45	34556	768	1635	167501656	Cars/Railroad
Meatpacking	50	30382	608	1295	514666667	Meatpacking
Clothing/Men's	328	29111	89	1597	170497452	Clothing/Men's
Printing/Publishing	1381	27479	20	1762	238853524	Printing/Publishing
Foundries/Machine Shops	512	23033	45	1650	151446868	Foundries/Machine Shops
Electrical Machinery	180	16777	93	1328	127308433	Electrical Machinery
Furniture	255	10956	43	1510	61330536	Furniture
Bread/Bakery	1052	9926	9	1521	80122997	Bread/Bakery
Iron and Steelworks	10	9663	966	1714	117160880	Iron and Steelworks
Steamfittings	20	7336	367	1771	41821370	Steamfittings
Agricultural Implements	4	7267	1817	1490	29534114	Agricultural Implements
Boots/Shoes	29	5353	185	1363	27644553	Boots/Shoes
Motor Vehicle Parts	147	3671	25	1526	22511251	Motor Vehicle Parts
Structural Ironwork	84	3606	43	1722	32127748	Structural Ironwork
Motor Vehicles	16	2614	163	1509	63477015	Motor Vehicles
Brass and Nonferrous Alloys	79	2417	31	1500	28284374	Brass and Nonferrous Alloys
Tinware	15	2336	156	1174	15043066	Tinware
Copper and Sheet Iron	172	2173	13	1733	15485973	Copper and Sheet Iron
Stamped Metal	26	2102	81	1244	8658161	Stamped Metal
Hardware	63	1860	30	1339	11982112	Hardware
Engines	5	1531	306	1590	4948725	Engines
Iron and Steel/Forgings	14	1518	108	1467	10583358	Iron and Steel/Forgings
Tools	58	1481	26	1600	9318645	Tools
Wire/Wirework	29	1009	35	1001	4283699	Wire/Wirework
Phonographs	20	992	50	1515	5453024	Phonographs
Surgical Appliances	16	948	59	1126	8230057	Surgical Appliances
Iron and Steel/Bolts	12	815	68	1353	6192472	Iron and Steel/Bolts
Motorcycles	4	662	166	1453	4197287	Motorcycles
Plumbers Supplies	14	638	46	1479	3950050	Plumbers Supplies
Stoves and Appliances	15	611	41	1618	3712865	Stoves and Appliances
Electroplating	50	602	12	1786	2362583	Electroplating
Stoves and Furnaces	10	594	59	1636	4536480	Stoves and Furnaces
Cutlery	9	574	64	1324	2461511	Cutlery
Iron and Steel/Doors	4	462	116	1945	2499090	Iron and Steel/Doors
Machine Tools	10	458	46	1796	2189761	Machine Tools
Pumps	10	172	17	1852	1758873	Pumps
Shipbuilding	5	155	31	1705	513819	Shipbuilding
Typewriters	9	143	16	1494	1197623	Typewriters
Washing Machines	8	126	16	1485	1008791	Washing Machines
Galvanizing and Coating	7	124	18	1554	748457	Galvanizing and Coating
Aluminum	6	122	20	1857	893539	Aluminum
Aircraft and Parts	0	0	0	0	0	Aircraft and Parts
Babbitt Metal	0	0	0	0	0	Babbitt Metal
Cash/Calculating Machines	0	0	0	0	0	Cash/Calculating Machines
Instruments/Scientific	0	0	0	0	0	Instruments/Scientific
Iron and Steel/Blastfurnaces	0	0	0	0	0	Iron and Steel/Blastfurnaces
Iron and Steel/Nails	0	0	0	0	0	Iron and Steel/Nails
Iron and Steel/Processed	0	0	0	0	0	Iron and Steel/Processed
Refrigerators	0	0	0	0	0	Refrigerators
Screw Machine Products	0	0	0	0	0	Screw Machine Products
Sewing Machines	0	0	0	0	0	Sewing Machines
Springs	0	0	0	0	0	Springs

SOURCE: U.S. Census of Manufactures, 1923, for firms within City of Chicago boundaries (CHGO23A). * In 1923 Dollars.

TABLE 2-4: ILLINOIS METAL-RELATED COMPLEX IN 1923

INDUSTRIES	No. of Estabs.	Total Employment	Plant Size (In Jobs)	Value Added	INDUSTRIES
ALL MANUFACTURING	14345	797021	56	2246500750	ALL MANUFACTURING
PRIMARY METAL AND "BACKEND" SUPPLIES					
Iron and Steelworks	30	25944	865	82712996	Iron and Steelworks
Tinware	24	5820	243	13397041	Tinware
Brass and Nonferrous Alloys	106	4061	38	10100021	Brass and Nonferrous Alloys
Copper and Sheet Iron	248	3707	15	11072168	Copper and Sheet Iron
Iron and Steel/Blastfurnaces	6	3018	503	23681448	Iron and Steel/Blastfurnaces
Babbitt Metal	8	437	55	1603046	Babbitt Metal
Aluminum	9	433	48	1208602	Aluminum
Iron and Steel/Processed	10	124	12	334377	Iron and Steel/Processed
Iron and Steel/Nails	5	71	14	145776	Iron and Steel/Nails
PERCENT OF ALL MANUFACTURING	**3**	**5**		**6**	
"FRONTEND" MANUFACTURERS OF DURABLE METAL-RELATED GOODS					
Cars/Railroad	206	71096	345	130681192	Cars/Railroad
Electrical Machinery	212	53571	253	124755896	Electrical Machinery
Agricultural Implements	42	16573	395	40776880	Agricultural Implements
Motor Vehicles	32	5281	165	25839926	Motor Vehicles
Stoves and Furnaces	46	4593	100	11478625	Stoves and Furnaces
Instruments/Scientific	38	4142	109	16235611	Instruments/Scientific
Stoves and Appliances	25	2604	104	7504138	Stoves and Appliances
Washing Machines	14	2208	158	6384690	Washing Machines
Sewing Machines	4	2026	507	4444307	Sewing Machines
Phonographs	24	1646	69	4390515	Phonographs
Surgical Appliances	16	1372	86	3882052	Surgical Appliances
Cash/Calculating Machines	6	1109	185	4563594	Cash/Calculating Machines
Typewriters	12	1101	92	2238262	Typewriters
Motorcycles	4	800	200	1767945	Motorcycles
Refrigerators	9	445	49	1195193	Refrigerators
Shipbuilding	9	268	30	533286	Shipbuilding
Aircraft/Parts	3	20	7	37275	Aircraft/Parts
PERCENT OF ALL MANUFACTURING	**5**	**21**		**17**	
METALWORKING SUPPLIER INDUSTRIES					
Foundries/Machine Shops	820	56717	69	162113515	Foundries/Machine Shops
Motor Vehicle Parts	211	7602	36	20833920	Motor Vehicle Parts
Hardware	89	6503	73	17187265	Hardware
Structural Ironwork	104	5500	53	16843932	Structural Ironwork
Stamped Metal	53	3956	75	7758556	Stamped Metal
Iron and Steel/Forgings	27	2884	107	8894104	Iron and Steel/Forgings
Machine Tools	30	2601	87	8130517	Machine Tools
Tools, nec.	73	2363	32	5739520	Tools, nec.
Screw Machine Products	32	1657	52	3623277	Screw Machine Products
Pumps	20	941	47	2384915	Pumps
Springs	9	865	96	2962602	Springs
Electroplating	53	779	15	2048666	Electroplating
Iron and Steel/Doors	4	539	135	1633115	Iron and Steel/Doors
Cutlery	15	755		2040641	Cutlery
Galvanizing and Coating	10	224	22	632839	Galvanizing and Coating
Wire/Wirework	50	5418	108	12719542	Wire/Wirework
Engines	14	5349	382	11844017	Engines
Plumbers Supplies	21	2452	117	6366640	Plumbers Supplies
Steamfittings	24	11944	498	34977565	Steamfittings
Iron and Steel/Bolts	16	1391	87	4518527	Iron and Steel/Bolts
PERCENT OF ALL MANUFACTURING	**12**	**15**		**15**	

SOURCE: United States Census of Manufactures, 1923 (IL23STA3).

* In 1923 Dollars.

TABLE 2-5: 1923 LOCATION QUOTIENTS FOR ILLINOIS METAL-RELATED AND OTHER PROMINENT INDUSTRIES

INDUSTRIES	Employment Location Quotient	Value Added Location Quotient	INDUSTRIES
Agricultural Implements	5.75	5.34	Agricultural Implements
Aircraft and Parts	0.07	0.05	Aircraft and Parts
Aluminum	0.30	0.35	Aluminum
Babbitt Metal	2.75	2.52	Babbitt Metal
Boots/Shoes	0.71	0.65	Boots/Shoes
Brass and Nonferrous Alloys	0.71	0.65	Brass and Nonferrous Alloys
Bread/Bakery	1.11	1.12	Bread/Bakery
Cars/Railroad	1.40	1.42	Cars/Railroad
Cash/Calculating Machines	0.78	0.64	Cash/Calculating Machines
Clothing/Men's	2.32	2.03	Clothing/Men's
Copper and Sheet Iron	1.29	1.34	Copper and Sheet Iron
Cutlery	0.52	0.40	Cutlery
Electrical Machinery	2.24	1.93	Electrical Machinery
Electroplating	2.25	2.43	Electroplating
Engines	1.20	0.96	Engines
Foundries/Machine Shops	1.36	1.33	Foundries/Machine Shops
Furniture	1.33	1.36	Furniture
Galvanizing and Coating	2.72	2.46	Galvanizing and Coating
Hardware	1.41	1.46	Hardware
Instruments/Scientific	3.50	4.15	Instruments/Scientific
Iron and Steelworks	0.78	0.86	Iron and Steelworks
Iron and Steel/Blastfurnaces	0.94	1.51	Iron and Steel/Blastfurnaces
Iron and Steel/Bolts	1.00	1.22	Iron and Steel/Bolts
Iron and Steel/Doors	2.33	1.92	Iron and Steel/Doors
Iron and Steel/Forgings	1.20	1.19	Iron and Steel/Forgings
Iron and Steel/Nails	0.28	0.27	Iron and Steel/Nails
Iron and Steel/Processed	0.80	0.63	Iron and Steel/Processed
Machine Tools	0.83	0.97	Machine Tools
Meatpacking	3.34	2.71	Meatpacking
Motor Vehicle Parts	0.53	0.53	Motor Vehicle Parts
Motor Vehicles	0.25	0.29	Motor Vehicles
Motorcycles	1.37	1.43	Motorcycles
Phonographs	0.92	0.81	Phonographs
Plumbers Supplies	1.03	0.90	Plumbers Supplies
Printing/Publishing	1.60	1.59	Printing/Publishing
Pumps	0.63	0.47	Pumps
Refrigerators	0.58	0.48	Refrigerators
Screw Machine Products	2.07	1.78	Screw Machine Products
Sewing Machines	1.66	1.81	Sewing Machines
Shipbuilding	0.05	0.05	Shipbuilding
Springs	1.10	1.23	Springs

INDUSTRIES	Employment Location Quotient	Value Added Location Quotient	INDUSTRIES
Stamped Metal	1.28	1.03	Stamped Metal
Steamfittings	3.01	2.90	Steamfittings
Stoves and Appliances	1.65	1.36	Stoves and Appliances
Stoves and Furnaces	1.54	1.29	Stoves and Furnaces
Structural Ironwork	1.11	1.07	Structural Ironwork
Surgical Appliances	2.42	2.10	Surgical Appliances
Tinware	2.14	1.93	Tinware
Tools	0.88	0.83	Tools
Typewriters	0.84	0.67	Typewriters
Washing Machines	3.64	2.98	Washing Machines
Wire/Wirework	1.62	1.33	Wire/Wirework

SOURCE: United States Census of Manufactures, 1923

TABLE 3-1: TAKEN FROM TABLE 3 IN

"CHICAGO'S GERMAN WORKING CLASS IN 1900,"
GERMAN WORKERS IN INDUSTRIAL CHICAGO, 1850-1919: A COMPARATIVE PERSPECTIVE,
HARTMUT KEIL AND JOHN B. JENTZ, EDS.
(DEKALB, IL: NORTHERN ILLINOIS UNIVERSITY PRESS), P. 28.

Table 3. The distribution of the German working class in the Chicago economy in 1880 and 1900 by first and second generation

Sector of the economy	First generation (1880)	Second generation (1880)	First generation (1900)	Second generation (1900)
Manufacturing and mechanical	**39.0**	**47.0**	**38.7**	**37.0**
Baking	1.7	1.7	2.5	1.0
Meat	3.1	2.3	4.2	1.8
Brewing	0.6	0.5	1.3	0.1
Tobacco	1.7	2.0	1.2	0.6
Leather	4.2	3.6	2.6	0.9
Shoes	2.6	1.3	1.3	0.8
Clothing	7.2	14.6	6.0	12.8
Wood	6.9	5.3	3.6	4.0
Furniture	3.7	5.3	3.4	2.0
Metal	6.7	8.5	12.5	12.4
(Iron and steel)	(3.3)	(2.5)	(4.8)	(2.6)
Building and construction	13.1	8.0	14.2	8.9
Printing and publishing	1.1	4.2	1.9	3.2
Transportation	5.2	3.8	6.7	6.1
Domestic services	6.2	9.3	3.8	5.7
Public services	2.1	2.0	4.0	5.[illegible]
Labor unspecified	24.1	8.8	16.9	10.7
Other	9.2	16.9	13.8	22.4
N	2,008	787	1,177	784
%	71.8	28.2	60.0	40.0

Source: Chicago Project, analysis of 2,222 German households for 1880 and of 1,532 German households for 1900.

TABLE 6-1: MANUFACTURING EMPLOYMENT IN CHICAGO AND ILLINOIS

	1929	1939	1947	1958
ILLINOIS				
All Manufacturing Jobs	827507	752728	1186134	1139412
All Manufacturing Establishments	15333	11983	15993	18100
METROPOLITAN CHICAGO				
All Manufacturing Jobs	636464 *	609940 *	946041 *	911923 **
All Manufacturing Establishments	11693 *	9058 *	12285 *	13952 **

* For the Chicago SMA (Standard Metropolitan Area) which includes Lake, Kane, DuPage, Cook, Will Counties in Illinois and Lake County in Indiana.

** For the Chicago-Northwestern, Indiana SMSA (Standard Metropolitan Statistical Area) which includes Lake, Kane, DuPage, Cook, Will, and McHenry Counties in Illinois and Lake and Porter Counties in Indiana; census regions changed in 1958.

SOURCE: United States Census of Manufactures, 1954, 1958.
FILE: (TABLE6-1)

TABLE 6-2: ILLINOIS MANUFACTURING IN 1958; ITS METAL-RELATED COMPLEX AND OTHER SECTORS RANK ORDERED BY EMPLOYMENT

INDUSTRIES	No. of Estabs.	Total Employment	Value Added	INDUSTRIES
ALL MANUFACTURING	18100	1139400	11664100	ALL MANUFACTURING
SIC 35: Machinery	2530	164400	1726200	SIC 35: Machinery
SIC 36: Electrical Equipment	904	162300	1455400	SIC 36: Electrical Equipment
SIC 20: Food Products	2186	129000	1653000	SIC 20: Food Products
SIC 34: Fabricated Metal	2348	127700	1201300	SIC 34: Fabricated Metal
SIC 27: Printing & Publishing	2857	94400	918500	SIC 27: Printing & Publishing
SIC 33: Primary Metal	558	89500	906900	SIC 33: Primary Metal
SIC 28: Chemical Products	857	46200	847800	SIC 28: Chemical Products
SIC 37: Transportation Equipment	275	44700	535600	SIC 37: Transportation Equipment
SIC 23: Apparel	1002	44300	246400	SIC 23: Apparel
SIC 32: Stone, Clay, Glass	835	37700	418800	SIC 32: Stone, Clay, Glass
SIC 39: Misc. Manufacturing	888	35700	316400	SIC 39: Misc. Manufacturing
SIC 26: Paper Products	441	31900	287000	SIC 26: Paper Products
SIC 38: Instruments	336	31000	302900	SIC 38: Instruments
SIC 25: Furniture & Fixtures	618	24700	188100	SIC 25: Furniture & Fixtures
SIC 30: Rubber & Plastics	368	22100	185200	SIC 30: Rubber & Plastics
SIC 29: Petroleum Products	98	14100	208300	SIC 29: Petroleum Products
SIC 24: Wood Products	676	11800	77500	SIC 24: Wood Products
SIC 22: Textile Mill Products*	103	8100	60100	SIC 22: Textile Mill Products*
SIC 31: Leather Products*				SIC 31: Leather Products*
SIC 21: Tobacco Products*				SIC 21: Tobacco Products*

* Sector contains an insignificant amount of activity.
** In 1958 Dollars.

SOURCE: United States Census of Manufactures, 1958.
FILE: (58C)

TABLE 6-3: LOCATION QUOTIENTS**
ILLINOIS MANUFACTURING, 1958

INDUSTRIES	Employment Location Quotient	Value Added Location Quotient	INDUSTRIES
SIC 20: Food Products	1.03	1.14	SIC 20: Food Products
SIC 21: Tobacco Products*			SIC 21: Tobacco Products*
SIC 22: Textile Mill Products*			SIC 22: Textile Mill Products*
SIC 23: Apparel	0.51	0.50	SIC 23: Apparel
SIC 24: Wood Products	0.27	0.30	SIC 24: Wood Products
SIC 25: Furniture & Fixtures	0.96	0.97	SIC 25: Furniture & Fixtures
SIC 26: Paper Products	0.78	0.61	SIC 26: Paper Products
SIC 27: Printing & Publishing	1.48	1.40	SIC 27: Printing & Publishing
SIC 28: Chemical Products	0.89	0.84	SIC 28: Chemical Products
SIC 29: Petroleum Products	1.06	1.00	SIC 29: Petroleum Products
SIC 30: Rubber & Plastics	0.86	0.68	SIC 30: Rubber & Plastics
SIC 31: Leather Products*			SIC 31: Leather Products*
SIC 32: Stone, Clay, Glass	0.92	0.92	SIC 32: Stone, Clay, Glass
SIC 33: Primary Metal	1.10	0.94	SIC 33: Primary Metal
SIC 34: Fabricated Metal	1.63	1.55	SIC 34: Fabricated Metal
SIC 35: Machinery	1.65	1.69	SIC 35: Machinery
SIC 36: Electrical Equipment	1.95	1.70	SIC 36: Electrical Equipment
SIC 37: Transportation Equipment	0.39	0.42	SIC 37: Transportation Equipment
SIC 38: Instruments	1.41	1.26	SIC 38: Instruments
SIC 39: Misc. Manufacturing	0.84	0.81	SIC 39: Misc. Manufacturing

* Sector contains an insignificant amount of activity.

** Location quotients calculated using "all manufacturing" instead of "all employment" as the base.

SOURCE: U.S. Census of Manufactures, 1958 (2DIGLQ58).

TABLE 6-4: THE ILLINOIS METAL-RELATED MANUFACTURING COMPLEX IN 1958 AT THE THREE-DIGIT SIC LEVEL; A RANKING BY EMPLOYMENT

INDUSTRIES	No. of Estabs.	Total Employment	Plant Size (In Jobs)	Annual Income/ Worker**	Value Added ($1,000s)**
ALL MANUFACTURING	18100	1139400	63	4590	11664100
SIC 366/Communications Equipment	62	52800	852	4910	482700
SIC 353/Construction Machinery	169	45200	267	4571	550200
SIC 331/Basic Steel Products	71	44500	627	5884	512000
SIC 354/Metalworking Machinery	795	27000	34	5299	238300
SIC 352/Farm Machinery	118	26700	226	5020	285000
SIC 363/Household Appliances	78	23500	301	4526	229200
SIC 349/Misc. Fab. Metal Products	196	23300	119	5087	218200
SIC 371/Motor Vehicles and Parts	165	22000	133	5150	248200
SIC 344/Fab. Structural Metal Products	624	21600	35	4875	212000
SIC 365/Audio and Video Equipment	51	21500	422	3802	207700
SIC 356/General Industrial Machinery	349	19100	55	4985	202300
SIC 364/Electric Lighting and Wiring	220	17300	79	4088	155000
SIC 346/Metal Stampings	348	17300	50	4572	154300
SIC 367/Electronic Components	180	17300	96	3317	112900
SIC 332/Iron and Steel Foundries	125	16400	131	4448	110200
SIC 345/Screw Machine Products	324	16100	50	4870	145000
SIC 342/Cutlery, Handtools, Hardware	206	15100	73	4443	146800
SIC 361/Electric Distribution Equipment	105	14900	142	4243	131600
SIC 355/Special Industry Machinery	266	14300	54	4969	130400
SIC 341/Metal Cans and Containers	23	11200	487	5454	128800
SIC 372/Aircraft and Parts	31	11000	355	5582	171800
SIC 335/Nonferrous Rolling and Drawing	50	10600	212	5500	128400
SIC 362/Electrical Industrial Apparatus	119	10300	87	4043	92800
SIC 374/Railroad Equipment	20	9700	485	5171	101100
SIC 359/Machine Shops***	628	8600	14		
SIC 358/Refrigeration and Service Mach.	153	8100	53	4519	82700
SIC 386/Photographic Equipment	69	7900	114	4750	76300
SIC 343/Plumbing and Heating	93	7900	85	4600	81000
SIC 347/Metal Services	380	7800	21	4143	57300
SIC 382/Measuring Devices	67	7800	116	4354	89000
SIC 348/Misc. Fabricated Wire Products	154	7500	49	4557	57900
SIC 351/Engines and Turbines*	11	7200	655		44500
SIC 336/Nonferrous Foundries (Castings)	190	7000	37	4633	52100
SIC 357/Computing and Office Equipment	45	6800	151	4302	73300
SIC 387/Watches, Clocks, and Parts	25	6400	256	4000	31900
SIC 339/Misc. Primary Metal Products	77	5900	77	5375	55900
SIC 384/Medical Instruments	104	5700	55	4275	76400
SIC 369/Misc. Electrical Equipment	89	4600	52	3800	43600
SIC 334/Secondary Nonferrous Metals	40	3500	88	4593	36000
SIC 381/Scientific Instruments	36	2200	61	4750	22200
SIC 333/Primary Nonferrous Metals	5	1600	320	4231	12200
SIC 379/Misc. Transportation Equipment	25	600	24	4500	4000
SIC 373/Ship and Boat Building*	21	600	29		4800
SIC 385/Ophthalmic Goods	15	200	13	5000	1700
SIC 375/Motorcycles, Bicycles and Parts	0	0	0	0	0

* Data unreported in 1958 for some industries; 1954 data substituted instead.

** In 1958 Dollars.

*** Data is problematic for this industry. As a larger inclusive category, it reported about 30,000 jobs in 1954; 8600 were reported unofficially for this sector in 1958.

SOURCE: United States Census of Manufactures, 1954, 1958 (3DIG58C).

TABLE 6-5: TOOL AND DIE SHOPS IN 1958
DISTRIBUTED ACROSS METAL-RELATED INDUSTRIES IN THE UNITED STATES

INDUSTRIES	No. of Estabs.	Total Production Employment	Plant Size (in jobs)	INDUSTRIES
TOTAL SIC 33-38	7224	161082	22	TOTAL SIC 33-38
SIC 33: Primary Metal	232	5539	24	SIC 33: Primary Metal
SIC 34: Fabricated Metal	1936	27097	14	SIC 34: Fabricated Metal
SIC 35: Machinery	3100	58561	19	SIC 35: Machinery
SIC 36: Electrical Equipment	1016	17388	17	SIC 36: Electrical Equipment
SIC 37: Transportation Equipment	745	49532	66	SIC 37: Transportation Equipment
SIC 38: Instruments	195	2965	15	SIC 38: Instruments

SOURCE: United States Census of Manufactures, Selected Metalworking and Related Operations, 1958.
FILE: TOOL58

TABLE 6-6: TOOL AND DIE SHOPS IN 1958 DISTRIBUTED ACROSS METAL-RELATED INDUSTRIES IN THE UNITED STATES AT THE THREE-DIGIT SIC LEVEL

INDUSTRIES	No. of Estabs.	Total Production Employment	Plant Size (in jobs)	Percent of Tool & Die Employment
TOTAL SIC 33-38	7224	161082	22	100
SIC 331/Basic Steel Products	33	206	6	0
SIC 332/Iron and Steel Foundries*				
SIC 333/Primary Nonferrous Metals*				
SIC 334/Secondary Nonferrous Metals*				
SIC 335/Nonferrous Rolling and Drawing	105	2304	22	1
SIC 336/Nonferrous Foundries (Castings)*				
SIC 339/Misc. Primary Metal Products	94	3029	32	2
SIC 341/Metal Cans and Containers	11	143	13	0
SIC 342/Cutlery, Handtools, Hardware	381	4265	11	3
SIC 343/Plumbing and Heating	120	752	6	0
SIC 344/Fabricated Structural Metal Products	213	7307	34	5
SIC 345/Screw Machine Products	266	3355	13	2
SIC 346/Metal Stampings	641	8630	13	5
SIC 347/Metal Services*				
SIC 348/Misc. Fabricated Wire Products	148	729	5	0
SIC 349/Misc. Fabricated Metal Products	156	1916	12	1
SIC 351/Engines and Turbines*	59	2091	35	1
SIC 352/Farm Machinery	208	2962	14	2
SIC 353/Construction Machinery	257	3996	16	2
SIC 354/Metalworking Machinery	1394	32306	23	20
SIC 355/Special Industry Machinery	282	2476	9	2
SIC 356/General Industrial Machinery	296	4309	15	3
SIC 357/Computing and Office Equipment	99	3878	39	2
SIC 358/Refrigeration and Service Machinery**	159	1750	11	1
SIC 359/Machine Shops	346	4866	14	3
SIC 361/Electric Distribution Equipment	159	2053	13	1
SIC 362/Electrical Industrial Apparatus	181	3292	18	2
SIC 363/Household Appliances	112	3426	31	2
SIC 364/Electric Lighting and Wiring	174	1839	11	1
SIC 365/Audio and Video Equipment	52	668	13	0
SIC 366/Communications Equipment	103	2477	24	2
SIC 367/Electronic Components	172	1878	11	1
SIC 369/Misc. Electrical Equipment	63	1755	28	1
SIC 371/Motor Vehicles and Parts	348	25709	74	16
SIC 372/Aircraft and Parts	311	22029	71	14
SIC 373/Ship and Boat Building	23	132	6	0
SIC 374/Railroad Equipment	28	991	35	1
SIC 375/Motorcycles, Bicycles and Parts	13	587	45	0
SIC 379/Misc. Transportation Equipment	22	84	4	0
SIC 381/Scientific Instruments	54	969	18	1
SIC 382/Measuring Devices	105	1612	15	1
SIC 384/Medical Instruments*				
SIC 385/Ophthalmic Goods*				
SIC 386/Photographic Equipment*				

INDUSTRIES	No. of Estabs.	Total Production Employment	Plant Size (in jobs)	Percent of Tool & Die Employment
SIC 387/Watches, Clocks, and Parts	36	384	11	0
TOOL AND DIE INDUSTRY (SIC 3544 AND 3545) AS REPORTED IN THE METALWORKING REPORT* **	1217	29297	24	18
SIC 3544/Special Tools and Dies	1124	27798	25	17
SIC 3545/Machine Tool Accessories	93	1499	16	1
TOOL AND DIE INDUSTRY (SIC 3544 AND 3545) AS REPORTED IN THE REGULAR CENSUS	6650	98220	15	61
SIC 3544/Special Tools and Dies	5745	68916	12	43
SIC 3545/Machine Tool Accessories	905	29304	32	18

* Not reported in the Metalworking Report as having toolrooms; however, as a survey, the report may be inaccurate.
** Toolroom employment for this industry reported as a range (from 1000 to 2499) for disclosure reasons.
*** The Metalworking Report is a survey. Therefore, its coverage is incomplete compared with the regular census.
SOURCE: United States Census of Manufactures, Selected Metalworking and Related Operations, 1958.
FILE: (TOOL58B)

TABLE 7-1: EMPLOYMENT IN ILLINOIS MANUFACTURING INDUSTRIES RANKED BY NUMBER OF JOBS OFFERED

INDUSTRY RANKING IN 1958 BY SECTOR SIZE

	Jobs	Percent
ALL MANUFACTURING	1139400	100
SIC 35: Machinery	164400	14
SIC 36: Electrical Equipment	162300	14
SIC 20: Food Products	129000	11
SIC 34: Fabricated Metal	127700	11
SIC 27: Printing & Publishing	94400	8
SIC 33: Primary Metal	89500	8
SIC 28: Chemical Products	46200	4
SIC 37: Transportation Equipme	44700	4
SIC 23: Apparel	44300	4
SIC 32: Stone, Clay, Glass	37700	3
SIC 39: Misc. Manufacturing	35700	3
SIC 26: Paper Products	31900	3
SIC 38: Instruments	31000	3
SIC 25: Furniture & Fixtures	24700	2
SIC 30: Rubber & Plastics	22100	2
SIC 29: Petroleum Products	14100	1
SIC 24: Wood Products	11800	1
SIC 22: Textile Mill Products*		
SIC 31: Leather Products*		
SIC 21: Tobacco Products*		

INDUSTRY RANKING IN 1987 BY SECTOR SIZE

	Jobs	Percent
ALL MANUFACTURING	989600	100
SIC 35: Machinery	133400	13
SIC 34: Fabricated Metal	109500	11
SIC 27: Printing & Publishing	109400	11
SIC 36: Electrical Equipment	98200	10
SIC 20: Food Products	81000	8
SIC 30: Rubber & Plastics	55100	6
SIC 28: Chemical Products	49000	5
SIC 33: Primary Metal	48300	5
SIC 37: Transportation Equipment	40100	4
SIC 38: Instruments	36400	4
SIC 26: Paper Products	32300	3
SIC 39: Misc. Manufacturing	23900	2
SIC 32: Stone, Clay, Glass	20300	2
SIC 25: Furniture & Fixtures	19600	2
SIC 23: Apparel	15100	2
SIC 24: Wood Products	11500	1
SIC 29: Petroleum Products	6800	1
SIC 21: Tobacco Products*		
SIC 31: Leather Products*		
SIC 22: Textile Mill Products*		

* Sector covers an insignificant amount of activity.

SOURCE: United States Census of Manufactures, 1958, 1987 (2DIGLAB3).

TABLE 7-2: ILLINOIS MANUFACTURING CHANGE IN EMPLOYMENT, 1958-1987

INDUSTRIES	Employment (1,000s) 1958	1987	% Change 1958-1987	% Change 1958-1967	% Change 1967-1977	% Change 1977-1987	INDUSTRIES
ALL MANUFACTURING	1139400	989600	-13	23	-8	-23	ALL MANUFACTURING
SIC 20: Food Products	129000	81000	-37	-7	-13	-22	SIC 20: Food Products
SIC 21: Tobacco Products*							SIC 21: Tobacco Products*
SIC 22: Textile Mill Products*							SIC 22: Textile Mill Products*
SIC 23: Apparel	44300	15100	-66	-13	-36	-39	SIC 23: Apparel
SIC 24: Wood Products	11800	11500	-3	3	15	-17	SIC 24: Wood Products
SIC 25: Furniture & Fixtures	24700	19600	-21	4	-9	-17	SIC 25: Furniture & Fixtures
SIC 26: Paper Products	31900	32300	1	28	-12	-10	SIC 26: Paper Products
SIC 27: Printing & Publishing	94400	109400	16	13	-6	9	SIC 27: Printing & Publishing
SIC 28: Chemical Products	46200	49000	6	24	-5	-10	SIC 28: Chemical Products
SIC 29: Petroleum Products	14100	6800	-52	-21	-3	-37	SIC 29: Petroleum Products
SIC 30: Rubber & Plastics	22100	55100	149	72	32	10	SIC 30: Rubber & Plastics
SIC 31: Leather Products*							SIC 31: Leather Products*
SIC 32: Stone, Clay, Glass**	37700	20300	-46	1	DU	DU	SIC 32: Stone, Clay, Glass**
SIC 33: Primary Metal	89500	48300	-46	21	-18	-46	SIC 33: Primary Metal
SIC 34: Fabricated Metal	127700	109500	-14	13	-3	-22	SIC 34: Fabricated Metal
SIC 35: Machinery	164400	133400	-19	36	-6	-37	SIC 35: Machinery
SIC 36: Electrical Equipment	162300	98200	-39	30	-27	-37	SIC 36: Electrical Equipment
SIC 37: Transportation Equipment	44700	40100	-10	1	11	-20	SIC 37: Transportation Equipment
SIC 38: Instruments	31000	36400	17	42	0	-17	SIC 38: Instruments
SIC 39: Misc. Manufacturing	35700	23900	-33	4	-7	-31	SIC 39: Misc. Manufacturing

* Sector contains an insignificant amount of activity.
** Data unreported (DU) by the census for this sector for 1977.
SOURCE: United States Census of Manufactures, 1958, 1967, 1977, 1987 (2DIGLAB4).

TABLE 7-3a:
EMPLOYMENT IN ILLINOIS MANUFACTURING
(Non-adjusted SIC sectors)

INDUSTRIES	Employment 1958	Employment 1987	% Change 1958-1967	% Change 1967-1977	% Change 1977-1987	% Change 1967-1987	% Change 1958-198'	INDUSTRIES
ALL MANUFACTURING	1139400	989600	23	-8	-23	-29	-13	ALL MANUFACTURING
"CUSTOMER INDUSTRIES":								"CUSTOMER INDUSTRIES":
SIC 331: Blast Furnaces	38300	20800	32	-11	-54		-46	SIC 331: Blast Furnaces
SIC 352: Farm/Garden Machinery	26700	10000	18	-19	-61		-63	SIC 352: Farm/Garden Machinery
SIC 353: Construction Equipment	45200	24300	40	-11	-57		-46	SIC 353: Construction Equipment
SIC 363: Appliances	23500	10300	9	-22	-48		-56	SIC 363: Appliances
SIC 366: Communication Equipment**	52800	21100	-17	-4	-49		-60	SIC 366: Communication Equipment*
SIC 371: Motor Vehicles/Parts***	22000	20600	2	21	-24		-6	SIC 371: Motor Vehicles/Parts***
"SUPPLIER INDUSTRIES":								"SUPPLIER INDUSTRIES":
SIC 346: Forgings/Stampings	17300	23300	61	11	-25		35	SIC 346: Forgings/Stampings
SIC 354: Metalworking Machinery	27000	24500	44	-16	-25		-9	SIC 354: Metalworking Machinery
SIC 359: Industrial Machinery*		18700		5	17	23		SIC 359: Industrial Machinery*

* Data not reported at the state level in 1958 except as a footnoted and incomplete entry in the industry report; at 8,627 jobs.
** Data unreported (DU) in 1967; data from 1963 substituted instead.
*** Data unreported (DU) in 1987; data from 1983 substituted instead.

SOURCE: United States Census of Manufactures, 1958, 1967, 1977, 1987.
FILE: (3DIGLAB5)

TABLE 7-3b:
EMPLOYMENT IN ILLINOIS MANUFACTURING--ADJUSTED FOR CHANGES IN SIC CLASSIFICATION

INDUSTRIES	Employment 1958	Employment 1987	% Change 1958-1967	% Change 1967-1977	% Change 1977-1987	% Change 1967-1987	% Change 1958-198'	INDUSTRIES
ALL MANUFACTURING	1139400	989600	23	-8	-23	-29	-13	ALL MANUFACTURING
"CUSTOMER INDUSTRIES":								"CUSTOMER INDUSTRIES":
SIC 331: Blast Furnaces	38300	20800	32	-11	-54		-46	SIC 331: Blast Furnaces
SIC 352: Farm/Garden Machinery	26700	9886	18	-20	-61		-63	SIC 352: Farm/Garden Machinery
SIC 353: Construction Equipment	45200	24300	40	-11	-57		-46	SIC 353: Construction Equipment
SIC 363: Appliances	23745	10363	10	-24	-48		-56	SIC 363: Appliances
SIC 366: Communication Equipment**	52800	29777	-17	-5	-28		-44	SIC 366: Communication Equipment*
SIC 371: Motor Vehicles/Parts***	22000	20600	2	21	-24		-6	SIC 371: Motor Vehicles/Parts***
"SUPPLIER INDUSTRIES":								"SUPPLIER INDUSTRIES":
SIC 346: Forgings/Stampings	17300	20622	61	-10	-18		19	SIC 346: Forgings/Stampings
SIC 354: Metalworking Machinery	27000	23703	44	-16	-28		-12	SIC 354: Metalworking Machinery
SIC 359: Industrial Machinery*		17565		10	5	16		SIC 359: Industrial Machinery*

* Data not reported at the state level in 1958 except as a footnoted and incomplete entry in the industry report; it listed 8,627 jobs.

** Data unreported (DU) in 1967; data from 1963 substituted instead.

*** Data unreported (DU) in 1987; data from 1983 substituted instead.

NOTE: I calculated SIC adjustments where possible by shifting employment from the old to the newly classified industries to make these 3-digit sectors comparable over time. In many cases, however, reclassified industries (often at the 5-digit and above levels) did not report their employment at the state level. Therefore, I applied a national percentage to a larger Illinois industry to obtain an appropriate adjustment. Where employment changes were also not reported at the national level, I compared differences in the value of shipments for the adjusted categories and applied that share to state employment figures for the appropriate industry. Adjusted sectors include: SIC 352, 363, 366, 346, 354, and 359.

SOURCE: United States Census of Manufactures, 1958, 1967, 1977, 1987 (3DIGLB5A).

TABLE 7-4: EMPLOYMENT RANKINGS; ILLINOIS METAL-RELATED COMPLEX
(Non-adjusted SIC Codes)

INDUSTRIES	1958 Employment (1,000s)	1987 Employment (1,000s)	INDUSTRIES
ALL MANUFACTURING	1139.4	989.6	ALL MANUFACTURING
SIC 366/Communications Equipment	52.8	24.5	SIC 354/Metalworking Machinery
SIC 353/Construction Machinery	45.2	24.3	SIC 353/Construction Machinery
SIC 331/Basic Steel Products	38.3	23.3	SIC 346/Metal Forgings and Stampings
SIC 354/Metalworking Machinery	27.0	22.5	SIC 367/Electronic Components
SIC 352/Farm Machinery	26.7	21.8	SIC 356/General Industrial Machinery
SIC 363/Household Appliances	23.5	21.1	SIC 366/Communications Equipment
SIC 349/Misc. Fabricated Metal Products	23.3	20.8	SIC 331/Basic Steel Products
SIC 371/Motor Vehicles and Parts	22.0	20.6	SIC 371/Motor Vehicles and Parts*
SIC 344/Fabricated Structural Metal Products	21.6	19.9	SIC 349/Misc. Fabricated Metal Products
SIC 365/Audio and Video Equipment	21.5	18.7	SIC 359/Industrial Machinery, nec.
SIC 356/General Industrial Machinery	19.1	18.5	SIC 344/Fab. Structural Metal Products
SIC 346/Metal Stampings	17.3	17.7	SIC 364/Electric Lighting and Wiring
SIC 367/Electronic Components	17.3	14.9	SIC 382/Measuring Devices
SIC 364/Electric Lighting and Wiring	17.3	13.4	SIC 345/Screw Machine Products
SIC 332/Iron and Steel Foundries	16.4	12.9	SIC 342/Cutlery, Handtools, Hardware
SIC 345/Screw Machine Products	16.1	12.0	SIC 358/Refrigeration and Service Machiner
SIC 342/Cutlery, Handtools, Hardware	15.1	11.0	SIC 335/Nonferrous Rolling and Drawing*
SIC 361/Electric Distribution Equipment	14.9	10.8	SIC 332/Iron and Steel Foundries*
SIC 355/Special Industry Machinery	14.3	10.6	SIC 362/Electrical Industrial Apparatus
SIC 341/Metal Cans and Containers	11.2	10.3	SIC 363/Household Appliances
SIC 372/Aircraft and Parts	11.0	10.1	SIC 374/Railroad Equipment*
SIC 335/Nonferrous Rolling and Drawing	10.6	10.0	SIC 352/Farm and Garden Machinery
SIC 362/Electrical Industrial Apparatus	10.3	9.2	SIC 355/Special Industry Machinery
SIC 374/Railroad Equipment	9.7	8.6	SIC 347/Metal Services, nec.
SIC 358/Refrigeration and Service Machinery	8.1	7.6	SIC 381/Navigation Equipment
SIC 343/Plumbing and Heating	7.9	7.3	SIC 361/Electric Distribution Equipment
SIC 386/Photographic Equipment	7.9	7.2	SIC 384/Medical Instruments
SIC 382/Measuring Devices	7.8	7.0	SIC 357/Computer and Office Equipment
SIC 347/Metal Services, nec.	7.8	6.6	SIC 336/Nonferrous Foundries (Castings)*
SIC 348/Fabricated Wire Products, nec.	7.5	6.2	SIC 372/Aircraft and Parts*
SIC 351/Engines and Turbines*	7.2	5.8	SIC 351/Engines and Turbines
SIC 336/Nonferrous Foundries (Castings)	7.0	5.4	SIC 369/Misc. Electrical Equipment
SIC 357/Computing and Office Equipment	6.8	5.3	SIC 341/Metal Cans and Containers
SIC 387/Watches, Clocks, and Parts	6.4	3.9	SIC 386/Photographic Equipment
SIC 339/Misc. Primary Metal Products	5.9	3.5	SIC 365/Audio and Video Equipment
SIC 384/Medical Instruments	5.7	3.3	SIC 343/Plumbing and Heating*
SIC 369/Misc. Electrical Equipment	4.6	2.5	SIC 348/Ordnance*
SIC 334/Secondary Nonferrous Metals	3.5	2.2	SIC 339/Misc. Primary Metal Products
SIC 381/Scientific Instruments	2.2	2.0	SIC 334/Secondary Nonferrous Metals*
SIC 333/Primary Nonferrous Metals	1.6	1.4	SIC 387/Watches, Clocks, and Parts*
SIC 373/Ship and Boat Building*	0.6	1.3	SIC 375/Motorcycles, Bicycles and Parts*
SIC 379/Misc. Transportation Equipment	0.6	0.7	SIC 373/Ship and Boat Building*
SIC 385/Ophthalmic Goods	0.2	0.7	SIC 385/Ophthalmic Goods*
SIC 375/Motorcycles, Bicycles and Parts*	0.0	0.5	SIC 379/Misc. Transportation Equipment*
SIC 359/Industrial Machinery**	DU	0.5	SIC 333/Primary Nonferrous Metals*

* Data unreported (DU) in census year (1958 or 1987); data from previous census recorded instead (1954, 1983).
** Data unreported (DU) in 1958; 1954 data not comparable since industry category significantly redefined.
*** Some industrial categories changed in title and content between 1958 and 1987: SIC 348, 352, 359, 376, 381.
SOURCE: United States Census of Manufactures, 1958, 1987 (3DIGLAB7).

TABLE 7-5: ILLINOIS METAL-RELATED COMPLEX
(Unadjusted SIC Codes)

EMPLOYMENT LOCATION QUOTIENTS

INDUSTRIES	1958	1967	1977	1987	INDUSTRIES
"CUSTOMER INDUSTRIES":					"CUSTOMER INDUSTRIES":
SIC 331: Blast Furnaces	0.89	1.13	1.30	1.58	SIC 331: Blast Furnaces
SIC 352: Farm/Garden Machinery	3.32	3.19	2.56	2.34	SIC 352: Farm/Garden Machinery
SIC 353: Construction Equipment	3.06	3.20	2.58	2.47	SIC 353: Construction Equipment
SIC 363: Appliances	2.22	2.09	1.87	1.69	SIC 363: Appliances
SIC 366: Communication Equipment	3.32	ERR	1.39	1.55	SIC 366: Communication Equipment
SIC 371: Motor Vehicles/Parts	0.51	0.42	0.47	ERR	SIC 371: Motor Vehicles/Parts
"SUPPLIER INDUSTRIES":					"SUPPLIER INDUSTRIES":
SIC 346: Forgings/Stampings	1.86	1.71	1.64	1.75	SIC 346: Forgings/Stampings
SIC 354: Metalworking Machinery	1.56	1.60	1.67	1.75	SIC 354: Metalworking Machinery
SIC 359: Industrial Machinery	ERR	ERR	1.09	1.23	SIC 359: Industrial Machinery

VALUE ADDED-BASED LOCATION QUOTIENTS

INDUSTRIES	1958	1967	1977	1987	INDUSTRIES
"CUSTOMER INDUSTRIES":					"CUSTOMER INDUSTRIES":
SIC 331: Blast Furnaces	0.78	1.07	1.37	1.53	SIC 331: Blast Furnaces
SIC 352: Farm/Garden Machinery	3.17	3.28	2.65	2.91	SIC 352: Farm/Garden Machinery
SIC 353: Construction Equipment	3.24	3.24	2.88	3.14	SIC 353: Construction Equipment
SIC 363: Appliances	1.79	1.62	1.44	1.45	SIC 363: Appliances
SIC 366: Communication Equipment	2.87	ERR	1.42	1.52	SIC 366: Communication Equipment
SIC 371: Motor Vehicles/Parts	0.45	0.41	0.31	ERR	SIC 371: Motor Vehicles/Parts
"SUPPLIER INDUSTRIES":					"SUPPLIER INDUSTRIES":
SIC 346: Forgings/Stampings	1.78	1.70	1.72	1.91	SIC 346: Forgings/Stampings
SIC354: Metalworking Machinery	1.40	1.43	1.53	1.59	SIC354: Metalworking Machinery
SIC 359: Industrial Machinery	ERR	ERR	1.08	1.17	SIC 359: Industrial Machinery

* Location quotients were calculated utilizing "all manufacturing" value added as the base instead of value added for for the entire Illinois or national economies; ERR means data not disclosed for sector or no production in that sector for Illinois.

SOURCE: United States Census of Manufactures, 1958, 1967, 1977, 1987 (3DIGLQL3).

TABLE 7-6:
NUMBER OF ESTABLISHMENTS IN ILLINOIS MANUFACTURING SECTORS
(Non-adjusted SIC sectors)

INDUSTRIES	No. of Estabs. 1958	No. of Estabs. 1987	% Change 1958-1967	% Change 1967-1977	% Change 1977-1987	% Change 1967-1987	% Change 1958-1987	INDUSTRIES
ALL MANUFACTURING	18100	18404	2	5	-6	-1	2	ALL MANUFACTURING
"CUSTOMER INDUSTRIES":								"CUSTOMER INDUSTRIES":
SIC 331: Blast Furnaces	19	105	326	37	-5		453	SIC 331: Blast Furnaces
SIC 352: Farm/Garden Machinery	118	93	10	-1	-28		-21	SIC 352: Farm/Garden Machinery
SIC 353: Construction Equipment	169	185	-4	20	-5		9	SIC 353: Construction Equipment
SIC 363: Appliances	78	33	-26	-9	-38		-58	SIC 363: Appliances
SIC 366: Communication Equipment	62	71	45	44	-45		15	SIC 366: Communication Equipment
SIC 371: Motor Vehicles/Parts	165	197	-6	16	9		19	SIC 371: Motor Vehicles/Parts
"SUPPLIER INDUSTRIES":								"SUPPLIER INDUSTRIES":
SIC 346: Forgings/Stampings	348	405	3	19	-6		16	SIC 346: Forgings/Stampings
SIC 354: Metalworking Machinery	795	1055	25	6	0		33	SIC 354: Metalworking Machinery
SIC 359: Industrial Machinery*	DU	1215		22	5	28		SIC 359: Industrial Machinery

* Data unreported (DU) at the state level in 1958.
SOURCE: United States Census of Manufactures, 1958, 1967, 1977, 1987.
FILE: 3DIGCO2

LIST OF GRAPHS

GRAPH 1-1:
CHICAGO'S METAL-RELATED MANUFACTURING COMPLEX

THE "FRONTEND" OF THE CHAIN: METAL-RELATED MANUFACTURERS
"Customer" industries include agricultural and construction equipment, autos, consumer appliances, consumer electronics and communication equipment, and other machinery producers.
STATS: Establishments: 2883; Employment: 239,900; Average Establishment Size: 83

THE "INTERMEDIATE PART" OF THE CHAIN: THE METALWORKING INDUSTRY
Metalworking "supplier" industries include fabricated metals, tool and diemaking, metal stamping, screw machine products, machining and custom machinery production, and metal services like plating.
STATS: Establishments: 5455; Employment: 188,600; Average Establishment Size: 35

THE "BACKEND" OF THE CHAIN: STEEL AND PRIMARY METALS
The "backend" of the metal-related production chain consists of the basic and unprocessed steel and metals industries.
STATS: Establishments: 455; Employment: 48,300; Average Establishment Size: 106

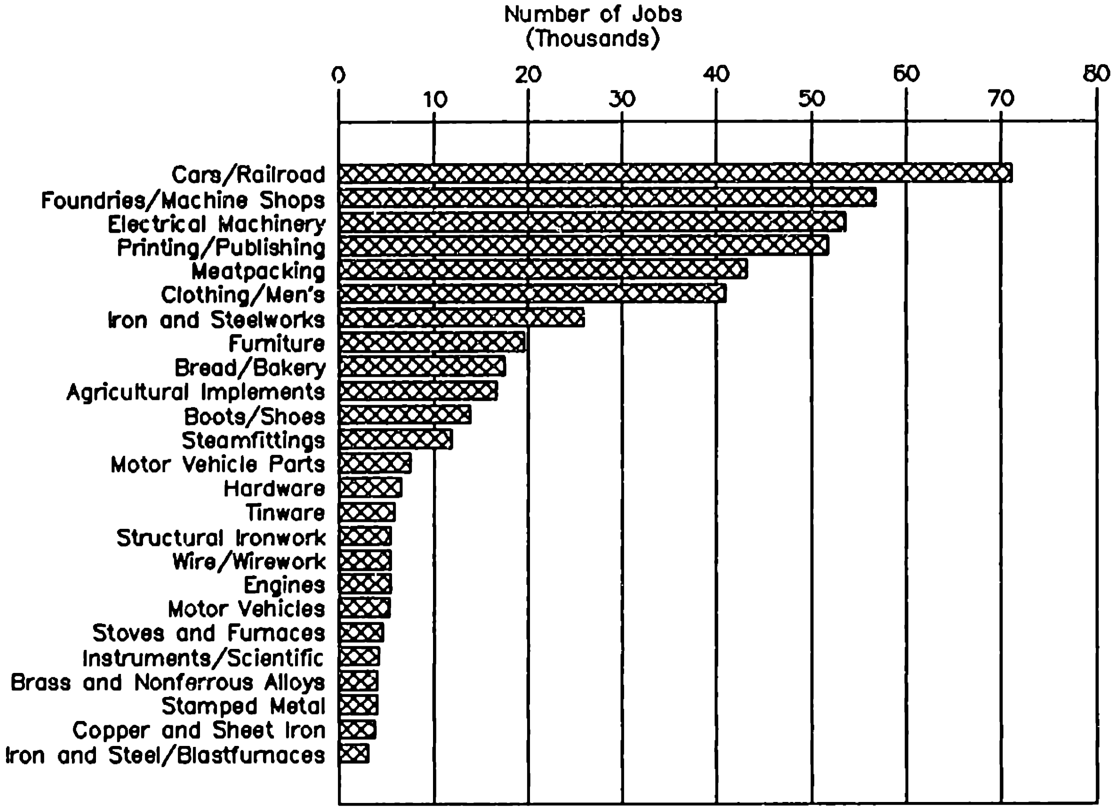
SOURCE: U.S. Census of Manufactures, 1987; all statistics reported for the State of Illinois as a proxy for the Chicago region.

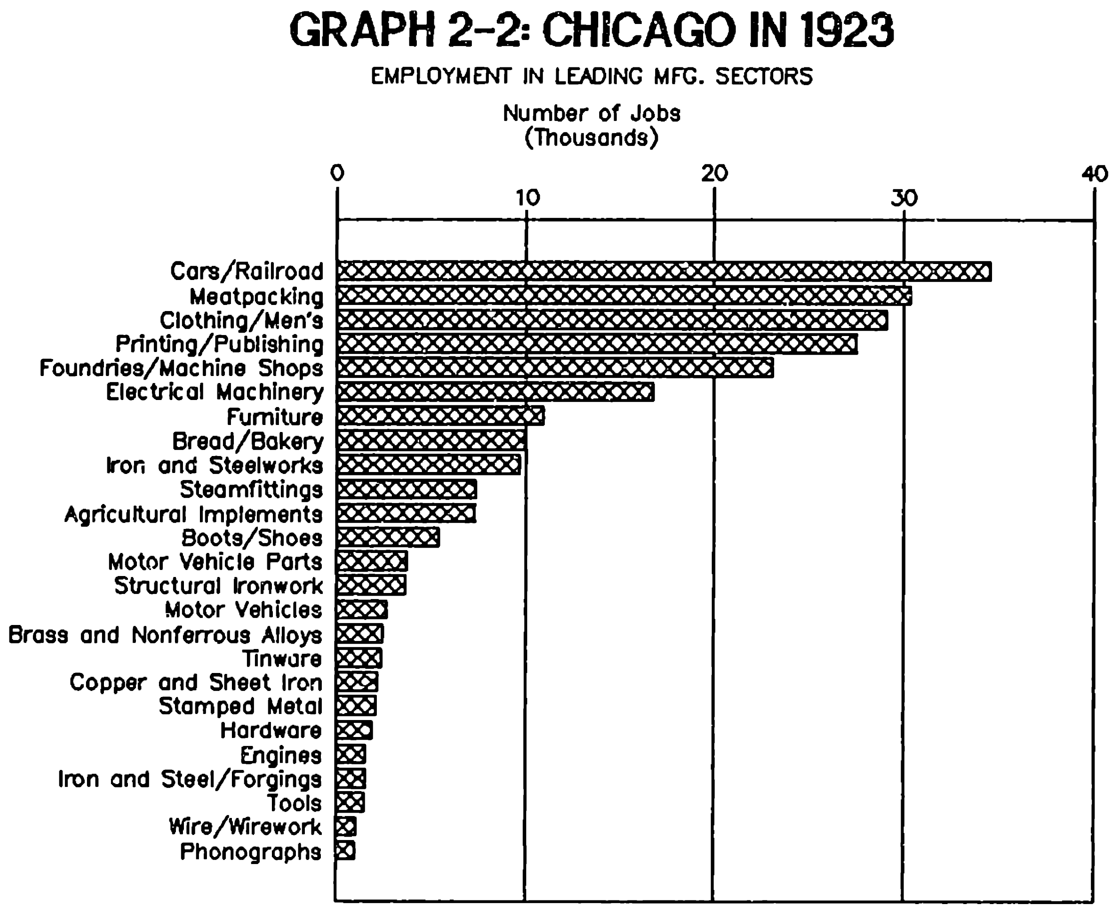
GRAPH 1-2:
A LIFE-CYCLE MODEL OF CHICAGO'S METALWORKING NETWORK

SUPPLIER-LABOR ALLIANCE	**SUPPLIER-CAPTIVE SHOP ALLIANCE**	**TODAY'S CHALLENGE TO THE NETWORK**
1925 - 1955	1955 - 1985	1985 - Today
FEATURES:	**FEATURES:**	**FEATURES:**
Metalworking shop owners, the IAM, and craftworkers collaborate.	Metalworking suppliers and captive shops collaborate.	Supplier collaboration is weakened while supplier-customer firm collaboration strengthens.
Quality production and a "living wage" ethic provides a common bond.	Skilled training program provides a common bond between network participants.	Ten percent of all suppliers are selected to be "preferred suppliers" to multinational customer firms.
The network strengthens the position of the suppliers as part of a larger craft community.	The network excludes the craft union and adopts an anti-union stance.	Tensions grow within the horizontally structured metalworking network.

GRAPH 2-1: ILLINOIS IN 1923

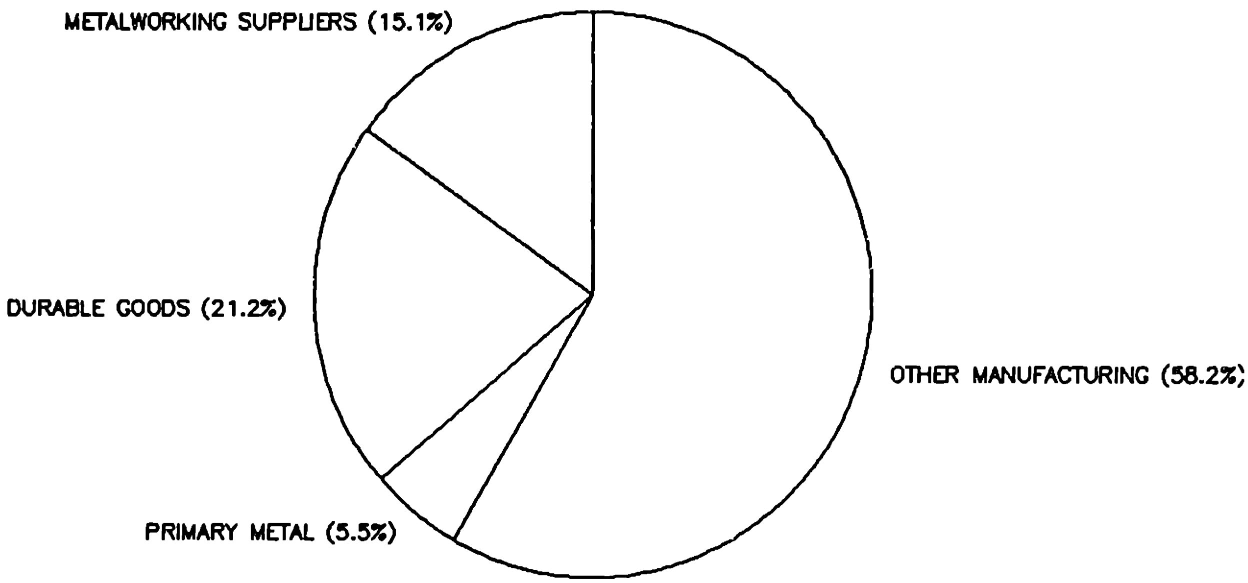
EMPLOYMENT IN LEADING MFG. SECTORS




GRAPH 2-2: CHICAGO IN 1923
EMPLOYMENT IN LEADING MFG. SECTORS
Number of Jobs
(Thousands)
0
10
20
30
40
Cars/Railroad
Meatpacking
Clothing/Men's
Printing/Publishing
Foundries/Machine Shops
Electrical Machinery
Furniture
Bread/Bakery
Iron and Steelworks
Steamfittings
Agricultural Implements
Boots/Shoes
Motor Vehicle Parts
Structural Ironwork
Motor Vehicles
Brass and Nonferrous Alloys
Tinware
Copper and Sheet Iron
Stamped Metal
Hardware
Engines
Iron and Steel/Forgings
Tools
Wire/Wirework
Phonographs

GRAPH 2-3: ILLINOIS MANUFACTURING, 1923

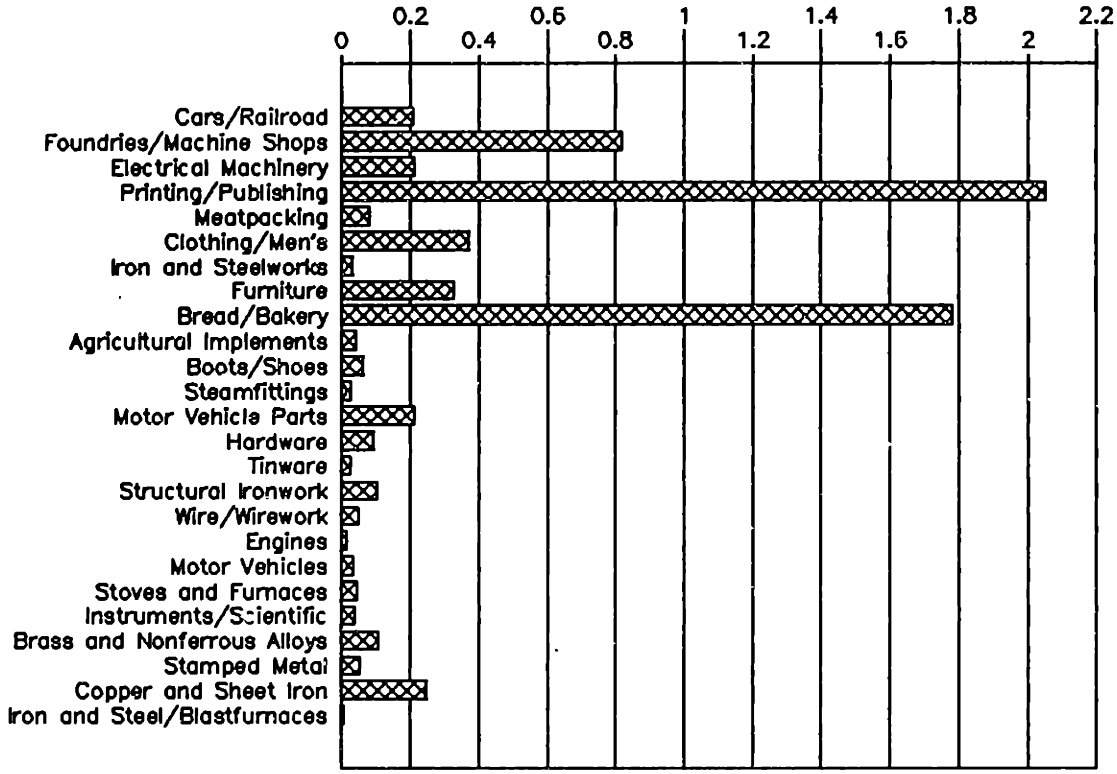
COMPONENTS OF ITS METAL-RELATED COMPLEX



GRAPH 2-4: ILLINOIS IN 1923

NUMBER OF FIRMS IN LEADING SECTORS

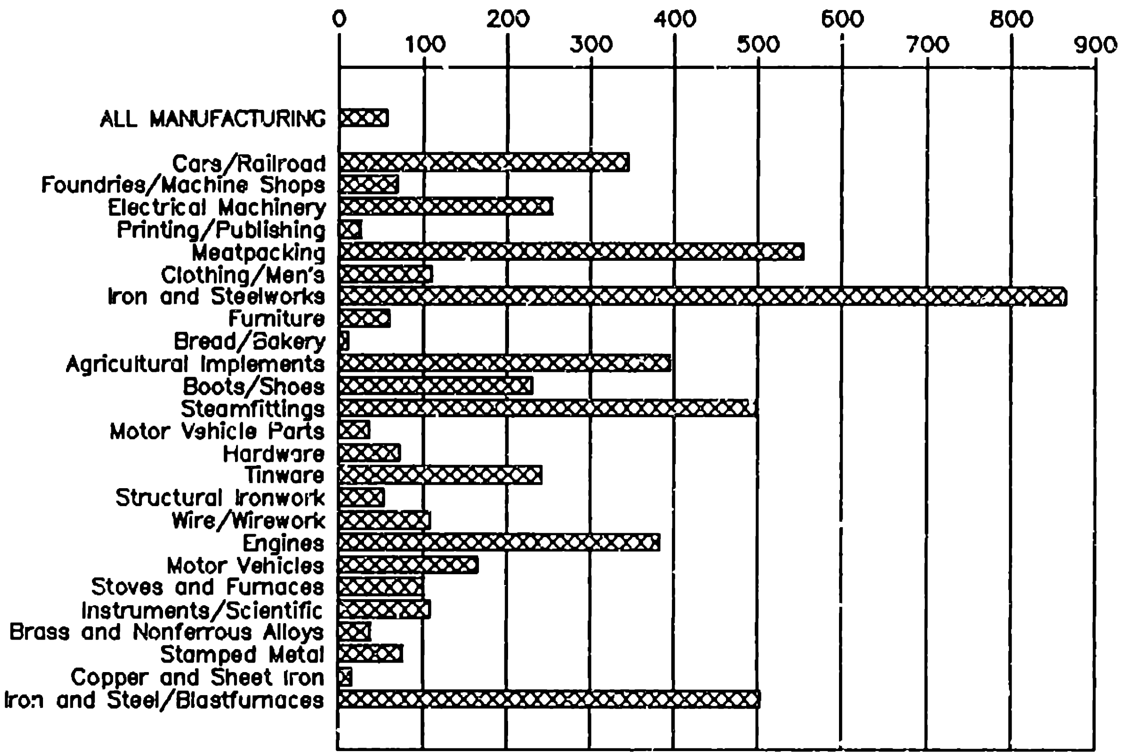
(Thousands)



GRAPH 2-5: ILLINOIS IN 1923

AVERAGE PLANT SIZE IN LEADING SECTORS

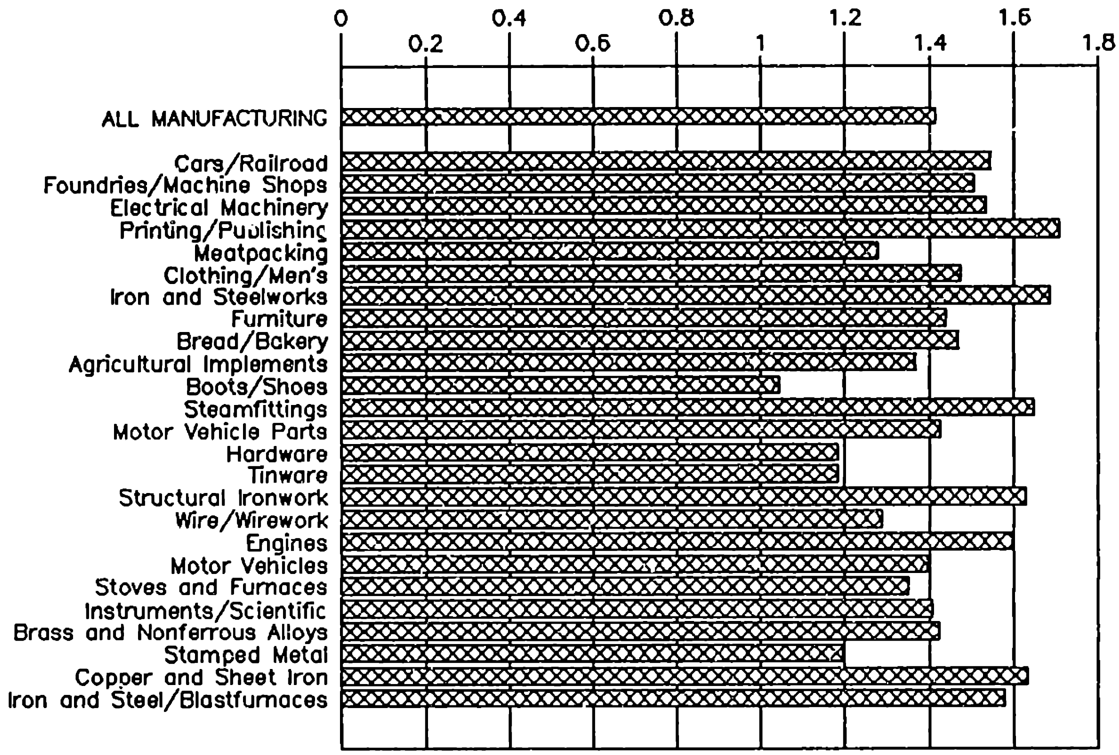
Number of Workers per Establishment



GRAPH 2-6: ILLINOIS IN 1923

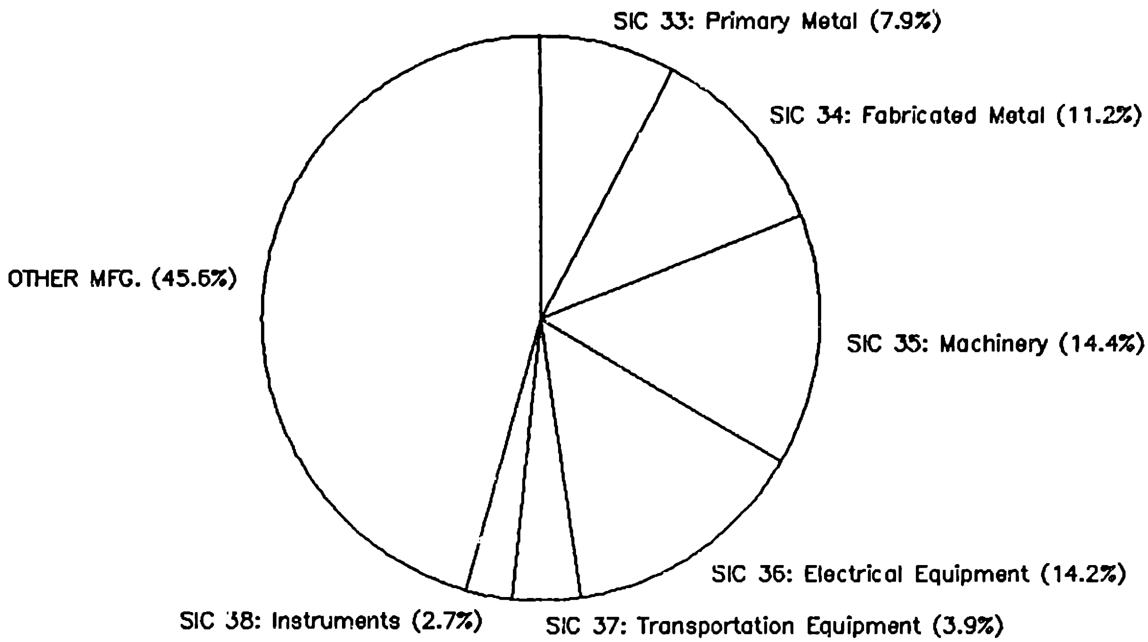
AVERAGE ANNUAL WAGE IN LEADING SECTORS

(1923 Dollars)
(Thousands)



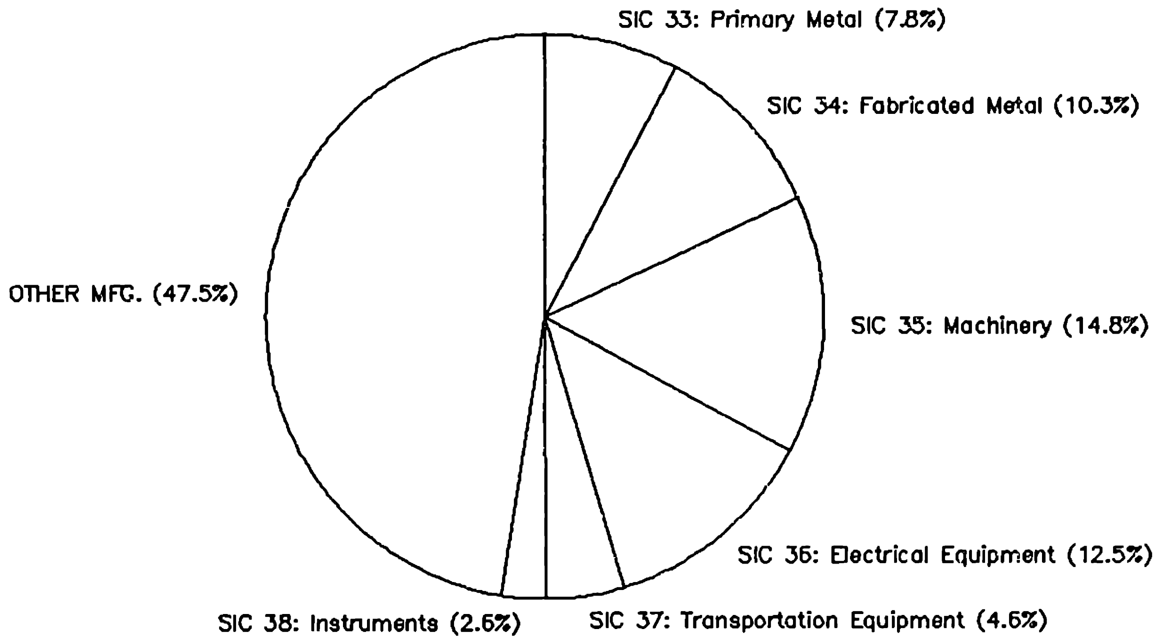
GRAPH 6-1: MANUFACTURING EMPLOYMENT

ILLINOIS METAL-RELATED SECTORS IN 1958



GRAPH 6-2: MANUFACTURING VALUE ADDED

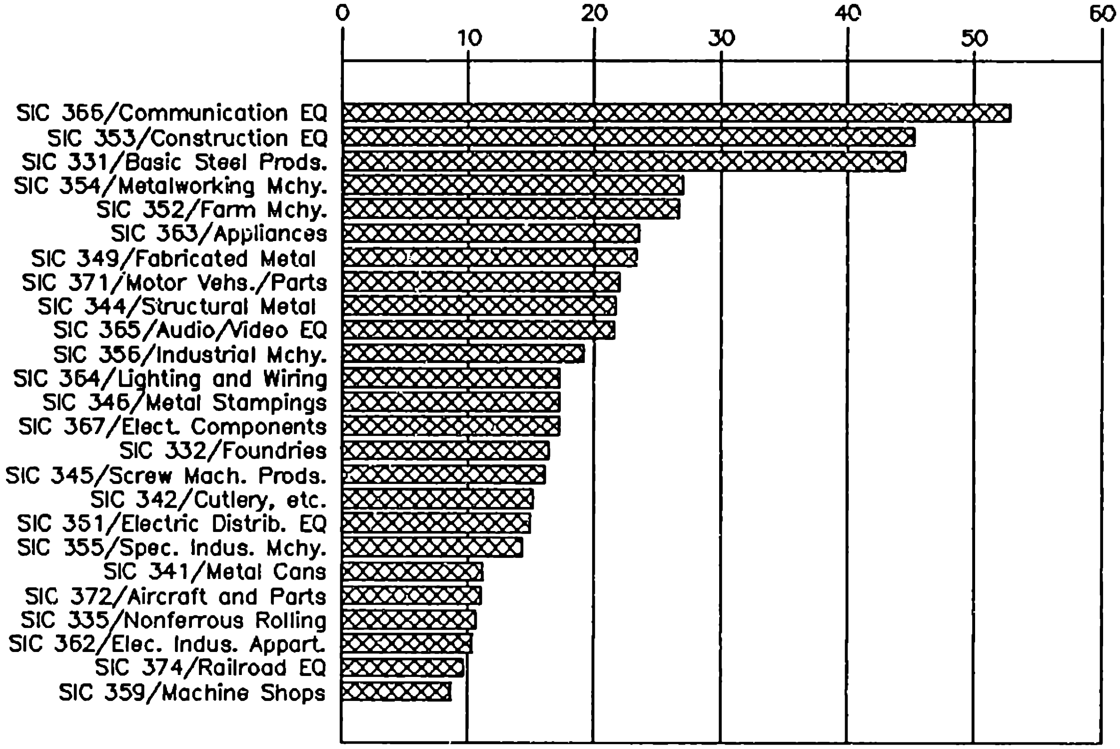
ILLINOIS METAL-RELATED SECTORS IN 1958



GRAPH 6-3: ILLINOIS EMPLOYMENT IN 1958

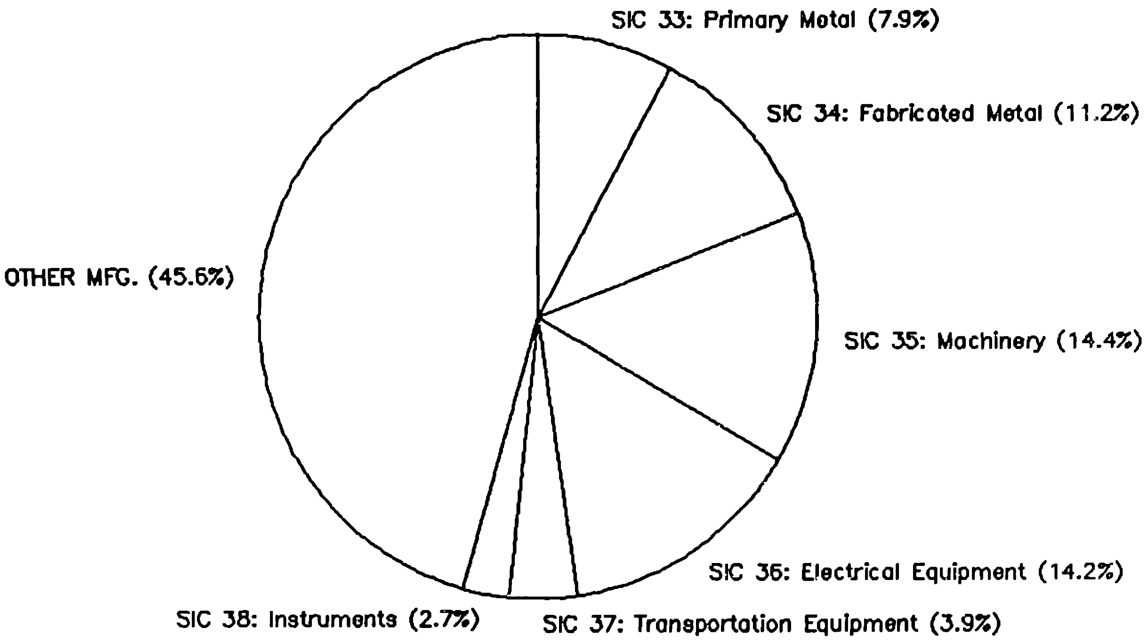
TOP METAL-RELATED SECTORS

(Number of Jobs)
(Thousands)

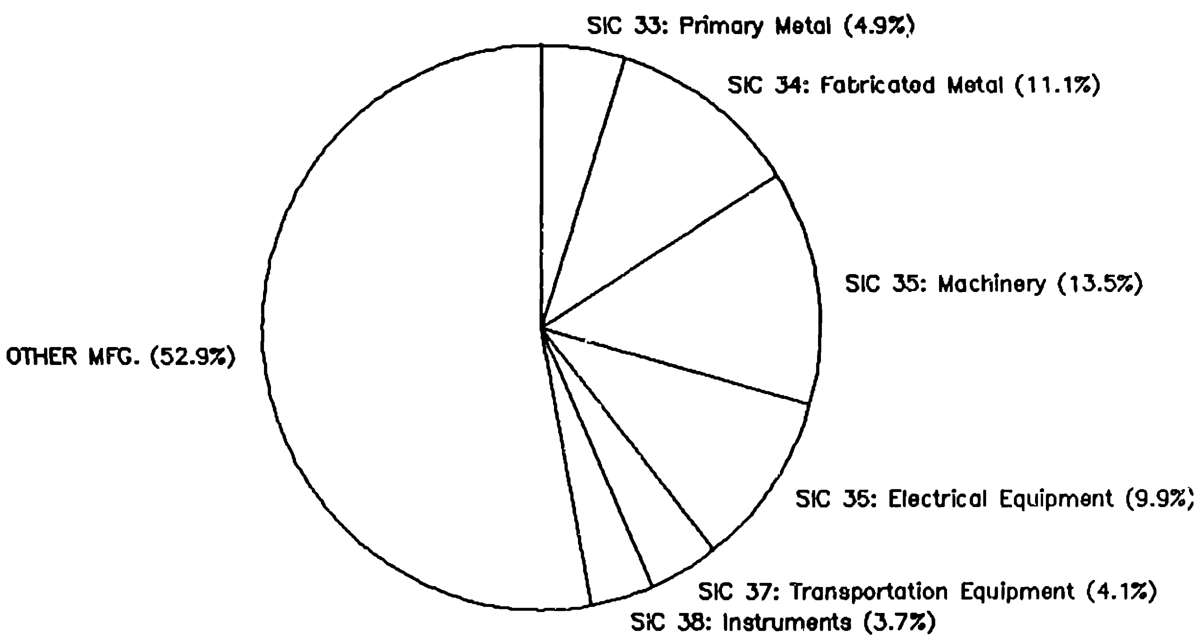


GRAPH 7-1: MANUFACTURING EMPLOYMENT

ILLINOIS METAL-RELATED SECTORS IN 1958

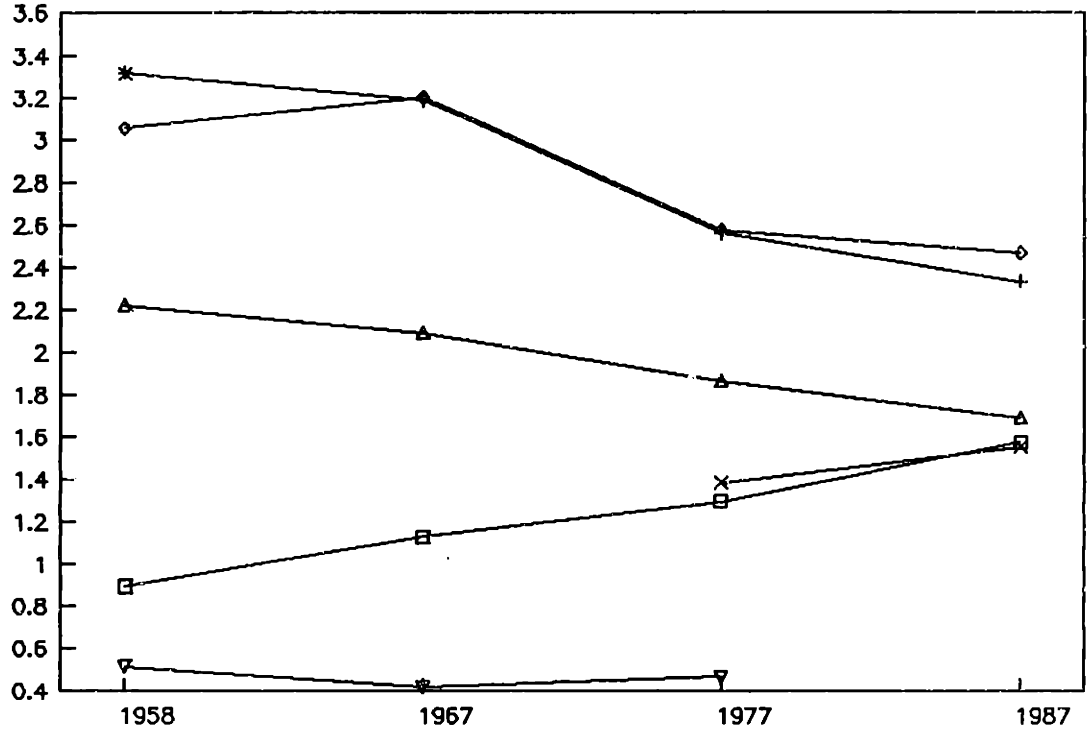


ILLINOIS METAL-RELATED SECTORS IN 1987



GRAPH 7-2:

EMPLOYMENT LOCATION QUOTIENTS



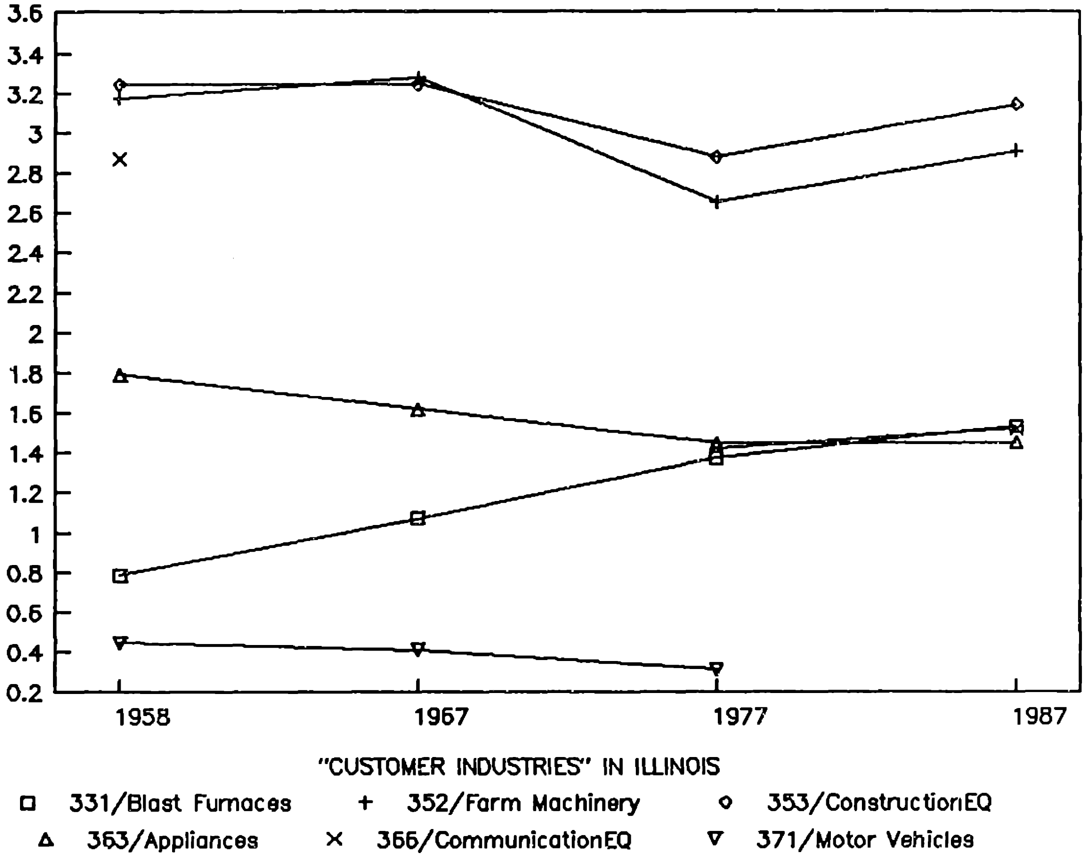
"CUSTOMER INDUSTRIES" IN ILLINOIS

□ 331/Blast Furnaces + 352/Farm Machinery ◇ 353/ConstructionEQ

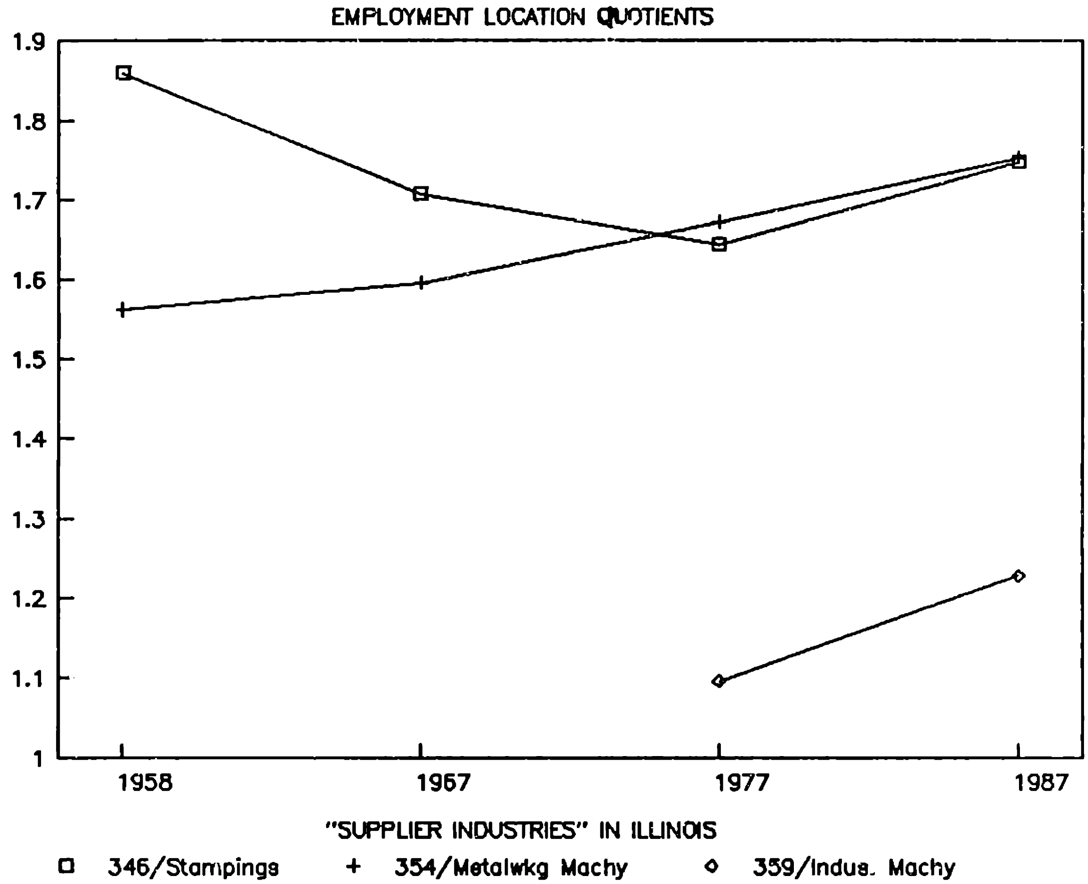
△ 363/Appliances × 366/CommunicationEQ ▽ 371/Motor Vehicles

GRAPH 7-2:

VALUE ADDED LOCATION QUOTIENTS

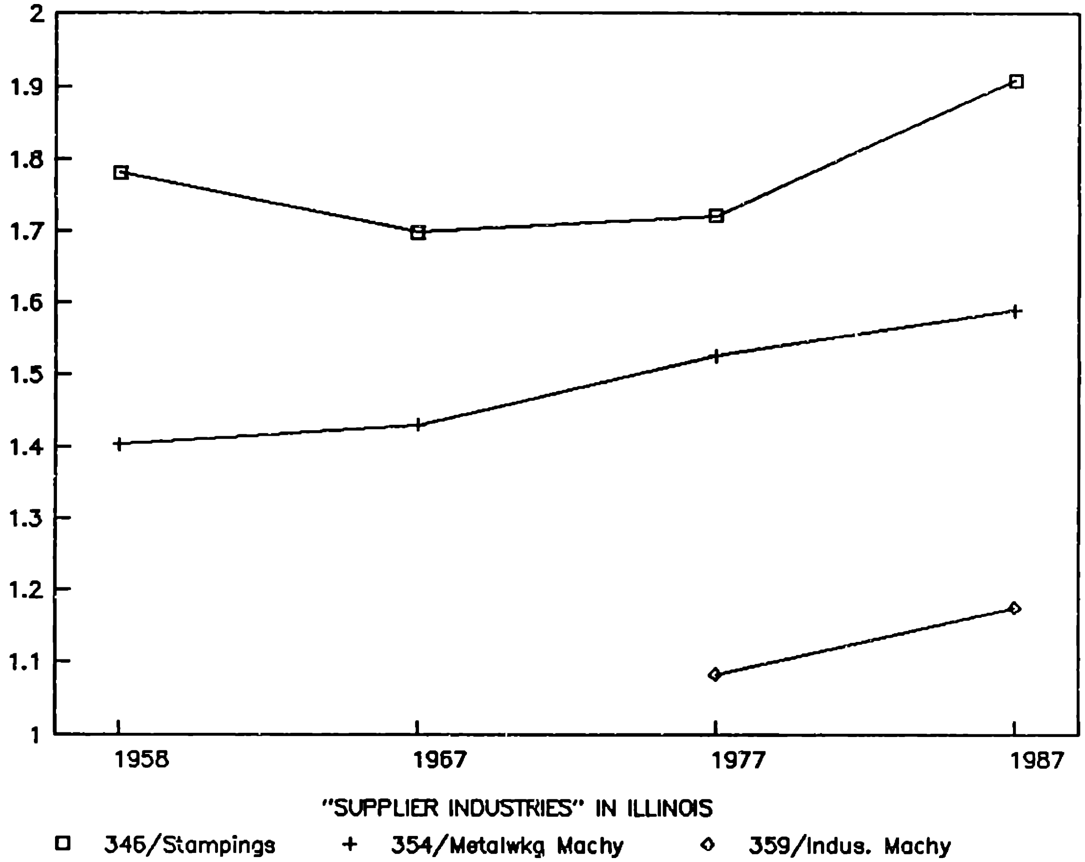


GRAPH 7-2:


EMPLOYMENT LOCATION QUOTIENTS
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
1958
1967
1977
1987
"SUPPLIER INDUSTRIES" IN ILLINOIS
346/Stampings
354/Metalwkg Machy
359/Indus. Machy

GRAPH 7-2:

VALUE ADDED LOCATION QUOTIENTS



GRAPH 8-1:
A TYPOLOGY OF MANUFACTURING NETWORKS

The Features of "Local Developmental Networks":	
o	Collective learning takes place primarily between supplier firms--and with customer firms that take an interest in the broader development goals of the regional industry.
o	The goal of interfirm collaboration is developmental: to improve the state of knowledge, technology, and the "craft" of manufacturing more generally among a wide variety of industry participants in a region.
o	Supplier firm loyalty to the "craft" supplier industry and the region takes precedence.
o	Supplier firms are interested in cutting costs and improving efficiency as a group to maintain the industry's competitiveness and profitability.
o	Suppliers build long term interfirm relationships that may or may not meet their specific production demands at any one time.
o	Local development networks strengthen the competitive advantage of a regional manufactu.ing complex.

The Features of "Global Supply Networks":	
o	Collective learning takes place between customer firm and its preferred suppliers regardless of geographic location.
o	The goal of interfirm collaboration is to improve the customer's product (and supplier processes that feed into it).
o	Supplier firm loyalty to the multinational customer firm takes precedence.
o	The customer firm is interested in cutting costs and time in its supply chain, exclusively, to maintain its competitiveness and profit situation.
o	The customer firm selects only suppliers that meet its specific production demands, with which to build long term relations.
o	Global supply networks strengthen the competitive advantage of the "lead firm."

LIST OF APPENDICES

APPENDIX 1-1:
LIST OF INTERVIEWS

The following 32 metalworking firms were interviewed from 1988 to 1992. Originally, twenty firms were randomly selected using the Illinois Manufacturers Directory; metalworking firms (SIC 34 and SIC 35) located within the City of Chicago and employing fewer than 25 workers were targetted. Following these initial interviews, a snowballing technique was employed to locate other metalworking firms that were larger and/or industry leaders. In addition, other interviews were held with two steel service centers and one multinational customer firm of metalworking. Interviews were held with firm owners, plant managers, or other supervisory personnel in all instances. The interviewed firms were promised confidentiality. Therefore, a description of their characteristics follows rather than a listing of company name.

METALWORKING FIRMS

SIC CODE	NUMBER OF FIRMS:							
	IN TOTAL	BY FIRM LOCATION		BY FIRM SIZE (NUMBER OF WORKERS)				
		CITY	SUBURBAN	1-10	11-20	21-50	51-100	101-200
345	6	3	3	0	0	2	3	1
346	9	7	2	3	2	0	0	4
347	1	1	0	1	0	0	0	0
349	1	1	0	0	1	0	0	0
354	6	3	3	1	0	1	4	0
355	1	1	0	0	0	0	1	0
359	8	1	0	0	5	3	0	0
TOTAL	32	24	8	5	8	6	8	5

SIC CLASSIFICATIONS:
SIC 345: Screw Machine Products
SIC 346: Metal Stampings
SIC 347: Metal Plating and Finishing
SIC 349: Metal Fabrication
SIC 354: Machine Tools and Tool-and-Diemaking
SIC 355: Special Machinery
SIC 359: Miscellaneous Machinery

FIRMS IN THE METAL-RELATED COMPLEX

SIC CODE	NUMBER OF FIRMS: IN TOTAL	BY FIRM LOCATION: CITY	SUBURBAN
Steel Service Centers	2	1	1
"Customer" Firm in Communication Equipment	1	0	1
TOTAL	3	1	2

OTHER INTERVIEWS

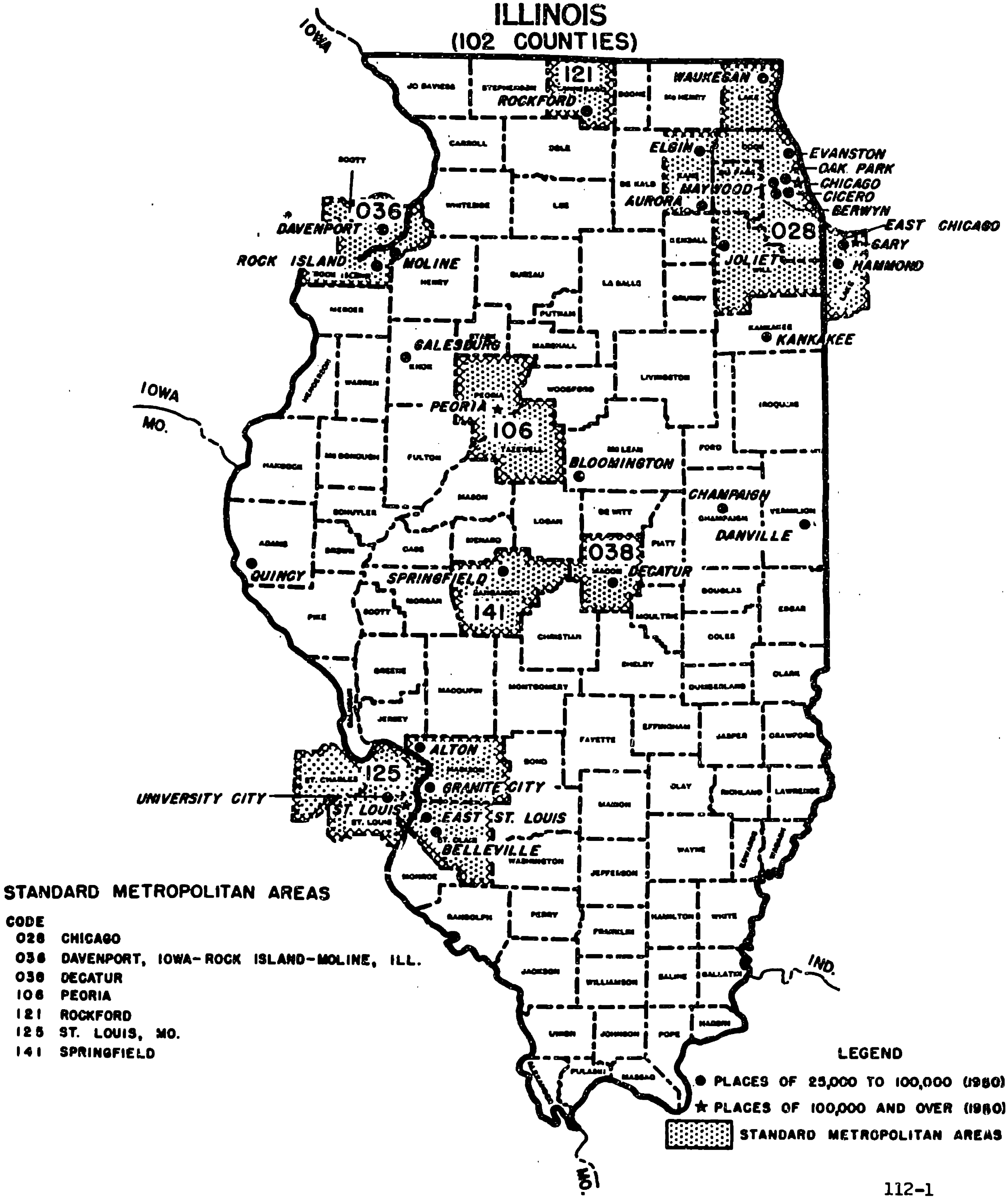
1. Casa Aztlan Immigrant Aid, Carlos Arango
2. Chicago Commons Screw Machine Training Program, Neil Burke and Sue Mueller
3. Chicago Federation of Labor, Don Turner
4. City of Chicago, Department of Economic Development, John Maclennan, Carl Lewis, Julie Putterman, Tom DeBois
5. City of Chicago, Economic Development Corporation, Chuck Hicklin
6. Daley Community College, Worker Training Program, Prem Sud
7. International Association of Machinists, Local #113, Ken Ford
8. Jane Addams Resource Center, Mary LaPorte and Michael Buccatelli
9. Joyce Foundation, Joel Getzendanner
10. Labor Historian, Toni Gilpin
11. Labor Historian, Steve Rosswurm, Lake Forest College
12. Mexican American Legal Defense and Education Fund
13. Midwest Center for Labor Research, Dan Swinney and Greg LeRoy
14. Polish Welfare Association, Jerzy Bereszko and Tom Camakowski
15. Sociologist and Puerto Rican Community Leader, Felix Padilla
16. Steel Service Center Institute, Gertrude Scott
17. Tooling and Manufacturing Association, Bruce Braker
18. Travelers and Immigrant Aid Society, David Marzahl and Joan Schwingen
19. United Auto Workers, Dick Marco and Carl Shier
20. United Electrical, Radio and Machine Workers of America, Neil Burke
21. United Steel Workers, John Meyerik

22. University of Illinois, Center for Urban Economic Development, David Ranney, John Betancur
23. University of Illinois, Labor and Industrial Relations Center, Francisco Montalvo
24. University of Illinois, Technology Commercialization Program, Gary Wagenen and Herb Roscoe

APPENDIX 2-1:
MAP OF THE CHICAGO METROPOLITAN REGION,
ILLINOIS, AND THE NORTHEASTERN UNITED STATES

SOURCE: 1954, Census of Manufactures

ILLINOIS
(102 COUNTIES)

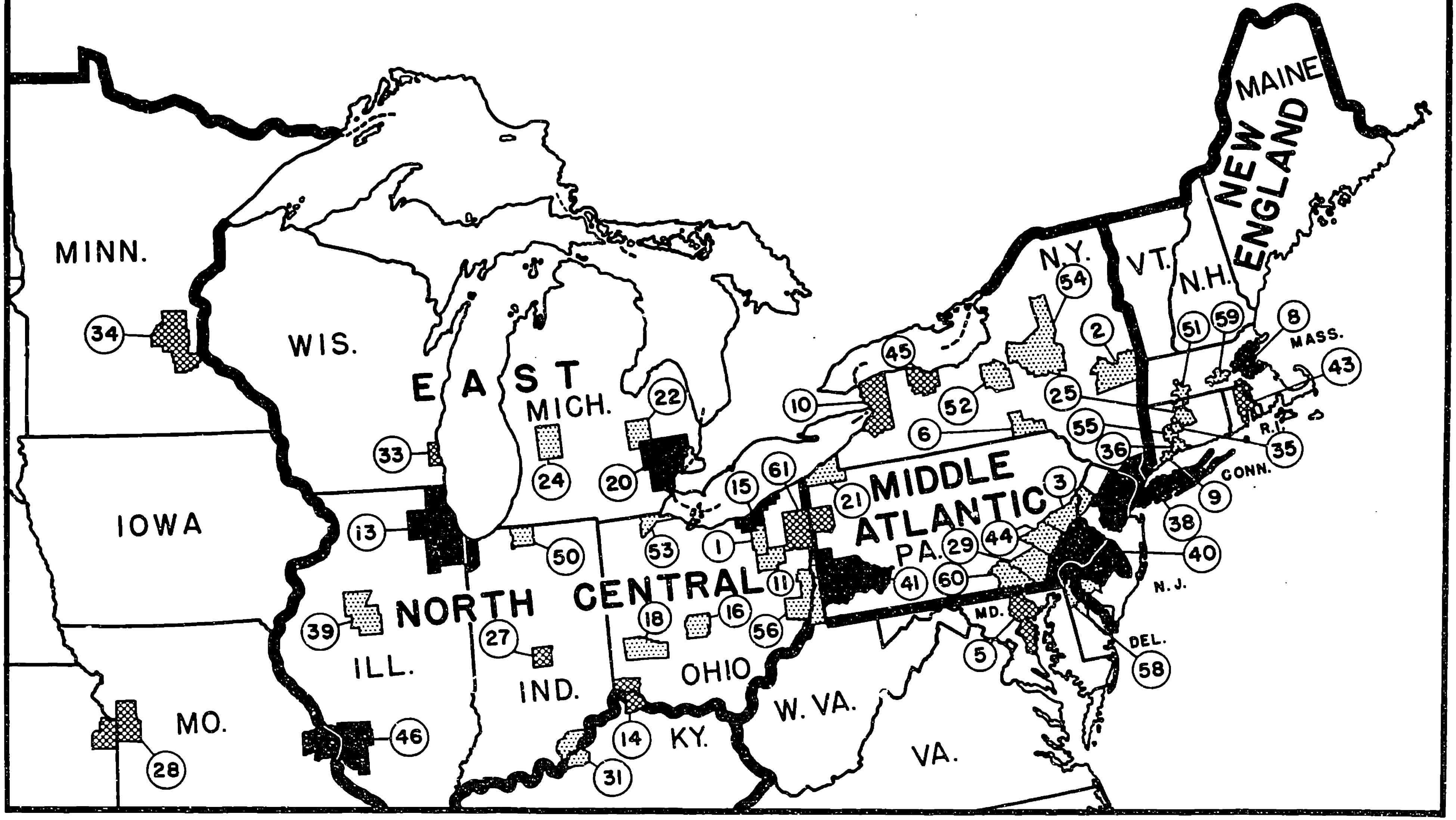


112-1

NORTHEASTERN PART OF THE UNITED STATES

GEOGRAPHIC DIVISIONS, STATES, AND STANDARD METROPOLITAN AREAS

(SEE UNITED STATES MAP FOR KEY TO METROPOLITAN AREAS)



APPENDIX 2-2:
FOUNDRY AND MACHINE SHOP PRODUCTS
IN U.S. FIRMS

SOURCE: 1931, Census of Manufactures

TABLE 3.—PRODUCTS, BY KIND, QUANTITY, AND VALUE, FOR THE UNITED STATES: 1931 AND 1929

[The figures for 1931 represent production; those for 1929 refer to sales (shipments or deliveries) by manufacturers]

KIND	1931	1929
1. "Foundry and Machine Shop Products Not Elsewhere Classified" industry, all products, total value	$1,266,619,273	$2,791,461,964
2. Foundry and machine-shop products, not elsewhere classified, value	1,208,821,842	2,653,571,063
3. Other products (not normally belonging to the industry), value	57,797,431	137,890,901
4. Foundry and machine-shop products classified in this industry, made as secondary products in other industries, value	153,596,501	316,270,186
Foundry and machine-shop products (machinery, industrial boilers, smokestacks, tanks, castings, ball and roller bearings, and miscellaneous machine-shop products), all industries:		
Aggregate value (sum of 2 and 4)	1,362,418,343	2,969,811,219
Boiler-shop products:		
Boilers (industrial), total value	$16,478,350	$34,722,032
Number reported:		
Number	14,419	29,477
Value	$16,032,305	$34,003,377
Number not reported, value	$445,961	$718,655
Smokestacks, total value	$1,771,451	$3,822,658
Number reported:		
Number	4,570	12,341
Value	$1,115,554	$3,793,977
Number not reported, value	$655,907	$28,681
Tanks (iron and steel), total value	$34,843,132	$70,785,448
Iron:		
Number reported:		
Number	1,170	
Value	$1,157,788	
Number not reported, value	$277,128	
Steel:		
Number reported:		
Number	258,220	444,423
Value	$25,961,043	$63,501,210
Number not reported, value	$4,674,638	$7,284,238
Not distributed:		
Number reported:		
Number	18,703	
Value	$1,083,031	
Number not reported, value	$1,688,607	
Other boiler-shop products, value	$16,900,317	$47,812,443
Castings: [1]		
Gray-iron, including semisteel: [2]		
Tons	2,390,498	5,079,846
Value	$174,197,327	$375,508,194
Malleable-iron: [2]		
Tons	200,200	738,228
Value	$35,204,201	$101,108,837
Rolls for rolling mills:		
Gray-iron:		
Tons	66,462	128,074
Value	$7,935,177	$14,533,091
Steel:		
Tons	32,464	48,752
Value	$5,413,104	$8,852,598
Machinery, total value [3]	$563,260,887	$1,184,769,123
Reported by specified classes, value	$505,498,400	$1,026,067,958
Machinery other than specified classes, value	$57,762,487	$158,701,165
Machine parts and attachments, value	$52,193,329	$90,579,655
Miscellaneous machine-shop products:		
Ball bearings and parts, value [4]	$28,309,809	$66,880,024
Roller bearings and parts, value [4]	$22,218,578	$53,153,188
Flexible metallic tubing and hose, value	$1,618,299	$4,165,484
Gears, except motor-vehicle, total value	$14,143,372	$30,328,642
Quantity reported:		
Tons	14,287	30,600
Value	$3,937,001	$16,170,314
Quantity not reported, value	$10,206,371	$14,158,328
Industrial furnaces, value	$3,206,842	(5)
Industrial oil burners, total value	$2,234,761	$4,306,921
Number reported:		
Number	12,088	....
Value	$1,290,198	....
Number not reported, value	$944,543	$4,306,921

For footnotes, see end of table.

TABLE 3.—PRODUCTS, BY KIND, QUANTITY, AND VALUE FOR THE UNITED STATES: 1931 AND 1929—Continued.

[See note at head of table.]

KIND	1931	1929
Foundry and machine-shop products—Continued.		
Miscellaneous machine-shop products—Continued.		
Piston rings, for sale:		
Number	173,806,156	281,570,890
Value	$13,114,915	$20,137,709
Water softeners, total value	$2,283,851	(5)
Number reported:		
Number	7,650	
Value	$1,814,012	
Number not reported, value	$469,839	
Flat-bright cold-rolled strip steel, total value	$11,273,993	$51,647,021
Widths 6 inches and narrower:		
Tons	160,071	348,480
Value	$19,166,441	$30,536,721
Wider than 6 inches but under 12 inches:		
Tons	76,858	220,729
Value	$7,250,391	$18,335,481
Widths 12 inches and wider, not including motor-vehicle fender steel:		
Tons	173,956	282,407
Value	$11,438,453	$18,807,612
Fender steel (for motor-vehicle fenders):		
Tons	40,571	101,196
Value	$3,429,708	$6,907,207
Cold-finished steel bars, total value	$24,833,337	$71,756,645
Rounds, 2 inches in diameter and smaller, total value	$10,007,855	$35,912,667
Quantity reported:		
Tons	140,195	371,854
Value	$10,007,855	$31,170,912
Quantity not reported, value	....	$4,742,755
Rounds, larger than 2 inches in diameter, total value	$5,873,189	$10,974,218
Quantity reported:		
Tons	81,869	119,679
Value	$5,873,189	$8,600,583
Quantity not reported, value	....	$2,373,603
Rounds not distributed as to size, total value	$3,390,280	$5,071,600
Quantity reported:		
Tons	34,827	....
Value	$2,682,593	....
Quantity not reported, value	$707,687	$5,071,600
Shapes (square, hexagon, and flat), total value	$5,572,013	$19,798,031
Quantity reported:		
Tons	72,608	237,208
Value	$5,572,013	$18,518,402
Quantity not reported, value	....	$1,280,032
Valves, faucets, and fittings,[4] value	$84,747,462	
Other machine-shop products, including carburetors, fabricated pipe, lubricators, railroad appliances, etc., value	$208,990,887	
Cars and trucks, industrial, hand, total	$4,012,279	[7]$532,042,753
Number reported:		
Number	81,852	
Value	$2,270,666	
Number not reported	$1,741,613	
Cars and trucks, mining, total	$3,309,230	$8,066,994
Number reported:		
Number	11,950	26,614
Value	$1,900,704	$5,003,560
Number not reported	$1,408,526	$3,063,434
Amount received for products manufactured on contract, the processing of iron and steel, and machine-shop repair work	$84,666,264	$184,964,832

[1] For steel castings, see Report for Steel Works and Rolling Mills; for castings of nonferrous metals, see Report for Nonferrous-Metal Alloys and Products.

[2] For State figures, see table 4.

[3] For total production of machinery, by classes, so far as separately reported, see report entitled "Machinery."

[4] For detail, see table 5.

[5] Not called for on schedule.

[6] For detail, see table 6.

[7] Includes industrial cars and trucks, hand and motorized, to the value of $17,918,881 for 1929; for data for industrial cars and trucks, motorized, for 1931, see report entitled "Machinery," p. 930.

APPENDIX 4-1:
WAGE RATES IN TOOL AND DIE SHOPS IN SELECT CITIES AS RECORDED IN IAM AGREEMENTS IN 1947

SOURCE: IAM Archives, Tool and Die Industry File, August 23, 1947.

WAGE RATES IN TOOL AND DIE SHOPS FOR A SELECTED LIST OF CITIES. INFORMATION TAKEN FROM AGREEMENTS IN FILES OF THE RESEARCH DEPARTMENT, I. A. of M.

August 23, 1947

CITY	Tool and Diemaker	Machinist	Specialist	Production Workers	Die Sinkers
St. Louis, Mo.	$1.71	$1.56	$1.22	$ - - -	$ - - -
Chicago, Ill.	1.75-2.20	1.60-1.85			
Kansas City, Mo.	1.55-1.75	1.30-1.50			
Cleveland, Ohio	1.50-1.75	1.40-1.70			1.40-1.80
Rockford, Ill.	1.60	1.40	1.20		
Elkhard, Ind.	1.60-1.85	1.40-1.60			
Dayton, Ohio	2.00				
Long Island City, N. Y.	1.60-2.00	1.45-1.65			
Kenosha, Wisc.	1.80	1.65	1.50		1.98
Ft. Wayne, Ind.	1.80-2.00	1.40-1.78			
San Jose, Calif.	1.73				
San Francisco, California	2.01	1.76	1.41		
Seattle, Wash.	1.81	1.51			
Los Angeles, Calif.	1.75-2.10	1.75	1.45-1.60	1.05-1.30	
Oakland, Calif.	2.01	1.76	1.41	1.28	
Grand Haven, Mich.	1.38-1.52	1.22-1.34	1.10-1.22	.78- .92	
South Bend, Ind.	2.00	1.40			1.50
Milwaukee, Wis.	1.70-1.80	1.40-1.55			
Racine, Wisc.	1.55-1.85	1.45-1.75			
Cincinnati, O.	1.55-1.85				
Muskegon, Mich.	1.65-1.90	1.45-1.75	1.40-1.50		

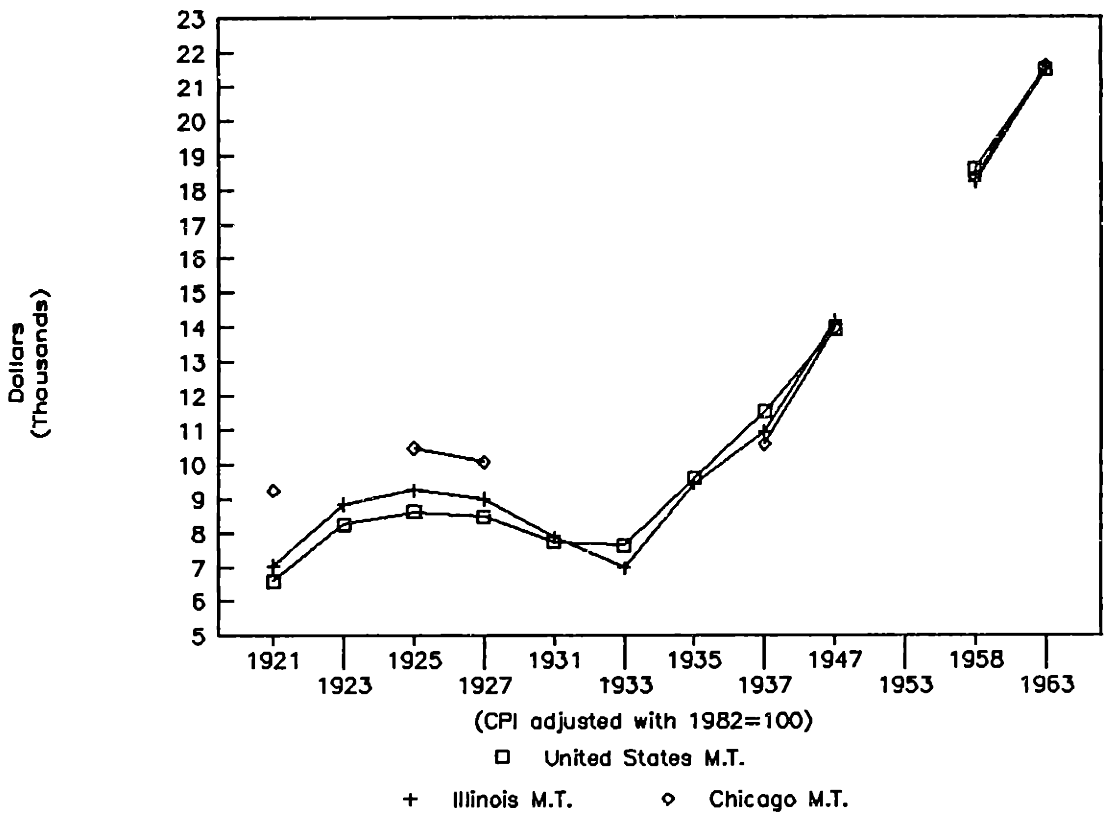
WAGE RATES IN TOOL AND DIE SHOPS FOR A SELECTED LIST OF CITIES. INFORMATION TAKEN FROM AGREEMENTS IN FILES OF THE RESEARCH DEPARTMENT, I. A. of M.

August 23, 1947

CITY	Tool and Diemaker	Machinist	Specialist	Production Workers	Die Sinker
St. Louis, Mo.	$1.71	$1.56	$1.22	$ - - -	$ - - -
Chicago, Ill.	1.75-2.20	1.60-1.85			
Kansas City, Mo.	1.55-1.75	1.30-1.50			
Cleveland, Ohio	1.50-1.75	1.40-1.70			1.40-1.80
Rockford, Ill.	1.60	1.40	1.20		
Elkhard, Ind.	1.60-1.85	1.40-1.60			
Dayton, Ohio	2.00				
Long Island City, N. Y.	1.60-2.00	1.45-1.65			
Kenosha, Wisc.	1.80	1.65	1.50		1.98
Ft. Wayne, Ind.	1.80-2.00	1.40-1.78			
San Jose, Calif.	1.73				
San Francisco, California	2.01	1.76	1.41		
Seattle, Wash.	1.81	1.51			
Los Angeles, Calif.	1.75-2.10	1.75	1.45-1.60	1.05-1.30	
Oakland, Calif.	2.01	1.76	1.41	1.28	
Grand Haven, Mich.	1.38-1.52	1.22-1.34	1.10-1.22	.78- .92	
South Bend, Ind.	2.00	1.40			1.50
Milwaukee, Wis.	1.70-1.80	1.40-1.55			
Racine, Wisc.	1.55-1.85	1.45-1.75			
Cincinnati, O.	1.55-1.85				
Muskegon, Mich.	1.65-1.90	1.45-1.75	1.40-1.50		

APPENDIX 5-1: AVG. ANNUAL WAGE

FOR THE MACHINE TOOL INDUSTRY



SOURCE: U.S. Census of Manufactures, 1921-1963. To derive the average annual wage, I divided the total industry wage bill for the census year by the number of workers and adjusted the result for inflation using the Consumer Price Index. This does not compensate for differences in overtime in different geographic regions.

APPENDIX 5-2: WAGE DATA
FROM "PRELIMINARY WORKING PAPER ON THE TOOL AND DIE INDUSTRY"
(IAM/T&D, 1952)

Contains:

"Appendix I: Straight-Time Hourly Earnings--Tool and Die Makers-In Machinery Manufacturing Plants in 29 Cities, Janaury 1951" (Bureau of Labor Statistics survey) and

"Appendix II: Straight Time Average Hourly Earnings--Tool and Die Makers in 36 Cities, 1945-1949" (Bureau of Labor Statistics survey).

APPENDIX I

STRAIGHT-TIME HOURLY EARNINGS-FOOL AND DIE MAKERS-IN MACHINERY MANUFACTURING PLANTS IN 29 CITIES, JANUARY 1951

Area	Date	Job Title	Av. Hourly Earnings	Est. No. of Employees	1.30-1.35	1.35-1.40	1.40-1.45	1.45-1.50	1.50-1.55	1.55-1.60	1.60-1.65	1.65-1.70	1.70-1.75	1.75-1.80	1.80-1.85	1.85-1.90	1.90-1.95	1.95-2.00	2.00-2.10	2.10-2.20	2.20-2.30	2.30-2.40	2.40-2.50	2.50-2.60	2.60-2.70	2.70-E
Atlanta	1/51	other	1.73	15			2		1	1	1	1	1	1	2			4	1							
Baltimore	12/50	other	1.80	150		3				2	12	14	21	26	27		35		9	1						
Boston	1/51	job	1.83	74				3	3		8		13		25		4		6	12						
Boston	1/51	other	1.80	191		3		3	7		50		32		47		21		12	4				9		
Buffalo	1/51	job	1.86	219					15	5	10		15		70		23		60	21						
Buffalo	1/51	other	1.81	125				8	10		14	9	7	5	19		21		26	4		2				
Chicago	3/51	job	2.27	1015											2	2	20	4	141	97	237	241	143	107	21[1]	
Chicago	3/51	other	2.11	1003						4	6		1	7	34	12	94	91	179	160	308	61	27	13	6[1]	
Cincinnati	2/51	job	1.96	82											6	11	6	15	44[2]							
Cincinnati	2/51	other	1.82	127					5	5	3	12	13	10	13	31	3	25	5[3]	2						
Cleveland	1/51	job	1.97	606								4	30	44	40	52	81	91	119[4]	67[5]	58[6]	12	8			
Cleveland	1/51	other	2.04	441									4	7	16	47	52	29	93[7]	155[8]	38[9]					
Cleveland	1/51	(MTAI) (prod.)	1.95	28										1	3	5	7		6	4	2					
Dallas	1/51	other	1.81	16								2	2	2	2	4	4									
Detroit	1/51	job	2.47	3434															40[10]	123[11]	226[12]	720[13]	1274	463	348	290[14]
Detroit	1/51	other	2.17	929												21	9	15	157[15]	372[16]	233[17]	113[18]	6	2		
Detroit	1/51	MTAI (prod.)	2.17	52														3	11[19]	5[20]	33[21]					
Hartford New Britain, Conn.	1/51	job	1.81	479	5	2	11	6	19		90		77		89		71		63	30	20	2				

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Area	Date	Job Title	Av. Hourly Earnings	Est. No. of Employees	1.30 1.35	1.35 1.40	1.40 1.45	1.45 1.50	1.50 1.55	1.55 1.60	1.60 1.65	1.65 1.70	1.70 1.75	1.75 1.80	1.80 1.85	1.85 1.90	1.90 1.95	1.95 2.00	2.00 2.10	2.10 2.20	2.20 2.30	2.30 2.40	2.40 2.50	2.50 2.60	2.60 2.70	2.70 +
Hartford New Bristol, Conn.	1/51	other	1.84	379		5	1	6	32		28		56		91		101		47	1	5	3	1	2		
Hartford New Bristol Conn.	1/51	MTAI (Job)	1.81	479	5	2	11	6	19		98		77		83		72		63	30	20	2				
Hartford New Bristol, Conn.	1/51	MTAI (Prod.)	1.83	52					4		10		10		8		11		3	1	0	3	1			
Houston	1/51	other	1.97	145								2	0	1	23	0	28	17	39[22]	35						
Indianapolis	12/50	job	1.87	284				5	5	0	9	12	19	34	49		57		84	7	1		2[23]			
Indianapolis	12/50	other	2.02	97						1	2	5	1	2	17		9		9	51						
Los Angeles	1/51	other	2.00	182											2	8	67	17	40[24]	35[25]	10[26]	3[27]				
Milwaukee	12/50	job	1.99	230									10	7	24	34	12	20	48	38	27	10				
Milwaukee	12/50	other	1.90	407						1	18	15	11	24	82	65	26	79	48	38						
Minneapolis St. Paul	12/50	other	1.91	205							3	3	20	11	24		88		40	16						
Newark	12/50	job	1.91	592				4	4	10	33	35	111		86		55		98	100	29	17		10[28]		
Newark	12/50	other	1.96	627					5		30	36	52		135		78		100	145	25	2	9	9[29]		
New York	1/51	job	2.03	413					9		28		16	64	30		46		53	21	138	8	16	24[30]		
New York	1/51	other	2.02	395					16		7	6	12	9	29		64		69	115	49	19				
Philadelphia	1/51	job	2.10	422							2		2		4		68		72	107	71	20	19	9	1[31]	

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APPENDIX I

Area	Date	Job Title	Av. Hourly Earnings	Est. No. of Employees	1.30 1.35	1.35 1.40	1.40 1.45	1.45 1.50	1.50 1.55	1.55 1.60	1.60 1.65	1.65 1.70	1.70 1.75	1.75 1.80	1.80 1.85	1.85 1.90	1.90 1.95	1.95 2.00	2.00 2.10	2.10 2.20	2.20 2.30	2.30 2.40	2.40 2.50	2.50 2.60	2.60 2.70
Philadelphia	1/51	other	1.93	540					3		18		165		79		112		164	48	7	4			
Pittsburgh	12/50	other	2.06	144								[illegible]	[illegible]	5	6	7	12	8	41	31	5			12[32]	
Portland Vancouver	12/50	other	1.87	17									1	1	5		2	8							
Providence	1/51	job	1.92	248									12		12		6		8	10					
Providence	1/51	other	1.68	131			5	6	24		29		43		15		4								
San Fran. - Oakland	1/51	other	2.21	237																41[33]	177[34]	19[35]			
St. Louis	12/50	job	2.17	82																56	16	10			
St. Louis	12/50	other	2.11	177									8			1	11		33	98	26				
Seattle - Tacoma	12/50	other	2.09	20															26	13[37]					
Syracuse	12/50	job	1.77	273				6	9	3	9	27	35	39	51	46	16	13	19						
Syracuse	12/50	other	1.77	137				1	10		19	14	17	5	15	38	12		8						
Tulsa	1/51	other	1.82	30							2		4	7	2	6	4	4	1[38]						
Worcester	1/51	other	1.82	106			2	2	4		8		28		30		28		3	1					

APPENDIX I

Footnotes

1. 2.60 /
2. Of whom 22 earn $2.05- $2.10
3. All 2.00 to 2.05
4. Of whom 72 - 2.00 to 2.05
   47 - 2.05 to 2.10
5. Of whom 55 - 2.00 to 2.05
   12 - 2.05 to 2.10
6. Of whom 32 from 2.00 to 2.05
   26 from 2.05 to 2.10
7. 45 - 2.00 to 2.05
   48 - 2.05 to 2.10
8. Of whom 72 - 2.00 to 2.05
   83 - 2.05 to 2.10
9. Of whom 36 - 2.00 to 2.05
   2 - 2.05 to 2.10
10. All 2.00 - 2.05
11. 9 - 2.10-2.15
    114 - 2.15-2.20
12. 50 - 2.20-2.25
    176 - 2.25-2.30
13. 352 - 2.30-2.35
    368 - 2.35-2.40
14. $2.70 /
15. 54 - 2.00-2.05
    103 - 2.05-2.10
16. 219 - 2.10-2.15
    152 - 2.15-2.20
17. 91 - 2.20-2.25
    142 - 2.25-2.30
18. 23 - 2.30-2.35
    90 - 2.35-2.40
19. 8 - 2.00-2.05
    3 - 2.05-2.10
20. 1 - 2.10-2.15
    4 - 2.15-2.20
21. 15 - 2.20-2.25
    18 - 2.25-2.30
22. 29 - 2.00-2.05
    10 - 2.05-2.10
23. 2.40 /
24. 25 - 2.00-2.05
    15 - 2.05-2.10
25. 12 - 2.10-2.15
    23 - 2.15-2.20
26. 6 - 2.20-2.25
    4 - 2.25-2.30
27. 3 - 2.30 /
28. 10 - 2.50 /
29. 9 - 2.50 /
30. 24 - 2.50 /
31. 1 - 2.60 /
32. 12 - 2.60 /
33. 41 - 2.15-2.20
34. 173 - 2.20-2.25
    4 - 2.25-2.30
35. 19 - 2.30-2.35
36. 7 - 2.05-2.10
37. 11 - 2.10-2.15
    2 - 2.15-2.20
38. 1 - 2.00-2.05

APPENDIX II

STRAIGHT TIME AVERAGE HOURLY EARNINGS - TOOL AND DIE MAKERS IN 36 CITIES: 1945-1949

Area or City and Industry	Jan-1945 No. of Emplyees	Jan-1945 Av Hrly Egs.	Oct-1946 No. of Emplyees	Oct-1946 Av Hrly Egs.	Jan-1947 No. of Emplyees	Jan-1947 Av Hrly Egs.	Dec-1948 No. of Emplyees	Dec-1948 Av Hrly Egs.	Nov-1949 No. of Emplyees	Nov-1949 Av Hrly Egs.
Atlanta										
Machinery							9	1.51	11	1.80
Akron										
Machinery			45	1.56						
Albany										
Machinery	8	1.32	9	1.33						
Baltimore										
Machinery	40	1.20	32	1.52	53	1.61	94	1.71	168	1.68
Job	40	1.26								
Birmingham, Ala.										
Machinery	7	1.19	10	1.38	12	1.55	11	1.68		
Boston										
Machinery			46	1.31	36	1.46	176	1.64	200	1.70
Job	73	1.32							67	1.74
Mach Tool Acc.					82	1.62	65	1.71	67	1.74
Mach Tool Acc except Job Shop	47	1.12								
Bridgeport										
Machinery	83	1.29	141	1.50						
Job	124	1.39								
Buffalo										
Machinery	75	1.23	39	1.52	35	1.52	103	1.71	68	1.75
Job	106	1.32							124	1.77
Canton										
Machinery	61	1.20								
Cincinnati										
Machinery			48	1.40	22	1.60	110	1.59	188	1.64
Job	38	1.37							135	1.74
Mach Tool	49	1.50								

APPENDIX II

STRAIGHT TIME AVERAGE HOURLY EARNINGS - TOOL AND DIE MAKERS IN 36 CITIES: 1945-1949

Area or City and Industry	Jan-1945 No. of Emplyees	Jan-1945 Av Hrly Egs.	Oct-1946 No. of Emplyees	Oct-1946 Av Hrly Egs.	Jan-1947 No. of Emplyees	Jan-1947 Av Hrly Egs.	Dec-1948 No. of Emplyees	Dec-1948 Av.Hrly Egs.	Nov-1949 No. of Emplyees	Nov-1949 Av Hrly Egs.
Chicago										
Machinery			170	1.59	140	1.78			908	1.94
Job	405	1.61							880	2.05
Mach Tools	11	1.35	37	1.55						
Mach Tool Acc Including Jb Sh					229	1.94				
Mach Tool Acc.					365	1.84				
Mach Tool Acc. (Job Shop)							785	2.08	880	2.05
Mach Tool Acc. (Prod. Shop)	88	1.43					49	1.89		
Cleveland										
Machinery	153	1.39	171	1.68	79	1.77	374	1.89	416	1.90
Job	355	1.52			172	1.69			585	1.85
Mach Tools	130	1.47			56	1.63				
Mach Tool Acc (Job Shop)					176	1.74	461	1.87	585	1.85
Mach Tool Acc (Prod. Shop)									17	1.69
Mach Tool Acc Except Job Shop	63	1.42			60	1.49				
Columbus, Ohio										
Machinery	37	1.24	27	1.36						
Job	59	1.30								
Dallas										
Machinery	10	1.09			18	1.45	29	1.56	16	1.67
Dayton										
Machinery	42	1.47	211	1.70						
Job	239	1.79			434	1.94				

APPENDIX II

STRAIGHT TIME AVERAGE HOURLY EARNINGS - TOOL AND DIE MAKERS IN 36 CITIES: 1945-1949

Area or City and Industry	Jan-1945 No. of Emplyees	Jan-1945 Av Hrly Egs.	Oct-1946 No. of Emplyees	Oct-1946 Av Hrly Egs.	Jan-1947 No. of Emplyees	Jan-1947 Av Hrly Egs.	Dec-1948 No. of Emplyees	Dec-1948 Av Hrly Egs	Nov-1949 No. of Emplyees	Nov-1949 Av Hrly Egs.
Denver										
Machinery	12	1.17			8	1.45				
Detroit										
Machinery	72	1.52	149	1.77	116	1.83	705	2.00	908	2.08
Job	806	1.75			329	1.96			2295	2.25
Mach Tools	129	1.65			37	1.85				
Mach Tool Acc Including Jb Sh					641	2.10				
Mach Tool Acc (Job Shop)							2052	2.22	2295	2.25
Mach Tool Acc except Job Sh.	56	1.63			38	1.81				
Fort Wayne										
Machinery	5	1.27	23	1.50						
Job	59	1.54								
Hartford										
Machinery	46	1.23	251	1.47	263	1.58	298	1.73	387	1.70
Job	115	1.30							334	1.65
Mach Tool Acc					134	1.58	440	1.60	57	1.72
Mach Tool Acc (Job Shop)									344	1.65
Houston										
Machinery	122	1.41	46	1.54			110	1.88	149	1.89
Indianapolis										
Machinery	103	1.27	47	1.49	52	1.71	110	1.89	94	1.84
Job	293	1.57							273	1.78
Mach Tool Acc					122	1.79			273	1.78
Mach Tool Acc Including Jb Sh					115	1.64	133	1.82		

APPENDIX II

STRAIGHT TIME AVERAGE HOURLY EARNINGS - TOOL AND DIE MAKERS IN 36 CITIES: 1945-1949

Area or City and Industry	Jan-1945 No. of Emplyees	Jan-1945 Av Hrly Egs.	Oct-1946 No. of Emplyees	Oct-1946 Av Hrly Egs.	Jan-1947 No. of Emplyees	Jan-1947 Av Hrly Egs.	Dec-1948 No. of Emplyees	Dec-1948 Av Hrly Egs	Nov-1949 No. of Emplyees	Nov-1949 Av Hrly Egs.
Los Angeles										
Machinery			44	1.60	49	1.72	339	1.76	216	1.81
Job	121	1.62								
Mach Tools	23	1.44								
Mach Tool Acc			88	1.75	34	1.83				
Milwaukee										
Machinery			97	1.48	98	1.61	367	1.73	386	1.74
Job	190	1.37							206	1.87
Mach Tool Acc					93	1.71			206	1.87
Mach Tool Acc Including Jb Sh					51	1.59	126	1.83		
Minn-St. Paul										
Machinery	36	1.30	55	1.47	39	1.59	170	1.74	187	1.77
Job	98	1.38								
Mach Tools	20	1.36								
Mach Tool Acc					41	1.60				
Mach Tool Acc Including Jb Sh					49	1.49				
Newark										
Machinery							366	1.80	439	1.86
Job	322	1.48							538	1.82
Mach Tool Acc					151	1.79	657	1.84	538	1.82
Mach Tool Acc Including JbSh					226	1.74				
Mach Tool Acc except Job Shop	75	1.52								
New York City										
Machinery	209	1.46	96	1.65	79	1.75	357	1.83	218	1.91
Job	166	1.61							545	1.93
Mach Tool Acc					121	1.85	537	1.86	545	1.93
Mach Tool Acc Including Jb Sh					115	1.81				
Mach Tool Acc except Job Shop	36	1.39								

APPENDIX II

STRAIGHT TIME AVERAGE HOURLY EARNINGS - TOOL AND DIE MAKERS IN 36 CITIES: 1945-1949

Area or City and Industry	Jan-1945 No. of Emplyees	Jan-1945 Av Hrly Egs.	Oct-1946 No. of Emplyees	Oct-1946 Av Hrly Egs.	Jan-1947 No. of Emplyees	Jan-1947 Av Hrly Egs.	Dec-1948 No. of Emplyees	Dec-1948 Av Hrly Egs.	Nov-1949 No. of Emplyees	Nov-1949 Av Hrly Egs.
Philadelphia										
Machinery	144	1.31	80	1.59	54	1.71	294	1.75	460	1.77
Job	208	1.65							239	2.00
Pittsbg.										
Machinery	30	1.26	28	1.50	39	1.56	109	1.80	112	1.81
Job	38	1.33								
Portland, Vancur										
Machinery	5	1.35			9	1.77			6	1.78
Providence										
Machinery	108	1.21			58	1.45	100	1.58	105	1.60
Job	73	1.40							46	1.73
Mach Tool Acc					88	1.59	72	1.64	8	1.45
Mach Tool Acc (Job Shop)									46	1.73
Mach Tool Acc except Jb Shop	2	1.25								
San Francisco										
Machinery	39	1.55	49	1.83	96	2.00	308	2.13	163	2.14
Seattle										
Machinery	15	1.45	17	1.80	6	1.91	15	2.06	4	2.06
South Bend										
Machinery	47	1.27	57	1.52						
Job	173	1.64								
St Louis										
Machinery			31	1.68	53	1.87	128	1.92	152	1.96
Job	103	1.49							106	2.08
Mach Tools	5	1.39								

APPENDIX II

STRAIGHT TIME AVERAGE HOURLY EARNINGS - TOOL AND DIE MAKERS IN 36 CITIES: 1945-1949

Area or City and Industry	Jan-1945 No. of Emplyees	Jan-1945 Av Hrly Egs.	Oct-1946 No. of Emplyees	Oct-1946 Av Hrly Egs.	Jan-1947 No. of Emplyees	Jan-1947 Av Hrly Egs.	Dec-1948 No. of Emplyees	Dec-1948 Av Hrly Egs.	Nov-1949 No. of Emplyees	Nov-1949 Av Hrly Egs.
Syracuse										
Machinery	63	1.19	58	1.45	95	1.53	87	1.69	136	1.69
Job	102	1.35							91	1.70

GPO 83-19139

APPENDIX 6-1: TMA (THE TOOLING AND MANUFACTURING ASSOCIATION) MEMBERSHIP GROWTH SINCE 1957

(In Number of Firms)

SOURCE: TMA Statistics, n.d.

TMA Membership Growth Since 1957

Year	New Members	Percent Change	Canceled	Percent Change	Net (Loss) or Gain	% Change	Year End Total
1957							478
1958	37	7.7%	44	-9.2%	(7)	-1.5%	471
1959	46	9.8%	14	-3.0%	32	6.8%	503
1960	41	8.2%	19	-3.8%	22	4.4%	525
1961	53	10.1%	29	-5.5%	24	4.6%	549
1962	56	10.2%	18	-3.3%	38	6.9%	587
1963	80	13.6%	34	-5.8%	46	7.8%	633
1964	79	12.5%	21	-3.3%	58	9.2%	691
1965	87	12.6%	16	-2.3%	71	10.3%	762
1966	119	15.6%	19	-2.5%	100	13.1%	862
1967	85	9.9%	41	-4.8%	44	5.1%	906
1968	76	8.4%	34	-3.8%	42	4.6%	948
1969	76	8.0%	32	-3.4%	44	4.6%	992
1970	53	5.3%	61	-6.1%	(8)	-0.8%	984
1971	56	5.7%	75	-7.6%	(19)	-1.9%	965
1972	57	5.9%	58	-6.0%	(1)	-0.1%	964
1973	80	8.3%	48	-5.0%	32	3.3%	996
1974	74	7.4%	36	-3.6%	38	3.8%	1,034
1975	57	5.5%	43	-4.2%	14	1.4%	1,048
1976	68	6.5%	60	-5.7%	8	0.8%	1,056
1977	109	10.3%	47	-4.5%	62	5.9%	1,118
1978	89	8.0%	40	-3.6%	49	4.4%	1,167
1979	96	8.2%	56	-4.8%	40	3.4%	1,207
1980	77	6.4%	41	-3.4%	36	3.0%	1,243
1981	89	7.2%	55	-4.4%	34	2.7%	1,277
1982	61	4.8%	112	-8.8%	(51)	-4.0%	1,226
1983	96	7.8%	83	-6.8%	13	1.1%	1,239
1984	123	9.9%	53	-4.3%	70	5.6%	1,309
1985	136	10.4%	54	-4.1%	82	6.3%	1,391
1986	103	7.4%	97	-7.0%	6	0.4%	1,397
1987	90	6.4%	96	-6.9%	(6)	-0.4%	1,391
1988	90	6.5%	85	-6.1%	5	0.4%	1,396
1989	121	8.7%	89	-6.4%	32	2.3%	1,428
1990	131	9.2%	76	-5.3%	55	3.9%	1,483
1991	107	7.2%	120	-8.1%	(13)	-0.9%	1,470
1992	94	6.4%	97	-6.6%	(3)	-0.2%	1,467
1993	90	6.1%	91	-6.2%	(1)	-0.1%	1,466
Average 1984-93	109	7.8%	86	-6.1%	23	1.7%	1,420

APPENDIX 7-1:
LISTING OF INDUSTRIES
COMPRISING CHICAGO'S METALWORKING TRADE ASSOCIATION,
THE TOOL AND MANUFACTURING ASSOCIATION (TMA)*

* Previously known as the Tool and Die Institute (T&DI)

SOURCE: 1984 Long-Range Trends Report of the Chicago Area Precision Metalworking Industry and the Tool & Die Institute" (Park Ridge, IL).

Figure 1 - 1. T&DI Regular Membership by SIC Code - May 1984

DESCRIPTION	SIC CODE	MEMBERS	PERCENT
Tools, Dies, Jigs Fixtures	3544	335	30%
Molds, Die Cast Dies	3544	180	16%
Metal Stamping	3469	133	12%
Job Machining, Machinery	3599	123	11%
Miscellaneous Plastic Parts	3079	58	5%
Special Industry Machinery	3559,51,52,53	30	3%
Sheet Metal Work	3444	23	2%
Screw Machine Products	3451	22	2%
Non-ferrous Foundries (Castings)	3361,62,69	18	2%
Machine Tools, Cutting & Forming	3541,42	14	1%
Machine Tool Accessories and Measuring Devices	3545	14	1%
Fabricated Metal Products not elsewhere classified	3499	13	1%
Allied Services: Design, Plating, Polishing, Engraving, Heat Treating		44	4%
End Products Manufacturers and Other		119	11%
		1126	100%

Observations: T&DI membership represents variety of types with tooling and machining accounting for 57%.