Workers' Learning through Inter-firm Linkages in the Process of Globalization: Lessons from the Indian Automobile Industry

by

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Abstract

This dissertation examines the conditions under which firms foster the development of their workers' skills in the process of globalization, using a case study of the automobile industry in India based on extensive fieldwork in India in 1996, 1997 and 1998. As India underwent economic reforms over the past decade, the Indian automobile industry has experienced remarkable growth and dynamic transformations, with an increased inflow of foreign direct investment (FDI) and intensifying competition within the domestic market, leading to considerable restructuring. In this process, two leading vehicle manufacturers, one with FDI, and the other without it, have played key roles in promoting growth in production and export, while increasing their competitiveness, through their massive investment in skill development for their workers. Indeed, both firms have well-structured internal incentive mechanisms to encourage and reward workers' learning. They have also strengthened their backward linkages by institutionalizing various learning mechanisms through their supply chains, altering the model of supplier relations that had prevailed in India. My questionnaire survey of 50 component suppliers revealed that the nature of skills has recently changed with increased emphasis on behavioral traits, resulting in considerable upskilling, particularly among workers at component suppliers. These findings markedly contrasts with the experiences elsewhere documented in the literature, where few FDI-affiliated firms develop backward linkages, and where local firms weaken comparatively in the face of growing dominance by FDI.

Challenging the growing literature that suggests FDI plays a role in brining new knowledge and skills to developing countries, this study finds that even in the process of globalization, the interplay of various institutional forces both inside and outside the firms still crucially shape the patterns of in-firm skill development. Such institutional forces include: 1) the peculiar historical imperatives under which firms needed to operate and develop their technological capabilities; 2) national institutional frameworks; 3) the government's involvement; 4) institutional alliances between firms and training institutions; and 5) vertical inter-firm linkages. In particular, inter-firm linkages are critical in promoting skill development among smaller local suppliers, thus spreading workers' learning widely across the economy. The Indian government has played an important role in 1) developing a key firm that would lead the growth of the industry, set operational and performance standards, and serve as a catalyst for the industry-wide learning; 2) forcing that firm to develop backward linkages through various policy measures; and 3) creating mechanisms for firms to promote in-firm training through policies such as statutory apprenticeship schemes. Thus, contrary to the claim by human capital theorists, various institutional conditions created rather than reduced incentives for firms to promote in-firm training not only for their own workers but also for workers at their suppliers.

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Chapter 1

Introduction

1.1 Overview: Globalization, Skills and Training

This study empirically examines the conditions under which firms foster the development of their workers' skills in the process of globalization. The forces of globalization[1] and technological change together pose a paradox to firms and workers of developing countries concerning skill development: on the one hand, firms, foreign and local alike, are becoming ever more eager to reduce production costs, including labor costs, to compete in the global markets, which may reduce their incentives to invest in training, especially in an economy with abundant surplus labor. On the other hand, as the global economy increasingly becomes "knowledge-based" (OECD 1997), with ever-accelerating technological change and innovations, the acquisition, accumulation, and diffusion of knowledge and skills have become more important in helping firms, and nations, become competitive (World Bank 1998). Globalized production processes may change the nature of the skills required of the country's workforce, which may in turn generate new demands for training.[2] Then, how do firms and workers in developing countries respond to these paradoxical challenges? What motivates firms to promote workers' training? What

[1] The concept of "globalization" has been contested. Hirst and Thompson (1996), for example, conceptually distinguish a "globalized economy" from "the international economy": in a globalized economy "distinct national economies are subsumed and rearticulated in the system by international processes and transactions," whereas in the international economy, "processes that are at the level of national economies still dominate and international phenomena are outcomes that emerge from the distinct and differential performance of the national economies" (p.10). Other scholars, such as Rodrik (1997), use the term "globalization" to mean a set of global phenomena associated with liberalization of trade and investment. While this study does not go into the debate over the definition of globalization or over whether globalization has indeed occurred (see Hirst and Thompson 1996), it uses the latter's interpretation as a working definition.

[2] On the issue of the changing nature of skills, similar concerns have been expressed for the workforce in developed countries such as the U.S. (Murnane and Levy 1996), the U.K. (Penn et al. 1994, Prais 1995, Booth and Snower 1996), and OECD countries as a whole (Colecchia and Papaconstantinou 1996, OECD 1996, 1997), and for the workforce in developing countries (World Bank 1995).

incentive structures help foster the development of workers' skills? What role can public policy play in promoting firm-level skill development?

This study examines changes in the patterns of firm-level skill development and factors that have affected such changes, using a case study of the Indian automobile industry. It is a micro-level study with a particular focus on firms as a locus of skill development. The unit of analysis is thus the firm and the inter-firm linkage (the supply chain). In this study, skills are broadly defined as a wide range of human capabilities to apply and transfer knowledge into action in production processes in manufacturing, including managerial, organizational, and technical skills that individuals acquire through either schooling or on-the-job training. It particularly focuses on cognitive and analytical dimensions of skills, which may have become more important in today's production activities due to technological change and the adoption of more flexible production systems, and considers what this change means to skill development, with particular reference to small-scale subcontractors in which craft skills have traditionally prevailed.

Industrial workers in India find themselves in an increasingly integrated world today, as India is in the midst of a rapid transformation into a member of the global economy. India's economic reforms over the past decade have resulted in dynamic restructuring, a growing exposure to global competition, and an increased inflow of foreign capital. The automobile industry is one of the Indian industries that have gone through the most rapid transformations in recent years. I particularly focus on two leading auto manufacturers, one with foreign direct investment (FDI) and the other without it, and their small-scale subcontractors. Both firms have achieved remarkable growth in outputs and sales since the mid-1980s (see Chapter 2). These two auto makers have not only successfully transformed themselves to become more competitive in the increasingly globalized Indian markets through various measures, including their massive investment in skill development for their workers, but have also successfully transformed their suppliers by institutionalizing various learning mechanisms through their supply chains.

Their impressive performance and equally impressive emphasis on firm-level skill development are somewhat surprising and go against the general trends observed elsewhere, on two grounds. First, as liberalization of trade and investment leads developing economies to depend more on FDI, FDI-affiliated firms often fail to transfer skills and technologies to their counterparts in developing countries and to create backward linkages (Kagami et al. 1998). In this study, however, the FDI-affiliated firm has experienced active skill and technology transfers and the creation of backward linkages. Second, intensified competition in the increasingly globalized domestic markets due to the entry of FDI has generally weakened the relative position of local firms in developing countries with their increased dependence on foreign capital and technologies (Kagami et al. 1998). But the local firm I studied has actually strengthened its position: it entered the passenger car segment by producing the first indigenously-made Indian cars, while investing much in skill development both within the firm and in suppliers, even amidst the entry of many foreign car makers into the Indian passenger car market. Why did these firms invest so much in human capital, even before competition became intensified, despite their secure dominant market positions, and despite the prevailing labor surplus? What motivated the firms to so eagerly promote *learning* among their local workers as well as their local suppliers? How do the characteristics of local labor market institutions, as well as education and training institutions, come into play in shaping the patterns of skill development for workers?

The dominant human capital theory (Becker 1993[1964]), using neo-classical assumptions, has explained firms' investment in training as determined by pricing mechanisms through market forces. With the shift in the production paradigm from the Fordist mass production to a more flexible (Piore and Sabel 1984) or lean (Womack et al. 1990) production system in the 1980s, recent literature has focused on the role of FDI (Lall 1995, de Mello 1997), and in particular of transplants in transferring advanced

manufacturing systems and techniques (OECD 1994).[3] A large body of literature has debated the transferability of some elements of such production systems (Florida and Kenney 1991, Kaplinsky 1995, Doeringer et al. 1996, Sargent and Matthews 1997) and the possible convergence (or divergence) of manufacturing processes across countries (Womack et al. 1990, MacDuffie 1996, Kochan et al. 1997). Many of these studies, however, simply consider the relationships between certain attributes of firms and changes in in-firm human resource practices, and downplay institutional conditions inherent in local economies outside the firm that might have interacted in shaping the pattern of skill formation in the firm. They also offer few insights into the implications of such changes for broader economic development in developing countries. This study shows how the interplay of various institutions shapes the patterns of skill development in these firms, while at the same time, even in the process of globalization, local institutional arrangements that had historically evolved over time have had greatly influenced the patterns of in-firm skill development.

The aim of this study is to develop an alternative framework that is more comprehensive than the existing theories, for guiding public policy to promote skills development in developing countries. More specifically, it aims 1) to understand the changing nature of skills required in different segments of the labor market in the automobile industry due to recent rapid transformations; 2) to examine how different institutions interact with one another in shaping the ways in which skill development occurs at the firm level; and 3) to analyze the patterns of firm-level skills development as a *dynamic* process beyond *static* models employed in the conventional theory.

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[3] In recent years, many scholars in different fields such as economic institutions, industrial development, organization sociology, and management, have paid much attention to the Japanese (more specifically the Toyota) production system, or the "lean production system" (Womack et al. 1990), as a successful model for firms in other countries to follow. The automobile industry has perhaps been the most well-researched industry on this subject (e.g., Womack et al. 1990, Florida and Kenny 1991, Sabel 1994, Kochan et al. 1997).

Several considerations motivated me to conduct this study. First, for developing countries like India, as the processes of industrialization largely involve *learning* in terms of borrowing technology from industrially advanced countries (Amsden 1989), the skill implications of global integration not only mean distributional consequences[4] but also concern the very way they industrialize. As industry moves into more complex products with technological development, specific types of higher technical and other skills become essential to efficient operation (Najmabadi and Lall 1995: 48). Some scholars even argue that the rate at which individual and organizational learning (i.e., acquisition of knowledge and skills) occurs is the major competitive advantage, especially in knowledge-intensive and skill-intensive industries (Stata 1989).

Second, as knowledge and skills required for today's production activities are becoming more and more tacit, hard to obtain, and costly to transfer between firms, and thus more specific, and often even firm-specific (Najmabadi and Lall 1995), the role of firms as a *de facto* institution for skill development is becoming of greater importance to improve productivity and gain competitiveness. Indeed, firms' investment in training to generate and diffuse knowledge and skills can constitute an important part of creating "competitive assets" (Amsden 1995). Yet, the existing literature has paid little attention to the factors determining firms' decisions regarding the mode, content, and extent of in-firm training. Nor has it successfully explained how existing training institutions, both formal and informal, involving the state, firms, and workers, influence the way in which training takes place at the firm level.

Third, this research is particularly relevant and timely in light of currently renewed interests in and ongoing debates on the role of education and training in economic development. Education and training have long been recognized as crucial not only in

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[4] Many scholars have debated over the relationship between globalization and skill-based inequality. Some scholars argue that globalization is a main cause of the declining demand for low-skilled workers in developed countries, increased unemployment for low-skilled workers in Europe, and a widening income inequality between the skilled and the low-skilled in the U.S. (Wood 1994). Others refute this argument,

fostering economic growth but also in reducing inequalities and alleviating poverty.[5] The economic successes of East Asian countries since the 1960s have prompted economists to theorize the main determinants of their rapid economic growth. Various schools of economists have attributed education and training to the East Asian "miracles" (World Bank 1993, Birdsall et al. 1997, Ashton and Green 1996). Indeed, a group of economists came up with a new (endogenous) growth theory, which emphasizes increasing returns on education, training, and R&D investment. They argue that economic growth is determined by the aggregate accumulation of human capital and the stock of knowledge of society as a whole (Stokey 1991). From the institutionalist perspective, other scholars emphasize the "most decisive role" of the East Asian governments in promoting education and in successfully linking education and training policy to trade and industrial policy, as in Singapore (Ashton and Green 1996). However, these discussions on the role of education and training have so far been limited to the macro level and not well grounded at the micro level.

Fourth, new growth theorists argue that as production becomes more decentralized and integrated beyond national boundaries, the increasing international flows of knowledge and ideas required for production accelerate economic growth (Rivera-Batiz and Romer 1991, Young 1991). Spillover effects of such firm-level learning would also contribute to the aggregate accumulation of human capital and the social stock of knowledge. However, it is less clear how ideas and knowledge are generated and transferred at the micro level (Rodrik 1995). My study, therefore, focuses on the role of firms as a locus of learning, in terms of receiving knowledge and ideas from abroad and transferring and diffusing them within the firm and between firms.

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suggesting technological change as a main cause for these trends (Katz and Murphy 1992, Krugman 1994, Bhagwati 1998). (Also see Rodrik for review). On India, see Parikh 1997.

[5] Notably, the human capital theories in the 1950s and 1960s (Becker 1993 (1964)) emphasized the importance of investing in education and training. Proponents of "redistribution with growth," "basic human needs," and the more recent "equity-oriented" development strategies (Chenery et al. 1974, Burke and ul-Haq 1981, Birdsall et al. 1997, Sen 1994) have all stressed the role of public investment in education (particularly basic education and secondary education) for upgrading skills of the labor force and thus

Finally, while the literature on education and skills development acknowledges higher returns on investment in training by employers than in pre-employment vocational training, empirical studies on skills development for workers at the firm level in developing countries are extremely rare (Middleton et al. 1993). As for India, despite some speculation that the poor productivity growth of Indian manufacturing in the past may have been due to the economy-wide under-investment in human resources (Kaplinsky 1997), virtually no micro-level study has been conducted on the educational and training profile of the labor force and on the nature and extent of in-firm training in the manufacturing sector.

The remainder of this chapter is organized as follows. Section 1.2 introduces the Indian case to provide some background. Section 1.3 reviews the literature concerning the issue of skill development, while identifying limitations of the existing theories in analyzing skill development in a changing Indian economy. Section 1.4 discusses the methodology of this study. Section 1.5 outlines the structure of this dissertation.

1.2 The Case

This study focuses on the automobile industry in India. India is a fascinating country in its own right, as one of the largest emerging economies with a huge growth potential in its domestic market with a total population of 940 million. Thus, the trends in India's economic performance, as well as the extent of its integration into the global economy, will have a significant impact on the economic trends of the developing world as a whole.

Until the mid-1980s, India's economic policy was characterized by an inward-looking trade regime, autarky, highly protected and regulated domestic markets, and restrictions on FDI. However, India has undergone economic reforms since the mid-1980s and more drastically since its introduction of the liberalization policy, along with a new industrial policy, in 1991. The actual inflow of FDI in India has increased almost fourteen

increasing both productivity and earnings as a viable strategy for achieving growth and alleviating poverty.

times in just four years since 1991. This growth in FDI is particularly striking when compared with India's export performance, which only nearly doubled during the same period (see Chapter 2). While the amount of FDI is still very small by global standards,[6] FDI shows a clear upward trend in India, attracted by the growth potential of its huge domestic market. These policy changes have brought about an economy-wide dynamic industrial restructuring.[7] These changes have also made manufacturing firms more conscious of producing high quality goods and at the same time attaining cost competitiveness. The automobile industry is one of the industries that have gone through the most dynamic restructuring.

1.2.1 The Indian Automobile Industry in Transformation

Automobile industry has been strategically important for every country that now produces cars (Kochan et al. 1997: 5). In particular, for newly industrializing developing countries, it has been a key industry to determine the course of post-war industrialization.

The history of the Indian automobile industry predates the nation's independence in 1947; by the early 1940s, both local and foreign auto makers started producing cars in India.[8] However, by the mid-1950s, the government required the gradual localization of component production, which forced foreign firms such as GM and Ford to close down their operation in India, and prevented any new firms from entering the industry (Kojima 1995). Since then, the growth of the automobile industry has lagged behind other auto producer countries, because of the closed and regulatory nature of the Indian economy,

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[6] For example, China received $38 billion in FDI in 1995-95, nineteen times that received by India (Parikh 1997).

[7] On the debates on the impact of Indian's economic reforms on its long-term economic development, see, for example, Kapila 1992 and Gelam 1996.

[8] In the 1930s, India imported about 20,000 cars annually. General Motors (GM) set up an assembly plant in Bombay in 1928, while Ford Motor Company (Ford) established assembly plants in Madras in 1930 and in Bombay and Calcutta in 1931 (Venkataramani 1989). Two major domestic car producers, Hindustan Motors and Premier Auto Ltd., were established in 1942 and 1944 respectively. A total of 2,000 cars were produced annually (Kojima 1995).

with little exposure to foreign technology or international competition.[9] The number of passenger cars in production remained almost unchanged throughout the 1970s, at 33,000 per annum on average.[10] In fact, the share of the automobile industry in the total value added of the manufacturing sector declined from 10.2% in 1965 to 6.3% in 1985 (Takahashi 1995).

Since the 1980s, however, the Indian automobile industry has witnessed remarkable growth, along with a rapid spurt in the inflow of FDI, and has experienced dramatic transformations in the industrial structures, production processes, and market environments. The passenger car segment grew most remarkably, at 19% annually in the 1980s and at 13% in the first half of the 1990s. In addition, the component industry grew at 13% annually during the same period. Moreover, by the mid-1990s, the entry of the world's leading auto assemblers and leading suppliers intensified competition within the domestic market. Meanwhile the domestic market expanded, due to the growth of middle-class consumers who can afford to purchase cars (estimated as 100 to 200 million) and increased variety in consumer tastes.

These changes have in turn brought about considerable intra-firm organizational restructuring not only in foreign-affiliated car manufacturers but also in local firms--car manufacturers as well as many small-scale suppliers. Intensified competition has led firms, both FDI-affiliated and local, to adopt more advanced manufacturing and management techniques, such as TQM, "kaizen" (or continuous improvement), QC circles, to improve both efficiency and the quality of products. They also changed the nature of inter-firm relations between car manufacturers and their suppliers. This has in turn changed the nature of skills required of their workers.

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[9] In fact, "Ambassador," a single passenger car model made by Hindustan Motors, a major domestic car manufacturer, did not go through any major model change since the 1950s, because it was controlled by the government through licensing.

[10] I calculated from ACMA 1995.

So far, few studies have shown how Indian firms have responded to industrial restructuring at the micro level (Kaplinsky 1997)[11] and how the patterns of workers' learning have been affected by such changes. In particular, despite these drastic economic reforms and their important and urgent implications for human resources development, the issue of education and training in India has not been a major focus among scholars and policy makers (Drèze and Sen 1996). Subsequent chapters show how such changes in skill requirements have also led to a considerable change in the characteristics of local labor markets and the way in which firms develop their workers' skills. Indeed, a growing number of local firms have made enormous strides in developing their workers' skills, by introducing or upgrading various in-firm training programs, whereas others have not, even though they operate in the same industry under the same domestic market conditions (Chapters 2, 3 and 4).

1.2.2 The Segmentation of Local Labor Markets

Before introducing the case, two considerations are to be made in understanding the patterns of skill development in the automobile industry in India. One is the nature of urban labor markets, and the other is the performance of formal education and training.

Urban labor markets in India have been highly segmented. While a large number of well-educated and skilled workers exist at the upper echelons of society, predominantly in the public sector and large-scale firms, the skill base for industry has remained small (Najmabadi and Lall 1995). India has not achieved universal basic education; its adult literacy rate is still 52% (Sen 1994, World Bank 1995). The incidence of poverty is still high: 40% of the total population live below the poverty line. In addition, India has a surprisingly low enrollment in secondary education, tertiary-level science and engineering education, and in vocational training, lower than that of more recently industrializing

[11] A recent study by Humphrey et al. (1998) attempted to illustrate the process of industrial restructuring at the micro-level through a case study of Crompton Greaves, Ltd., a leading Indian firm in the electrical industry.

countries such as Indonesia (Najmabadi and Lall 1995). As of 1990, junior secondary enrollment (11-14 years) was still 57.4%, while senior secondary enrollment (14-17 years) was only 24% of the respective age group population (Institute of Applied Manpower Research 1996: Table 2.1.21).[12]

Moreover, despite its emphasis on expanding general education at both elementary and higher levels, as well as vocational and technical education, India's past experience in promoting vocational and technical schools has been considered largely unsatisfactory for several reasons. Vocational and technical schools cannot anticipate the needs of the labor market; they lack flexibility to respond to the changing demands for skills; and they are relatively ineffective and expensive to run in terms of a higher cost per student than general education (Middleton et al. 1993).[13]

By contrast, in East Asia (e.g., Korea, Taiwan, Singapore, and Japan), where the skills required to develop technology, particularly local R&D to increase productivity and attain world competitiveness, resulted from massive investment in higher-level technical education and from measures that induced firm-level training at large firms, as in the case of POSCO in Korea (Amsden 1988, 1989). Moreover, enterprise-based training in Taiwan has been associated with a significant rise in output per worker, with the largest gains realized in firms that invested simultaneously in training and technology (Middleton et al. 1993). East Asian countries have almost universally achieved high levels of general education (with secondary enrollment rates of over 90%); thus, high levels of human resources were readily available across different sectors and firms of different sizes,

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[12] India's progress on the education front has been particularly slow, compared to countries like Korea. In 1965, both Korea and India had secondary students as 29% of the secondary-age population; but by 1978, Korea's figure more than doubled to 68%, whereas India's figure remained almost unchanged (Amsden 1989: Table 9.2).

[13] For instance, the National Policy of Education 1986 suggested the introduction of systematic, well-planned and rigorously implemented programs of vocational education to enhance individuals' employability and to reduce "skill mismatch" between demand and supply of skilled manpower, and aimed at enrolling 25% of secondary students in vocational schools by 1990. However, this objective had not been achieved with only less than 10% of secondary students enrolled in vocational training (Dougherty 1989: 71 as cited in Middleton et al. 1993).

allowing the diffusion of *learning* among different segments of society to occur relatively smoothly and rapidly. Without such an equitable distribution of education and skills, how can India manage to accelerate the processes of skill acquisition, accumulation and diffusion in various segments of its economy, when faced with a need to produce goods of higher quality?

As noted earlier, however, the average educational level of industrial workers in Indian large-scale enterprises is comparable to, or even better than, that in its East Asian counterparts, with a minimum attainment of two-year post-secondary industrial training in technical schools after general high-school education. Differences from East Asia, therefore, lie in the educational level of workers in the small-scale sectors of the economy.

India is nearly unique among developing countries in having maintained its democratic political institutions since its early stages of industrialization. Indian development policy has always placed emphasis on its distributional concerns, as the government needed to make populist policies to satisfy the social demands arising from the political constituency. The government has promoted and protected small-scale industries (including cottage industries), partly because of such distributional concerns, in terms of creating employment and generating income for the poorer section of society, and partly because of the Gandhian ideological tradition which respected cottage industries (particularly in the textile sector) as a way to achieve self-reliance, particularly among the poor.[14]

In India, as of 1993-94, 2.4 million small-scale firms accounted for 89% of the total enterprises, employed 14 million workers, or 29% of the total industrial workforce,

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[14] Interestingly, in this respect there are some similarities between the earlier Japanese experience of industrialization and the more recent Indian experience. In both Japan and India, the government heavily promoted and protected small-scale firms, and as a result, in both countries, small-scale firms have played a large role in economic and social development. In Japan, small- and medium-size businesses create 57% of value added to products but employ about 74% of the total industrial workforce (UNDP 1993). The earlier Japanese experience also shows that large-scale manufacturers provided their smaller-scale suppliers with a great deal of assistance and support, including skill development and transfer.

and created 17% of value added.[15] In addition, with regard to informal sector employment, according to the Government of India (1996b), as of 1995-96, as many as 85% of the total workforce of 319 million are self-employed or employed on casual wages (of whom the majority are in rural areas), whereas only 15% are regular wage-employed workers. About 35 million workers are categorized as marginal workers (p.73). In India, twice as many jobs have been created in the unorganized manufacturing sector as in the organized sector (UNDP 1993: 41).

If indeed, globalized production processes influence the nature of skills and skill formation practices, how do such practices become diffused and penetrate among workers in different segments of a highly stratified society like India? Despite the limited availability of skilled workforce for small-scale firms, the role of small-scale firms seems crucial in the acquisition and diffusion of skills, as they employ the majority of India's urban workers. Indeed, small-scale firms, particularly subcontractors to large-scale manufacturers, are exposed to the growing needs to produce goods of higher quality while improving productivity, as their customers' products must face global competition and/or need to meet global standards. How do they cope with these needs? Do they invest more in machines, or upgrade the skills of workers, or replace the existing workers with more skilled ones? If these small-scale firms choose to upgrade workers' skills, do they have the means and capabilities to train their workers, in the face of the possible change in the nature of skills required? What conditions facilitate firms' promotion of skill development? What roles do inter-firm linkages, both vertical (between manufacturers and suppliers) and horizontal (among these local firms), play in these processes of skills development? To answer these questions, I examined the cases of two leading auto manufacturers and their small-scale suppliers in India.

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[15] In India, small-scale firms refer to those with fewer than 100 employees. It should be noted that the definition differs from that of small-scale industry (SSI), which refers to firms with an initial capital of Rs. 6 million (regardless of the size of employment). The figures for India were calculated from (Government of India 1996a: Statements 6&7).

1.2.3 Two Successful Learners: Maruti and Telco

In this study, I analyzed the experiences of two leading Indian automobile manufacturers and their respective local suppliers in skill development for workers. One is Maruti Udyog Limited (hereafter Maruti), a joint venture firm between the Indian government and a Japanese auto manufacturer (Suzuki Motors Co. Ltd.), and the other is Tata Engineering and Locomotive Co. Ltd. (hereafter Telco), a local private firm entirely owned by the Tata Industries, the largest industrial business house in India. Telco is one of the two flagship firms of the Tata Industries, and the third largest firm in India. Telco is at present the only domestic producer that has no FDI involvement).[16] Maruti started its operation in 1983, while Telco was established in 1945.

Maruti's main plant is located in Gurgaon, a newly developing industrial town in the state of Haryana near Delhi. Maruti started its second plant in Gurgaon in 1992, and is expected to start its third plant in Noida near Delhi in 1999. On the other hand, Telco has three plants in various locations. The oldest plant, which was built in 1945, once the main plant, is in Jamshedpur in the state of Bihar, the poorest state in India, but the town has also been the home of Tata Iron & Steel Co (TISCO), the biggest firm of the Tata. The second plant, currently the main plant, is in Pune in the state of Maharashtra, which is one of India's wealthiest and most industrially advanced states. The third and newest plant is located in Lucknow, the state capital of Uttar Pradesh, the most populous and second poorest state in India.

These two firms are interesting to study for a variety of reasons. First, both Maruti and Telco have been leading manufacturers of passenger cars and commercial vehicles respectively and played an especially influential role in shaping the development of the

[16] This statement requires some clarification. Telco started with a license, but terminated in 1967, from Daimler-Benz, which still has 14% non-voting equity (Lall 1985b:271). Telco reinstated its technical cooperation with Mercedes-Benz to assemble Mercedes luxury cars on its premises (but in a separate plant) in Pune with 100% CKD components from Mercedes in Germany. However, Telco does not receive any financial cooperation from Mercedes for its own products.

Indian automobile industry (see Chapter 2). As of 1994-95, Maruti produced 197,842 vehicles per year, accounting for 75% of the Indian passenger market, while Telco produced 121,252 light and heavy commercial vehicles per year, accounting for 62% of the commercial vehicle market.[17] Second, both firms have made enormous investments in developing the skills of workers to enhance the firms' capabilities so as to produce vehicles of higher quality even *before* competition became intensified in the Indian car market. Despite their differences in ownership, product mix, and locations, somewhat surprisingly, they share some common elements in their skill formation systems. Yet, different dynamics, generated through the interplay of several institutional factors, have shaped different patterns of skill development within these firms (see Chapter 3). Finally, they both have made considerable efforts to upgrade the capabilities of their first-tier suppliers (see Chapter 4). Given their large share in the domestic markets, and given a high rate of local contents (96% for Maruti and 97% for Telco), their supplier relations are likely to have a great impact on the patterns of development of the component industry as a whole.

The experiences of these two firms in developing the skills of their workers and suppliers challenge popular assertions made in the recent literature in several ways. First, while many scholars have linked firms' more positive attitudes towards training to their export orientation and exposure to international competition, the export performance of the Indian automobile industry has remained modest in volume and sales (see Chapter 2). In fact, both Maruti and Telco have primarily focused on the domestic markets so far. Thus, the suggestion of positive associations between the change in trade regimes and the increase in in-firm training does not seem to hold here.

Second, as noted, a large body of recent literature suggests the role of FDI in changing skill requirements and hence in bringing about organizational changes in favor of skill development (Florida and Kenny 1991, OECD 1994, Lall 1995), but Telco, without

[17] In addition, Maruti produced 7,347 jeeps in the same year, which is not included in the percentage share in the market. Telco's percentage market share is the figure for both heavy and light commercial vehicles combined. For heavy commercial vehicles only, the share for Telco is 73% (ACMA 1995: 11).

any significant FDI involvement, has made massive investment in developing its workers' skills since the 1950s. Of course, Telco's emphasis on the type of skills to be developed has changed over time, but its overall institutional mechanism for skill formation, built in through various internal incentive measures, has evolved incrementally within the firm over time. This is striking in the Indian context where few firms, including Telco's competitors in the industry, had an explicit human resources policy until recently and where there was virtually no competition under India's heavily regulated and protected market conditions. Telco's experience challenges the popular claims that in developing countries the presence of FDI brings about organizational changes in firms that are more conducive to skill development among their workers and that local firms have become increasingly dependent on FDI.

Third, on a similar line, many scholars have seen positive links between the adoption of the so-called Japanese production systems, characterized by such manufacturing techniques as just-in-time (JIT) inventory systems and total quality management (TQM), and the changes in firms' orientation in favor of training (Florida and Kenney 1991, Kaplinsky 1995, Sargent and Matthews 1997). In both Maruti and Telco, however, the emphasis on skill development preceded the adoption of some elements of JIT and TQM, making it difficult to establish a link between the adoption of such techniques and skill development.

Finally, many empirical studies suggest that FDI-affiliated firms often do not invest in building up local backward linkages in developing countries (e.g., Amsden 1989, Piore and Luis- Durán 1998), as they tend to develop "ready-made" linkages with suppliers overseas, because of the high costs of searching out and transferring skills and know-how to small-scale firms (Najmabadi and Lall 1995). However, the case of Maruti suggests the contrary. Maruti has made massive investment in the development of local suppliers, many of which are small-scale, instead of using Suzuki's suppliers abroad.

Thus, the experiences of Maruti and Telco suggest a need for a more detailed investigation, at the micro level, of factors that encourage firms to foster skill development, both inside and outside the firm, beyond the simple explanations by firms' attributes (such as ownership and the adoption of certain management techniques).

In what follows, I briefly review the existing literature on skill development, to see how different schools of thought have considered the factors motivating firms to invest in workers' skill development.

1.3 The Theoretical and Empirical Literature on Skill Development

The concept of skill is difficult to define, because the skills a worker acquires to perform tasks for production activities are often tacit, intangible, and diverse across industries and firms and among different levels of workers. Even skilled workers differ greatly in the range and level of their skills. Thus, the content of skills has long been left as a black box, or alternatively, measured solely by the proxy of years of schooling or experience (Koike and Inoki 1990).

Even within the discussion of skills in manufacturing, different researchers appear to use the term "skill" in different dimensions and on different levels, and attribute skills to individuals, groups, or the firm as a whole. As for individual production skills, according to some researchers, skill refers to the ability to apply and translate knowledge into action in the production process. Individual learning in turn refers to a process by which individuals gain new knowledge, insights, and skills, and thereby modify their behavior and actions (Stata 1989). Whether in industrialized countries or in developing countries, most skill development takes place in the workplace, through informal on-the-job training, or through formal training programs financed by employers or workers, provided either in the workplace or at external training institutions (Middleton et al. 1993).

1.3.1 Human Capital Theory and the Market Failure Approach

The literature concerned with the relationship between training and work has predominantly relied on the human capital theory and has mainly focused on establishing three relationships: 1) between years of schooling and productivity; 2) between years of schooling and occupational status; and 3) between years of schooling and earnings (Becker 1993[1964], Psacharopoulos and Woodhall 1985; see Middleton et al. 1993 for review). Some scholars have debated whether learning itself through schooling or the diploma obtained from education (or education as a screening device) contributes to economic gains. Otherwise, the literature on education, training, and skills development has mainly been concerned with the question of which mode of education and training (e.g., formal versus informal; general versus vocational education; or pre-employment vocational training versus in-firm training by employers) has higher rates of return. Hence, these scholars have been busy calculating the costs and benefits of each mode of education.

The human capital theorists, using the neo-classical assumption, typically argue that government interventions in labor markets in pursuit of social and economic goals restrict wage flexibility and labor mobility, and thus distort the operation of labor markets and affect incentives for individuals and enterprises to invest in skills development (Becker 1993[1964], Psacharopoulos and Woodhall 1985, Middleton et al. 1993: 85).[18]

With respect to skill training, human capital theory postulates that there is perfect competition for general skills,[19] and that in the case of "general" training, which is useful for all employers in the economy, employers have no incentive to bear the costs of such training, because it is not employers but workers who receive all the benefits from training,

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[18] Human capital theory justifies minimal government interventions on only the grounds of 1) externalities (as social benefits exceed private benefits, government should redistribute income and wealth through taxes and transfers to reduce inequalities, but not by intervening in the market for training); 2) imperfections in capital markets (which constrain access by individuals to loans and loan guarantees to finance education, creating uncertainty in investing in education); and 3) economies of scale (thus it is more efficient to finance and provide education publicly) (Becker 1993 [1964], Psacharopoulos and Woodhall 1985).

[19] Becker's distinction between "general" and "specific" training differs from Doeringer and Piore's constructs of general and specific skills (See Doeringer and Piore 1971).

in the form of increased wages reflecting increased productivity; thus, workers should bear the costs of training through a subtraction from wages. In the case of specific training to acquire specific skills, which are useful only to a specific firm, the costs of training should be shared by firms and workers, so that workers internalize the cost of turnover, and the firms internalize the cost of firing. Hence, in both cases, the argument goes, there are no market failures. Proponents of this theory argue that removing institutional barriers such as minimum wages and progressive income taxes would allow employers to shift the cost of general skills training to the workers in the form of lower wages, increasing a private rate of return for the enterprise, which would encourage employers to invest in training for workers (Middleton et al. 1993). According to them, otherwise, such price distortions would lead to stagnation of employment growth in the modern sector, reducing individuals' incentives to acquire modern sector skills.

However, this dominant human capital theory suffers from two major limitations with regard to in-firm skills training. First, its underlying neo-classical assumption that market forces provide adequate incentives to invest in education and training does not allow us to consider what policy measures would promote in-firm training and what incentive structures created within the firm might motivate workers to learn. Second, the theory's preoccupation with the cost-benefit calculation of productivity gains arising from training pays little attention to the very question of *how* workers learn.

Challenging the human capital theory, another school of economists applies the market failure approach to argue for government interventions in skills development (Najbamadi and Lall 1995, Booth and Snower 1996). A recent study by Booth and Snower (1996), for example, identifies various types of market failures (while cautioning of the danger of "government failure") to explain "skills gaps" in the labor market in the U.K.[20] Their approach suggests that because of imperfect competition and the imperfectly

[20] These market failures include: 1) imperfect competition, making wages set below the market-determined level and workers unable to appropriate all the benefits from their training; 2) externalities caused by labor turnover and mobility between firms, with the result that benefits from training go not only to the firm

transferable nature of skills, the free market does not provide sufficient incentives for training.

While the market failure approach helps explain why markets do not function under certain conditions, it does not help us consider what factors would create conditions that promote skills acquisition and development, beyond removing market failures. Moreover, it still suffers from the same limitations as the human capital theory, as I pointed out earlier: it lacks any insight into the *process* of workers' learning within the firm and the actual internal mechanisms within the firm which create incentives for training. Therefore, like the human capital theory, this approach still has only limited utility for the analysis of skills development.

Insights gained from the market failure approach into the processes of externalities and learning complementarities between firms do, however, provide some hints to consider some factors outside the firm affecting in-firm training for workers. But few empirical studies have so far examined how the processes of externalities and learning complementarities between vertically-related firms actually occur in developing countries,[21] an aspect that may be important in understanding the nature of skill transfer through the inter-firm linkages that Maruti and Telco have forged with their suppliers (see Chapter 4).

1.3.2 The Internal Labor Markets Theory

Considering that knowledge dissemination and diffusion are part of what constitutes organization-level learning, one may need to pay more attention to the process

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providing training and the workers who undergo training but also to other firms that could make use of the skills acquired through training; 3) imperfect information and imperfect competition in the job-matching process, which allow workers to get jobs not at the wage level determined by the market but at the rate that other potential negotiating firms agree to pay; and 4) the market failure arising from the interaction between skills and skilled workers (firms create few skilled vacancies because there are few skilled workers available, and few workers acquire skills because there are few skilled vacancies, resulting in what they call a "low-skill, bad-job trap" (Booth and Snower 1996).

[21] A large body of literature on industrial districts and industrial clustering focuses on the learning complementarities among horizontally-related autonomous small firms in a geographically proximate locality (Pyke et al. 1990, Schmitz 1992, Nadvi and Schmitz 1994). A recent study by Tewari (1996) makes an important contribution by providing empirical evidence of such horizonal learning

of learning, including the system of knowledge dissemination and diffusion as an institutionalized form inside and outside of the firm, including the nature of on-the-job training. In addition, skills are developed and enhanced over time within firms, not only as a result of firms' decisions to do so, motivated by certain incentives (the external environment, policy, or incentives created through inter-firm relationship) and other institutional factors, but also as a result of individual workers' motivation to seek new knowledge and skills.

Realizing the shortcomings of mainstream economics in approaching the issue of skills development, some scholars, mainly in the fields of labor economics, economic institutions, and sociology, advocate a more micro-level orientation and focus on institutional factors inside and outside of the firm. These scholars commonly view the process of skills development (what Koike and Inoki call "skill formation systems") as a social institution.

Among them are those who developed the concept of internal labor markets (Doeringer and Piore 1971, Osterman 1984), which provides insightful analytical frameworks to understand the process of skills development, particularly on-the-job training and its interactions with other institutional factors existing within the firm. These authors argue that the internal labor markets, i.e., a set of administrative rules and procedures within the firm, rather than the external labor markets, govern the allocation and pricing of labor inside the firm, such as recruitment, promotion, transfer, wages, and training. Such internal labor markets also include customary laws, which evolve over time through repeated practices and imitation (Doeringer and Piore 1971).[22] According to this concept, the rigidity of the internal labor market is closely connected with firms' investment in firm-specific human capital and the content and extent of on-the-job training (Doeringer and Piore 1971: 7).

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complementarities in an industrial district of Ludhiana in the state of Punjab, India.

[22] Similar constructs of institutions are also theorized in more recent work by scholars of the new institutionalism in organizational sociology (Powell and DiMaggio 1991).

Traditionally, on-the-job training, which occurs informally as part of the production process, has been considered central in skills acquisition and development, particularly for production workers (Doeringer and Piore 1971, Odaka 1989, Koike and Inoki 1990). On-the-job training (and its narrow focus) makes the skills acquired highly specific to the context in which they are acquired; on the other hand, skills change with time as they are transferred from one person to another (Doeringer and Piore 1971: 22). In addition, the process of on-the-job training is automatic and dependent upon each individual's curiosity and desire to master a job. Thus, a firm's ability to infuse values within the firm by appreciating the types of skills to be required by the firm and rewarding those skills also seems important in promoting skills development.

Workers typically learn their skills as they move up a hierarchical ladder of different, but closely-related, job assignments, progressing from easier to more difficult jobs in the course of their worklife in the firm (Doeringer and Piore 1971, Odaka 1989, Koike and Inoki 1990). This suggests that skills development is greatly influenced by the division of labor and by the firm's organization of rules and procedures with respect to the assignments of workers to different jobs, i.e., internal labor markets. Some scholars emphasize the decentralization of skills and knowledge within the firm structure as a determinant of productivity and efficiency (Koike and Inoki 1990).

With respect to factors influencing the process of on-the-job training, Koike and Inoki (1990) highlight two requirements on the supply side: 1) a long-term firm history, because skill formation takes a long time; and 2) a stable firm environment, because skill formation takes the form of shopfloor practices. In terms of demand-side factors, scholars commonly point to wages, promotion opportunities, and long-term employment security as the most important incentives for workers to learn (Doeringer and Piore 1971, Koike and Inoki 1990). Some scholars also mention the existence of company unions as a factor (Osterman 1984). Other scholars argue that important as it is, in-firm training still requires

a base of educated manpower to work with, which can be provided only by general schooling (Najmabadi and Lall 1995, Koike and Inoki 1990).

These institutional perspectives are very helpful for examining the nature of skill development for workers and understanding the incentive structures for training within the firm. However, this approach alone may not be sufficient to analyze the cases of skill development in the Indian automobile industry which has undergone a rapid transformation, for a few reasons. First, well-defined internal labor markets exist largely among large-scale enterprises, and therefore the concept may be less useful for analyzing the nature of skill development among small-scale suppliers of Maruti and Telco. Second, this approach pays little attention to the institutional environment outside the firm (e.g., inter-firm linkages, public and private training institutions, and policy measures) and its interaction with the internal labor markets. Finally, this perspective's emphasis on institutional stability may overlook the processes through which firms transform themselves while adjusting the internal labor markets in response to changes in external institutional environments.

1.3.3 Technological Change, Division of Labor, and Organization of Work

For decades, scholars have debated the relationship between technological change and skills. The popular assertion in the literature in the 1970s that the need for skills decreases or that "de-skilling" occurs as mechanization and technological change proceed (Braverman 1974) was replaced by the opposite "upskilling" argument by the mid-1980s that current technological change is skill-biased and requires more skills (OECD 1996).[23] Scholars argue that the conceptual, organizational, and interpersonal skills required on the contemporary shopfloor actually increase as technology advances (Koike and Inoki 1990, Bailey 1990, Penn et al. 1994, Murnane and Levy 1996). For example, the tasks for the operator of high-level automated equipment, which are not one specialized repetitive task

but a wide range of tasks,[24] require more complex cognitive or conceptual skills.[25] Other scholars argue that in the current era of global competition, only the production of high value-added goods leads to "upskilling," while the production of low-value-added goods does not require more education and training (Ashton and Green 1996). Thus, this body of literature suggests that technological change in a high-value-added industry promotes skill development.

Another factor that scholars have considered as influencing in-firm skill development is the firm size. Many scholars agree that as the complexity and responsibilities of jobs increase in moving up the ladder from an entry-level job to a highly skilled one, cognitive and conceptual skills, including reading, writing, basic mathematics, skills in diagnosing problems, problem-solving and working in teams become more important than specific manual skills (Odaka 1989, Koike and Inoki 1990, Middeleton et al. 1993, Murnane and Levy 1996). Thus, in both developed and developing countries, employers of large-scale firms with more hierarchy and more division of labor generally prefer to hire individuals with comparatively high levels of general education for entry-level jobs over those with proficiency in specific manual skills, and provide training after employment (Middleton et al. 1993). A study on Korea shows large-scale firms that assigned high-quality managers to the shopfloor and inspired initiatives on the part of such managers to develop the skills of the workforce and to improve process performance (Amsden 1989: 160).

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[23] Some scholars distinguish "mechanization" and "automation" and attribute "de-skilling" to the former and "upskilling" to the latter (Bailey 1990).

[24] These tasks include: installing a wheel, monitoring the quality of the installation, moving over to help other workers when they have trouble, diagnosing problems, working in groups to solve problems, and constantly suggesting ways to improve assembly-line performance (Murnane and Levy 1996: 12; similar observations are also made in Koike and Inoki 1990).

[25] Based on extensive observation of the Japanese shopfloor, Koike and Inoki (1990) claim that production skills on today's shopfloor require much more intelligence than they used to do. They stress the importance of two kinds of production skills: 1) the cognitive skills to respond to unexpected changes; and 2) the analytical skills to be able to detect, diagnose, and rectify any problems efficiently. Similarly, scholars of organizational learning also suggest the importance of such individual skills as the capability to understand causal associations, to make a prescriptive decision, and to predict the course of production processes, as critical elements contributing to organizational learning (Bohn 1994: 62).

A growing body of literature suggests that the organization of work is an important factor influencing the extent and contents of in-firm skill development. This includes management patterns, such as flatter hierarchies between managers and workers, a high proportion of engineers at the plant level, and emphasis on manager training and education, which promote the development of individuals' skills (Amsden 1989, Najmabadi and Lall 1995). Other scholars emphasize the importance of decentralized production processes, characterized by team-work, task rotation, and worker participation in continuous improvement as the best way to induce intra-firm knowledge transfer and attitudinal changes in the workplace (Stata 1989, Sabel 1994).[26] In addition, they point to the demand for product variety and thus the emergence of flexible specialization production systems, which allow workers to assume multi-tasks operating different machines from line to line, as an important factor for promoting workers' training (Piore and Sabel 1984, Sabel 1994).

Many recent studies have examined the transferability of such organizational forms to Japanese transplants in industrialized countries (Florida and Kenney 1991, Doeringer et al. 1996) and in developing countries (Kaplinsky 1995, Sargent and Matthews 1997); they found marked differences between the Japanese transplants and domestic local firms in work organization and employment practices, including training. The Japanese transplants emphasize more social and organizational learning and employee commitment as the means of motivating labor efficiency, whereas local firms define workforce quality in different ways, and tend to assemble a patchwork of best practices without paying adequate attention to the consistency of the practices within the overall production systems (Doeringer et al. 1996, Kochan et al. 1997).

A recent cross-national study finds considerable variations in employment practices including those concerning skill acquisition and development among countries, due to

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[26] Some scholars suggest a convergence towards the Japanese production model among the automobile industries around the world (Womack et al. 1990). But others suggest that transferring the Japanese work organization to other countries has had mixed results (see Florida and Kenney 1991 for review).

differences in the strategies and power of the parties involved in the transfer and learning process (such as firms, unions, and government), as well as the effects of local institutional and cultural forces (Kochan et al. 1997). Thus, my study also considers these aspects in analyzing factors that have motivated Maruti, Telco, and their respective suppliers in the Indian automobile industry, as discussed in subsequent chapters.

1.3.4 The Role of FDI in Skill Transfer

The important role of foreign capital in bringing skills and know-how to developing countries was recognized as early as the 1950s (Hirschman 1958). However, the role of multi-national corporations (MNCs) in economic development has been debated, especially in terms of their effects on technology, finance, and income distribution. From the neo-Marxist perspective, the dependency theory in the 1970s and the more recent concept of "the new international division of labor" in the 1980s viewed the expansion of MNCs' activities as detrimental to the economic development of developing countries. One classic argument is that MNCs contribute to an increase in income of only the richest social group of recipient countries but do not benefit the majority of the population, particularly the poor, because 1) MNCs tend to use more capital intensive technology, which is labor displacing rather than labor saving; and 2) where capital is not in the hands of local people but in the hands of foreign firms, incomes generated out of such capital are not distributed to the masses who do not own capital, resulting in a worsening income distribution. In particular, the entry of MNCs often has a negative impact on small-scale local producers (Caves 1996). However, this line of argument does not take into account the externalities and spillovers of foreign firm activities in the host countries, including skill development.

Many studies in technological and skills development have regarded FDI as an effective means of transferring technology and skills (e.g., Lall 1985a, Koike and Inoki 1990): when MNCs come, they bring highly developed product differentiation techniques, sophisticated management systems and financial practices, and advanced methods of

quality control, product development and process engineering, apart from the initial provision of complex technology (Lall 1985a: 83). The common assumption is that MNCs transfer advanced management techniques from developed countries to developing countries, send high-level managers from the home country, and attract the best workers by offering relatively high salaries. MNCs' technological and engineering capabilities, together with highly developed training schemes, would tremendously benefit industries requiring such skills (Lall 1985a: 86). FDI promotes the direct movement of people between the home country and the host country, and thus influences the way in which technology and skills are disseminated (Koike and Inoki 1990). Lall (1985a) suggests various stages of skills and knowledge transfer by MNCs, from the acquisition of knowledge on how to carry out manufacturing activity to the acquisition of operating knowledge (know-how); the development of "know-why" capabilities; and the ability to undertake scientific research.

Partly influenced by new growth and trade theories, a large body of literature has recently resuscitated its interest in the role of FDI in transferring knowledge, skills, and technology to developing countries, viewing FDI as an engine of growth (OECD 1994, World Bank 1998; see de Mello 1997 for review).[27] The rapid growth of FDI, particularly by MNCs, is believed to bring about two associated phenomena in developing countries: a change in the level of technology and a change in the organization of work for local production activities. FDI is also believed to have a positive effect on human capital accumulation by providing training and skills acquisition and diffusion for workers in recipient countries (de Mello 1997: 9, OECD 1998).

However, advocates of FDI as a prime driving force for transferring knowledge and skills fail to explain the variance of experiences among firms with the same FDI partners across different countries. Moreover, many studies on FDI lack insights into the

[27] However, other scholars argue that what promotes growth is not FDI *per se* but particular characteristics of recipient countries which attract FDI, including existing factor endowments, such as the existence of well-educated labor (Kokko 1992).

detailed processes of skills development at the firm level. In addition, empirical studies find that FDI firms in developing countries often do not contribute to the development of skills in a local economy, as in the Korean automobile industry (Amsden 1989, Amsden and Lessard 1995) and in the Mexican automobile industry (Dussel et al. 1997, Piore and Ruiz-Durán 1998).

A study by Lall (1985a) on technological development in India, however, found no marked difference in the adaptation of imported technologies between MNCs and local firms; MNCs were as active as local firms in transferring skills, know-how, and product design to vertically linked suppliers (Lall 1995:123). The presence of MNCs also had a positive impact on local competing firms, as competition from technologically efficient MNCs induces local firms to improve their own technology (particularly know-how) and promote skill development. This suggests a need to look into peculiar institutional conditions in India, which might have encouraged MNCs such as Maruti to foster local skill development, rather than simply attributing firms' efforts towards skill development to FDI.

Inspired by the existing theoretical and empirical literature concerning skill development as reviewed above, and, also informed by their limitations, I focused on three institutional factors that may influence and determine the patterns of skill development at the firm level: 1) institutional factors[28] and incentive structures (such as recruitment, promotion opportunities, and labor relations) *within the firm* (see Chapter 3); 2) the nature of inter-firm linkages, i.e., the way firms organize their interactions and cooperation (Chapter 4); and 3) institutional arrangements and incentive mechanisms *outside of the firm*

[28] For some scholars such as Najmabadi and Lall (1995), institutions refer to the organizations set up to support the functioning of the skill, capital and information markets that are relevant to industrial technological development, including education and training institutions, development finance and venture-capital institutions, science and technology institutions, and others that support subcontracting, small-scale enterprises, and information flow. However, I define institutions in a broader sense to refer not only to organizations but also to a set of "rules of the game" (North 1990) which bind individuals and organizations, although I do not necessarily agree with North's behavioristic assumption underlying his theory.

(including external labor market conditions, government intervention, and links with education and training institutions) (Chapters 3 and 4).

1.4. Methods

This research involves a micro-level case study. I chose to study the nature of skill development in two leading vehicle manufacturers in India, Maruti and Telco, and skill transfer to their respective local first-tier suppliers.[29]

I collected data through three rounds of fieldwork: first in June and July 1996, then between November 1996 and May 1997, and finally in August 1998.

My primary data come from an original questionnaire survey and extensive interviews that I conducted with a sample of 50 first-tier supplier firms (25 of Maruti's and 25 of Telco's). In addition, I conducted extensive interviews with the two vehicle manufacturers, Maruti and Telco; interviews with each firm lasted about two weeks. With regard to the second- and third-tier suppliers, there are virtually no data available even to indicate who and where they are. Thus, I obtained lists of subcontractors from the first-tier suppliers I visited. However, due to both time and data constraints, the sample size of these lower-tier suppliers is small. I interviewed only about two dozen second-tier suppliers. My future research will focus more extensively on such lower-tier suppliers.

In visiting suppliers, I used a questionnaire survey format, partly to create a legitimate atmosphere for asking questions, and partly to maintain some consistency in the data I would gather from each firm. To develop my questionnaire, I referred to, and modified, four questionnaire survey formats used on related themes in the U.S. and India to allow a cross-country comparison in future research.[30] I added some questions that are

[29] This is incidentally similar in terms of research design to Lall's 1979 study on the role of inter-firm linkages in technological development. He compared two leading truck manufacturers and their suppliers in India: Ashok Layland, a joint venture with a British firm, and Telco, a local manufacturer (Lall 1985b). However, Lall did not do a detailed study of the actual processes of skills transfer and how such vertical linkages actually influence the way in which skills development and transfer occur within and between firms.

[30] The questionnaires that I referred to are: 1) "Worker Training and Workforce Adjustment Questionnaire" (prepared and administered by Harry Katz and Jeffrey Keefe, sponsored by the U.S. Department of Education,

more country-specific and of particular interest to me, such as questions related to castes, migration, educational attainment, and social security benefits, to accommodate factors relevant to my research framework.

To select sample firms, I employed a different strategy for Maruti and Telco. In the case of Maruti, I was able to obtain the list of all 404 first-tier suppliers, with their addresses, firm size, and share of sales to Maruti. Accordingly, I classified the suppliers on the basis of location, firm size, and the share of sales by Maruti (as a proxy for the strengths of the inter-firm linkage), and selected 30 firms (of which 25 agreed to respond), balancing these three criteria. Telco was reluctant to release a list of its 1,200 suppliers, partly because it has no consolidated lists due to a wider product range and multiple locations of plants in three states. Therefore, I visited Telco's suppliers through arrangements made by Telco's supplier development department. As a result, the sample of Telco suppliers is more subject to selection bias. The geographic coverage of these 50 first-tier suppliers spreads over four states, namely, Union Territory of Delhi, Haryana (cities of Gurgaon and Faridabad), Maharashtra (Mumbai, Pune, and Aurangabad), and Uttar Pradesh (Ghaziabad and Lucknow).

During my field visit to a firm, I asked questions with my questionnaire in hand to elicit answers from the respondents, then filled in the answers myself while listening to their responses. Respondents were mainly managers and production-level supervisors, and, in smaller firms, often the owner or partner; they often invited appropriate subordinates to sit in. I tried to interview production workers but rarely gained useful results because such interviews were allowed only with the presence of managers. I gained supplementary data through additional questions after the questionnaire survey. Interviews

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the Center for Advanced Human Resources of Cornell University, and the Institute of Management and Labor Relations of Rutgers University); 2) "International Automotive Assembly Plant Study" (administered by International Motor Vehicle Program, MIT with Jones Center on Management Policy, Strategy, and Organization, Wharton School, University of Pennsylvania); 3) "Performance of Ancillary Units: Questionnaire for 'Mother Units'" (administered by the Small-scale Industry Development Bank of India (SIDBI)); and 4) "Survey of Small Industries" (Indian Institute of Management, Ahmedabad).

were usually followed by a guided tour of the plants, following the production lines on the shopfloor. I conducted additional interviews during and after such plant tours. A typical visit lasted half a day. In some cases, I returned to the same firms for follow-up interviews.

In addition, I have interviewed officials from various ministries of the Government of India; personnel from industrial organizations; officials from government agencies in charge of small-scale industries, such as the District Industrial Centers (in Gurgaon and Pune, in particular), and training institutions, such as Industrial Training Institutes (in New Delhi and Pune, in particular); representatives from national umbrella organizations of trade unions and researchers from local research institutions relevant to my study. Also, I collected secondary data (including statistical data) from various government agencies, the international organizations such as the International Labor Office (ILO) and the United Nations Development Programme (UNDP) in New Delhi, industrial associations, and local research institutions.

1.5. Structure of the Dissertation

The remainder of this dissertation is organized as follows: Chapter 2 illustrates the nature of rapid transformations of the Indian automobile industry since the-mid 1980s while identifying the setting where Maruti and Telco have been placed. Chapter 3 analyzes the pattern of skills development in the two auto manufacturing firms, with particular focus on five types of in-firm training: 1) internal labor markets and on-the-job training; 2) apprenticeship programs; 3) in-firm formal training; 4) overseas training, and 5) work organization. I then examine factors that determine the patterns of skill development in each firm. Chapter 4 analyzes the pattern of skill development among the 50 sample suppliers of these two vehicle manufacturers, and examines how the inter-firm linkages that Maruti and Telco have forged with their suppliers have influenced the way skills have been transferred and developed in these suppliers. Chapter 5 concludes this dissertation while

summarizing the findings and discussing their implications for public policy for promoting skill training in developing countries.

Chapter 2

Globalization and Transformations of the Indian Automobile Industry

2.1 Introduction

This chapter illustrates the dynamic process of transformation that the Indian automobile industry has gone through since the mid-1980s. In so doing, it shows the performance of Maruti and Telco and their critical roles in leading the growth of the industry during this process.

Until the mid-1980s, the Indian economy, with its import substitution industrialization strategy since the late 1950s, was characterized by an inward-looking trade regime, highly regulated and protected domestic markets, and control on foreign investment, partly because of the country's ideological orientation towards self-reliance. This policy regime had long discouraged innovation, cost reduction, and the acquisition of technological capabilities, causing considerable inefficiencies, sluggish export performance, and slow growth (Lall 1987, Rodrik 1995, Agrawal et al. 1995). The 1963 Monopolies and Restrictive Trade Practices (MRTP) Act restricted the activities of large private business houses (conglomerates) in order to control monopolies and growth of private-sector firms and to promote public-sector enterprises.[1] The government had also restricted the inflow of FDI since the 1960s, both in terms of the sectors to enter and the percentage of equity share, to promote localization of the domestic industries and limit FDI only to the sectors that needed foreign technology (Lall 1985a, 1987).

In the mid-1980s, however, the government adopted macroeconomic adjustment policies; along with some liberalization of the industrial and trade regimes, these led to

[1] In India, the state has played an important role in promoting industrialization. It owns more than 60% of all productive capital in the industrial sector, and runs 8 out of the top ten enterprises in the country. It directly employs two-thirds of all workers in the organized sector, through nationalized financial institutions holds over 25% of paid-up capital of joint stock companies in the private sector (Bardhan 1984: 37-38).

considerable industrial growth and improved export performance.[2] In 1991, faced with an acute balance-of-payment crisis, the government introduced the New Economic Policy and the New Industrial Policy, bringing about a drastic shift towards trade liberalization and economic reforms. As part of the policy, the government: 1) abolished the licensing Page 42 of system in 1992; 2) lifted the reservations to the state of many areas of economic activity; 3) relaxed restrictions on the inflow of foreign capital and technology transfer; 4) relaxed restrictions on the large business houses; 5) abolished import controls on raw materials, and intermediate and capital goods; 6) reduced the tariff levels; and 7) devaluated the currency (Kaplinsky 1997).

Table 2.1. Recent Trends of Economic Performance in India

	1950-80	81-90	90-91	91-92	92-93	93-94	94-95	95-96
GDP growth rate (%)	3.52	5.46	5.36	0.82	5.10	4.97	6.33	6.60
as a % of GDP:								
Exports (%)	n/a	n/a	6.2	7.2	8.2	8.9	8.9	10
Imports (%)	n/a	n/a	9.4	8.4	10.1	9.8	10.6	12.8
Foreign investment (%)	n/a	n/a	0.6	0.8	2.9	18.7	18.2	13
FDI (in US$ millions)	n/a	n/a	165	150	341	586	1,314	2,133

Source: Constructed from data in various tables in Parikh 1997.

Table 2.1 shows recent trends in economic performance. One of the most dramatic changes resulting from economic reforms was the increased inflow of foreign capital. The actual inflow of FDI in India has increased fourteen times, from US $150 million in 1991-92 to US $2,133 million in 1995-96 (Reserve Bank of India 1996 as cited in Sen et al. 1997). This growth in FDI is particularly striking, when compared with India's export performance, which only nearly doubled during the same period, from US $17,866 million

[2] These policies include: 1) Long-Term Fiscal Policy in 1985/86, 2) Long-Term Import Export Policy, 3) Technology Policy, 4) Textile Policy, 5) Electronics Policy, 6) Computer Policy, and 7) Policy on Sick Industries. These policies aimed to deregulate import restrictions in favor of the import of foreign technology, particularly in the high-tech industries. But the effects of these policy reforms were modest (Kaplinsky 1997).

to US $31,831 million (Government of India as cited in Parikh 1997). While India remains a relatively unpopular destination for FDI as compared with countries like China, Mexico and Singapore,[3] the trends in economic performance indicate a clear transformation of the Indian economy towards being more open and globalized.

Not only did India see a considerable increase in demand for consumer goods, but middle-income purchasing power also expanded in the domestic markets. These led to a change in India's industrial structure in favor of consumer goods. Meanwhile, income inequality widened and household savings fell. During the 1990s, then, the increase in middle-class demand, coupled with the openness to imports and to international taste-patterns, forced Indian manufacturers for the first time "to 'win over' consumers rather than to produce poor-quality standardized products into a supply-constrained market" (Kaplinsky 1997: 685).

The rest of this chapter proceeds as follows. Section 2.2 briefly reviews key policy changes as part of the introduction of the liberalization policy and in particular those pertaining to the automobile industry. Section 2.3 illustrates how the increased integration of the Indian economy into the global economy has led to a rapid transformation of its automobile industry, while Section 2.4 examines how it has brought about a dramatic restructuring of the industry. Together, this chapter provides some background contexts in which skill development occurs in firms in the automobile industry, which I discuss in subsequent chapters (Chapters 3 and 4).

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[3] FDI is heavily concentrated in the largest recipient developing countries, which receive nearly 80% of the total FDI inflows to the developing countries (Lall 1995). These countries are: China (US $158,462 million); Mexico (US $40,222 million); Singapore (US $39,176 million); Malaysia (US $31,967 million); Brazil (US $22,876 million); Argentina (US $22,409 million); Indonesia (US $20,773 million); Thailand (US $14,238 million); Hong Kong (US $11,639 million); and Chile (US $10,152 million) (OECD 1998: Table 2).

2.2 Liberalization Policy

This section reviews major changes in four policy areas as part of economic reforms beginning in the mid-1980s, and illustrates how these changes have affected the automobile industry. The four areas are licensing, foreign investment, localization, and reservation.

2.2.1 Licensing Policy

The Indian government formulated its first industrial policy in 1948, when India adopted the model of central planning to promote its overall economic development. This early policy was characterized by heavy regulation, excessive state control over private capital, and the promotion of state-owned enterprises in key industries. The 1963 MRTP introduced an extensive licensing regime (termed the "License Raj" in India) to control virtually every aspect of the industrial activities of large private firms, such as entry, plant size, product type and range, technology choice, and production capacity (Lall 1987, Agrawal et al. 1995). Moreover, the government protected and promoted state-owned enterprises by reserving key sectors of the industries for them. Thus it used licensing to protect them and prevent them from facing competition with private firms.

In addition, the import substitution trade regime required trade licensing for all imports, capital goods and intermediate inputs, including foreign technologies. This aimed to protect the domestic markets from foreign competition and helped the nation attain the goal of "self-reliance" (Lall 1987). This import licensing was relaxed in 1978, allowing some items to be imported without a specific license under the category of an "Open General License" (OGL). Later, under the 1985-1990 plan, the licensing policy was further relaxed, with an expanded list of industries open to large firms (Bowonder 1998b).

Under this "License Raj" regime, the government promoted, protected, and controlled two domestic car manufacturers--Hindustan Motors Ltd. (hereafter HML) and

Premier Auto Ltd. (hereafter PAL)--and several domestic commercial vehicle manufacturers, such as Telco, Ashok Layland (a joint venture with British Layland), Bajaj Tempo, and Eicher Motors. During this regime, virtually no new firms were permitted to enter the industry. At the same time, government licensing kept these domestic producers from expanding plant capacity, increasing product variety, and purchasing foreign technologies. For example, Telco, which was considered a "monopoly" firm, took seven years to obtain a license to start operating in its new plant in Pune in the 1970s. Likewise, domestic producers were forced to produce old-fashioned cars with obsolete technologies: From the 1950s on, HML was not permitted to undergo a major model change for the "Ambassador," its only car model. Moreover, licensing kept the level of output for each producer well below the demand level (Humphrey et al. 1998). In the 1980s, however, considerable de-licensing occurred in the automobile industry, permitting four new comers to enter the commercial vehicle sector, all in joint ventures: DCM-Toyota, Eicher-Mitsubishi, Swaraj-Matsuda, and Allwyn-Nissan. In addition, existing vehicle manufacturers were permitted to diversify their products, which allowed, for example, Telco to enter the passenger car market.

After the 1991 liberalization policy, industrial licensing was totally abolished in 1992. Accordingly, the component industry was de-licensed in 1992, and the vehicle manufacturers in 1993 (Humphrey et al. 1998), thus allowing firms to enter the market, expand their operations, diversify their products, upgrade their technologies, and increase their production, without requiring the lengthy process of obtaining licenses.

2.2.2 Foreign Investment Policy

During the earlier inward-looking trade regime, the government restricted the inflow of foreign capital, and the Foreign Exchange Regulation Act (FERA) of 1974 forced foreign investors to keep their equity share to 40% or less (Lall 1987).[4] In addition, the

[4] For the detailed discussions of this policy and its effects, see Lall 1987.

government imposed strict controls on the payments permitted and the life of the contract for technology licensing (Lall 1987: 35).[5] These policies constrained India's access to foreign technologies for decades. Along with the absence of competition within the domestic market that discouraged innovations, and the control of imports by licensing for the purchase of foreign technologies, this policy left the automobile industry with large technological gaps compared to the world's leading car producers.

The 1991 liberalization policy dramatically reversed India's anti-FDI position. In 1991, the government lifted FERA, which entailed that: 1) in 35 high-priority industries, including automobiles, up to 51% of equity holding by foreign investors is automatically approved if certain norms are satisfied; 2) FDI proposals no longer must include technology transfer agreements; 3) trading companies primarily involved in export activities are allowed up to 40% foreign equity; 4) existing firms can now raise foreign equity up to 51% for proposed expansion in priority industries; and 5) the 1973 FERA was amended and restrictions placed on foreign firms by FERA were lifted (Sen et al. 1997: 132). Gradually, the 51% limit on foreign equity was raised to 75%, except in a few industries (Bowonder 1998b). In addition, a new policy package targeting the small scale industry (SSI) sector,[6] including tiny units,[7] permitted equity participation in SSI firms, including that by foreign collaborators, up to 24%, to encourage modernization and technological upgrading in the sector (FICCI 1994).

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[5] The government restricted the royalty payments to be only up to 3-5% of the value of sales, and subject to a 40% tax, and the life of a technology contract up to 5 years (with an exception of specially permitted export-oriented industries). These conditions are unattractive compared to the norm in other countries, where royalties of 5-10% are common (Lall 1987: 35).

[6] Small-scale industry (SSI) refers to firms with an initial capital of Rs. 6 million (approximately US $150,000), regardless of the size of employment. In the case of a firm which exports at least 30% of the annual production by the end of the third year, the ceiling of investment goes up to Rs. 7.5 million. In addition, an ancillary unit, with an initial capital of Rs. 7.5 million, also receives similar protection.

[7] The government of India defines "tiny units' as those firms with an initial investment of up to Rs.0.5 million, as a subcategory of SSI firms.

2.2.3 Localization Policy

Under the import substitution industrialization regime, along with its commitment to "self reliance," the government required, through its Phased Manufacturing Program (PMP), both foreign and domestic producers to achieve a high level of localization of raw materials and components.

The PMP was abolished in 1992. However, the government still implicitly demanded 50% local content in approving foreign collaboration proposals; this would rise to 70% after five years. In order to promote FDI, the government deliberately formed no specific policy for the automobile industry with respect to local content. Rather, it signed confidential "Memoranda of Understanding" (MOUs) with each new entrant on a case-by-case basis (Humphrey et al. 1998). Imports of complete knockdown (CKD) kits with a 45% import duty were allowed in return for a firm's commitment to localization. Once certain levels of local contents are achieved, CKDs can be imported at the prevailing duty rate of 20-40% (Humphrey et al. 1998).

In 1997, with pressure from the industry to establish a clear and transparent policy on the automobile industry, the government formed a new policy requiring that a new foreign entrant 1) have a minimum foreign equity of US$50 million in the first three years of operation; and 2) achieve local contents of 50% in the first three years, and 70% by the fifth year (Humphrey et al. 1998).

2.2.4 Reservation Policy

Aside from extensive licensing, Indian industrial policy has required that more than 800 industrial products be produced exclusively by SSI firms. For some firms, this interfered significantly with achieving economies of scale. Moreover, the government provided various incentives for small firms, including favorable excise duties for every activity in which they competed with large firms (Lall 1985b, 1987: 30).

This reservation policy has had a large impact on the development of the automotive component industry in at least two ways. First, it prevented large auto manufacturers from intensifying their vertical integration by acquiring small suppliers and expanding into their activities. Second, it actively encouraged the growth of supporting industries by reserving many auto components to be produced by the SSI sector (see Appendix 2.4 for a list of such items), which forced auto manufacturers to buy rather than make these items. Thus, unlike the experience in Southeast Asian countries, with this government support and protection, small- and medium-scale firms that were capable of producing technologically simple components existed long before liberalization policy was introduced.

As part of liberalization, the total of 17 industries reserved for the public sector was reduced to 8 in 1991, and later to 6 (Bowonder 1998b). Even after liberalization, however, the reservation policy for SSI continued, with only 7 items removed from the list by 1994,[8] despite a recommendation for its lifting by a special government-appointed committee on SSI. The government has been hesitant to abolish its reservation policy for SSI: it is committed to employment generation, and also sees this sector's considerable growth in export performance, with an increase in its export share from 13.2% in 1975-76 to 30% in 1990-91, and further to 34% in 1993-94 (Sen et al. 1997, FICCI 1994:3).[9] Moreover, the 1991 liberalization resulted in a specific policy package introduced in 1994-95 for small, tiny, and cottage industries aimed at stimulating growth impetus in this sector.[10]

2.3 Globalization of the Indian Automobile Industry

[8] Based on a study by UNIDO in 1996.

[9] However, exports in the manufacturing sector has concentrated on relatively low value-added industries, such as leather, garments, wood and wood products, and gems and jewelley.

[10] In 1994-95, the government announced further policy changes concerning the SSI sector toward deregulation and liberalization, including: 1) simplified duty structures; 2) the elimination of government registration requirements to be qualified as SSI firms; 3) the abolishment of inspection systems for visits by government inspectors without a written authorization (FICCI 1994).

This section describes how policy reforms since the mid-1980s reviewed above have affected the performance of the Indian automobile industry, particularly in terms of the growth of production, an increased inflow of FDI, and greater trade openness.

2.3.1 Growth Spurt and the Emergence of an Industrial Leader

Although the Indian automobile industry began to emerge in the early 1940s, its growth lagged behind that of other countries from the mid-1950s on, because of the closed and highly regulatory nature of the Indian economy as discussed above. Trade policies such as the control of imports of raw materials, components, and equipment through licensing, the restrictions on FDI, and the imposition of localization of components production, protected the domestic market. At the same time, however, this inward-looking trade regime constrained the growth of domestic car producers, with little exposure to foreign technology or international competition.[11]

These trade and industrial policies discouraged the industry from attaining economies of scale and improving its performance in terms of both costs and quality. Moreover, very high levels of excise duties on passenger cars, which the government classified as "luxury goods," also impeded the growth of this segment even within the domestic market. Thus, during the 1970s, the number of passenger cars in production, mainly by HML and PAL, remained almost unchanged throughout the decade, at 33,000 per annum on average;[12] in fact the average annual growth rate was negative (see Table 2.2 below).

This picture changed dramatically in the early 1980s, with the entry of Maruti Udyog Ltd. (hereafter Maruti), a joint venture between the Indian government and a Japanese auto manufacturer (Suzuki Motors Corp., hereafter Suzuki), into the domestic

[11] In the early 1940s, both local and foreign auto makers started producing cars in India, but in the 1950s, the government imposed the gradual localization of component production, which forced foreign firms such as GM and Ford to withdraw their operations in India, and prevented new firms from entering the industry (Kojima 1995).

[12] I calculated this from the data in Automobile Component Manufacturing Association of India (ACMA) 1995b.

market. While Maruti started as a private firm, the government nationalized it in 1980 and reached joint venture and licensing agreements with Suzuki in 1982.[13] Suzuki's 26% equity participation in Marurti was the largest single FDI in India and the first major investment by a Japanese company (Venkataramani 1989: 2).[14] Maruti remained a state enterprise until 1992, when the government's share of equity was reduced from 60% to 49.9%, in accordance with government policy change that allowed public enterprises to form joint ventures.

Table 2.2: Production Growth by Type of Vehicle (numbers)

	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	Average annual growth rate (%) 1971-80	Average annual growth Rate (%) 1981-90	Average Annual growth Rate (%) 1991-95
Cars	36,032	21,658	31,275	102,804	181,821	347,800	-2.5	19.2	13.3
Jeeps	9,876	7,133	15,667	27,961	37,369	67,643	3.5	10.8	8.8
Commercial vehicles	62,165	76,998	144,480	173,908	283,129	450,441	9.7	7.3	9.3
Two wheelers	108,576	213,219	440,310	1190917	1820746	2658106	14.7	16.2	6.3
Three wheelers	4,743	13,378	26,930	49,947	89,162	161,679	17.6	13.7	9.9
Total	221,392	332,386	658,662	1545537	2412227	3685669	11.5	14.7	7.4

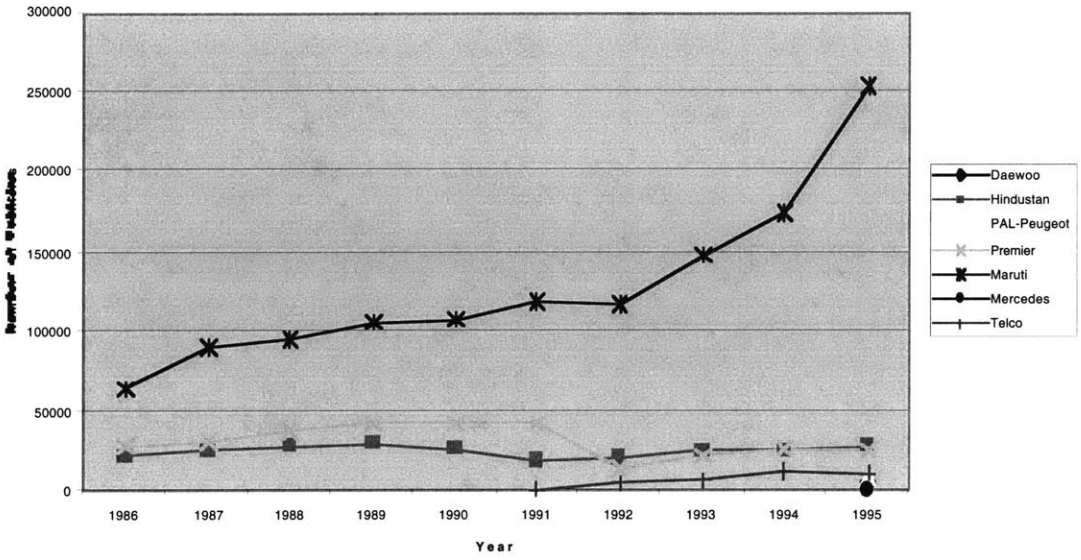
Source: Constructed and calculated from data in ACMA 1996

[13] The origin of Maruti was highly political. Initially, Sanjay Gandhi, the elder son of then-Prime Minister Indira Gandhi, started Maruti Ltd. as a private firm to achieve his dream of producing a "national car." Due to some political problem, however, it never started operation, and closed down in 1977. Indira Gandhi's government nationalized the firm in 1980, after the death of Sanjay Gandhi, to achieve her son's dream. Advised that the project would not succeed without the involvement of foreign technology, Indira Gandhi started searching for a potential partner. The government signed joint-venture and license agreements with Suzuki in 1982 (Interviews with a former CEO, Maruti Udyog Ltd.). Suzuki ranks only the sixth largest among the nine Japanese auto manufacturers. In the early 1980s, precisely because of its weaker domestic base, Suzuki, in search for a market niche, was keen to go to India, which then the major Japanese auto manufacturers considered to be a high-risk country for investment. In fact, larger manufacturers like Toyota, Nissan, and Mitsubishi all started a joint venture in the Indian market in the early 1980s, but virtually all withdraw by the late 1980s. Only Suzuki, with generous government support, managed to remain successful all along, with Maruti being its largest overseas operation.

[14] This 26% in cash equity participation was the highest bid. Mitsubishi, which was the second highest, offered only 10%. FDI in India was then considered still risky. In fact, the then Japanese ambassador to India advised Suzuki not to take part in this project (A talk by Mr. Bhargava, a former CEO of Maruti, at Harvard, February 1998).

As Table 2.2 shows, the industry's growth spurt occurred in the 1980s--even before the 1991 introduction of liberalization policy--particularly in the production of passenger cars, jeeps, and motorcycles. In fact, somewhat surprisingly, most vehicle types recorded higher growth rates in the 1980s than in the 1990s. As of 1995-96, India produced a total of 3.7 million vehicles (including two-wheelers) per year, ranking it as the seventh largest auto producer among developing countries.

Figure 2.1: Passenger Cars Production by Manufacturers



Source: ACMA 1996.

As Figure 2.1 indicates, the growth in the passenger car segment of the Indian automobile industry has largely been due to Maruti's growth. In 1983, Maruti started producing a small passenger car (the "Maruti 800") modeled after Suzuki's 800cc cars, in its new "greenfield" plant; it was the first modern assembly plant in India, as the Indian automobile industry was still largely operating in the craft production principle. It was a close copy of Suzuki's Kosai plant in Japan, in terms of plant layout, equipment, the organization of production and the operating principle. But, Maruti's level of automation was much lower than Suzuki's, because of large technological gaps between the two

countries and much lower labor costs in India. While all capital goods were purchased from Japan, and all the technologies were brought from Suzuki, Maruti has paid Suzuki only 3,000 yen (approx. US $25.00) per sale of a vehicle as a loyalty, thus keeping the costs of technology transfer relatively low.

Maruti's cars were 21% cheaper than the lowest-priced existing passenger car produced by domestic manufacturers, yet offered much higher quality, more safety features, and greater fuel efficiency. Since then, Maruti has dominated the small car segment, which was virtually untapped before its entry. With capital costs written off and over 90% localization, Maruti's production costs are extremely low: At the price of Rs. 210,000 (US$ 5,927), Maruti's small car is still "probably the cheapest car available in the world today" (Sen et al. 1997: 138). With sales of its cars soaring at 16% per year, Maruti sold more units in its first five years of operation than all other domestic manufacturers combined in the previous forty years.[15]

Maruti achieved a remarkable productivity growth, with 53 cars produced per employee per year, as compared with 5 for HMI, in 1996-97.[16] This makes Maruti's productivity the highest in the Indian automobile industry, and even comparable to those of world-leading car manufacturers such as Toyota (whose number of vehicles produced per employee was 51 in 1991).[17] Figure 2.2 shows Maruti's recent growth in productivity in terms of the number of vehicles produced per employee per year and value added per employee, which have nearly doubled and grown four times respectively between 1992-93 and 1996-97. Table 2.3 compares Maruti's value added per worker with those for the automobile industry in Japan, the U.S., and Germany, indicating Maruti's rapid process of catching-up with the world leading car producers, despite its relatively recent entry in the industry.

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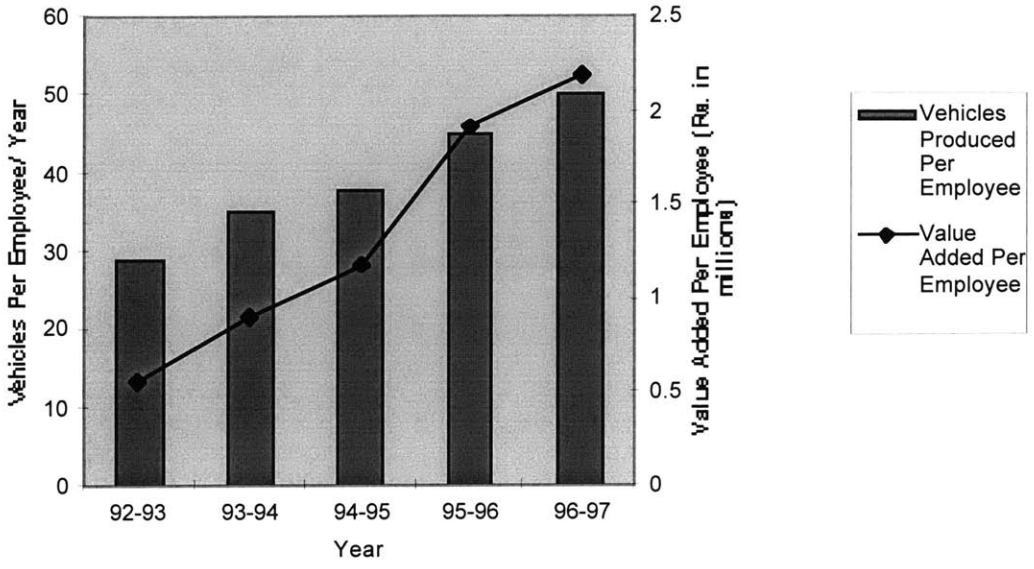
15 The Economic Times New Delhi, May 8, 1996.
16 Calculated from Maruti's and HML's 1996-97 annual reports.
17 Fujimoto 1997: Figure 3.2. Due to the two firms' different product mix, these figures are not comparable in a strict sense.

Figure 2.2: Maruti's Productivity Growth



Source: Maruti 1998.

Table 2.3: Productivity Comparison: Maruti and Global Players

	Maruti 1987-88	Maruti 1995-96	Japan 1987	U.S. 1987	Germany 1987
Value Added Per Employee ($1,000)	28.5	57.6	73.3	75.8	45.0

Notes: 1) Figures for Japan, the U.S. and Germany are the industrial average for both assemblers and component manufacturers combined. Therefore, these figures are not comparable with that for Maruti in a strict sense. 2) Figures for Maruti take into account different exchange rates for the two periods. The exchange rates for 1987-88 and 1995-96 were Rs.13.40 and Rs.33.18 per dollar respectively. Therefore, Differences in the figures between the two periods appear smaller than shown in Figure 2.2.
Source: Fujimoto and Takeishi 1994 (for Japan, the U.S. and Germany data); Maruti 1998 (for Maruti data).

During the 1980s, the government carefully protected and supported Maruti, by

preventing other foreign firms from entering the Indian market and other domestic firms from entering the small-car segment through licensing and policy measures as mentioned earlier. For example, the government never granted license for Telco's proposal to start a joint venture with Honda to produce passenger cars. Moreover, in 1983, the government reduced customs and excise duties for cars which had a capacity of no more than 1000 cc, a criteria that virtually only Maruti's small car could qualify (Venkataramani 1992). In subsequent years, only Maruti was granted foreign exchange clearance for two models of its middle-sized cars by the government.[18] Even after the 1991 liberalization policy, with Maruti's dominance in the small-car segment, other late entrants had to turn to the higher end of the passenger market; they could hardly compete with the price of Maruti's small car, given their lower levels of localization and the higher costs of imported components.

In the 1990s, the domestic market expanded markedly and the competition within the domestic market intensified, with the growth of middle-class consumers who can afford to buy cars (estimated at 100 to 200 million), and increased variety in consumer tastes. Maruti diversified its product range, introducing new middle-sized passenger cars in the early 1990s. In response to Maruti's growing dominance in the market, and a rapid expansion of the domestic market, local passenger producers such as PAL and HML had to upgrade their models, with foreign technical collaboration from Fiat and Peugeot and from Isuzu respectively.[19]

Telco, a local manufacturer, has traditionally dominated the heavy and light commercial vehicle markets, with its market share at 62% in the commercial vehicle sector in 1994-95.[20] It also diversified its product range and entered the passenger car market, introducing three models of multi-utility vehicles, after the abolishment of licensing in 1992. Further, in 1997, Telco started producing small passenger cars, as the "first genuine

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[18] The Economic Times, New Delhi, November 9, 1996.

[19] PAL produced an updated Fiat124 body, while HML introduced a new model, Contessa, based on a Vauxhall body with an Isuzu engine (Eurotech International 1993).

[20] See Bowonder (1998a) for a detailed account of Telco's historical development.

Asian car," entering the market segment so far almost monopolized by Maruti. Telco's successful performance in terms of both remarkable growth in production and its entry, without FDI involvement, into the domestic passenger car market, where competition has become fiercely intensified, stands out among local car manufacturers in India and even in developing countries as a whole. Many recent studies report the growing dominance of FDI in the automobile industries in the emerging markets, such as Mexico, Brazil, and China, where local producers, both assemblers and suppliers, have increasingly lost their independence (the exception is perhaps Hyundai in Korea).[21]

By the mid-1990s, the Indian automobile industry saw the entry of many foreign car producers in the middle-sized passenger car market. With a rapid expansion of the domestic market and export growth, sales of passenger cars in the industry as a whole doubled in the three years between 1993 and 1996. Interestingly, despite the intensified competition, Maruti continued to grow remarkably, with its share in the passenger car market rising to 80% in 1996-97, after the entry of several new players.

2.3.2 FDI and Internationalization of the Automobile Industry

Reflecting the government's dramatic turnaround in its policy toward foreign capital in 1991, which resulted in the virtual elimination of restrictions on FDI, however, the automobile industry experienced a big spurt in the inflow of FDI in the 1990s. One major factor motivating foreign auto manufacturers to enter India is clearly the huge growth potential of the Indian domestic market, with an estimated total population of 940 million and a recent reported growth in middle-class consumers.[22] As discussed earlier, the 1991 uplifting of FERA resulted in a rapid increase in foreign collaboration with local assemblers and component manufacturers; as of 1996, there were a total of 89 financial collaborations,

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[21] See Amsden (1989).

[22] However, the industry's analysts have recently modified downward their projections of the industry's growth, admitting that they had overestimated the growth of the Indian middle class that could afford to purchase passenger cars.

and a total of 211 technical collaborations (through licensing agreements) between local component firms and foreign firms.[23]

With this increased alliance with global auto makers, the passenger car segment has experienced very rapid transformations in recent years. In 1995, two local car manufacturers, PAL and HML, both started new joint ventures (PAL with Peugeot and Fiat, and HML with GM and Mitsubishi respectively) to produce new middle-sized passenger cars, which are luxury cars in the Indian context. Mercedes-Benz from Germany started producing luxury cars in 1995, with a new joint venture with Telco. Daewoo from Korea also started local production in 1995. Another Korean manufacturer, Hyundai, set up a 100% subsidiary to start operations in 1998.[24] By 1998, U.S. auto manufacturers such as Ford and GM, as well as other Japanese auto makers such as Toyota and Honda, had all entered the Indian passenger car market (see Appendix 2.1 and 2.2). The entry of these new auto manufacturers has made the Indian automobile market extremely competitive.

Also, many of the world's major auto component manufacturers, such as Delphi (GM's 100% subsidiary component supplier division), Lucas-TVS (a joint venture with Lucas in the U.K.), MICO (a joint venture with Bosch in Germany), and Denso India (a joint venture between Maruti and Denso in Japan), entered India to start local production to supply such new joint-venture car manufacturers (see Appendix 2.3 for a profile of the 25 largest component manufacturers in India).[25] Some of them have long-term plans to source components from India in the future.[26] The entry of these global suppliers has posed enormous challenges to local component producers, particularly in terms of

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[23] Calculated from ACMA 1996.

[24] The government announced in 1994 that it would give preference to foreign investments by MNCs through joint ventures with Indian partners, over the establishment of wholly-owned holding companies or subsidiaries. However, in 1995 the Foreign Investments Promotion Board (FIPB) suddenly approved a number of MNCs to set up 100% subsidiaries on special grounds. FIPB approved Hyundai because its proposal included 78% localization and committed to 98% localization by 2000 (Sen et al. 1997).

[25] For discussions on implications of the emergence of global supplier networks for supplier relations in the Indian and Brazilian automotive industries, see Humphrey et al. 1998.

[26] The Economic Times, Bombay, July 19, 1995.

improving their quality standards, as it exposes them to the unprecedented global competition emerging in the domestic market.

The largest number of foreign joint ventures came from Japan. This is due not only to Maruti's dominance in the industry (in joint venture with Suzuki), but also to the large presence of Japanese joint ventures in two-wheeler segments, such as TVS Suzuki (a joint venture with Suzuki), Hero Honda Motors Ltd. and Kinetic Honda Motors Ltd. (both in joint ventures with Honda). Thus, many Japanese joint-venture partners are suppliers of Suzuki and Honda in Japan. In fact, a dozen Maruti suppliers set up joint ventures with Suzuki's suppliers, through a matchmaking initiative by Maruti-Suzuki. Several firms that are Maruti's key suppliers with a joint venture with Suzuki's suppliers are located within the same complex as Maruti's main plant in Gurgaon.

The concern among first-tier suppliers, including relatively small firms, that they must upgrade their capabilities so they can expand their business with these new joint-venture car manufacturers, has led many of them to form partnerships with foreign firms. Some of the suppliers I interviewed have more than four foreign partners. One large firm producing lighting equipment, air filter systems, and rear mirrors (with 1,845 employees) has five joint ventures (2 Japanese, 1 Spanish, 1 U.S., and 1 Korean) for different products, while another firm producing similar products (with 183 employees) has four foreign collaborators. The growth in the number of FDI-related car manufacturers has led local suppliers to develop partnerships with their respective suppliers in their home countries, to meet different product specifications and standards.

Many firms have opted for foreign partnerships not only because of strategic decisions to expand their businesses but also because they fear that without them, they will fail. In fact, one small-scale firm owner said, "I honestly don't know if this is the right thing to do. But, since everyone else is doing it, I just don't want to be left out. In the long run, there will be a tremendous restructuring of the industry and only the fortunate few among local component producers will survive. The majority of us may be all wiped

out by foreign firms unless we improve our product quality." This fear seems common among small-scale component manufacturers, and has led them to build alliances with foreign firms to invest in plant capacity and develop technological capabilities.

Against this trend toward increased FDI involvement, however, in a few cases, firms actually terminated such alliances with foreign firms. For example, a large-scale maker of clutch components had a joint venture with a Japanese component firm, which is a key supplier to Toyota, between 1991 and 1993. But this firm decided to terminate this partnership because the Japanese partner was interested in transferring technology concerned with Japanese components, i.e., components supplied to Maruti, and was not willing to give any advice on other components. Differences between local suppliers and their global component manufacturers in their expectations of partnerships, in their management styles, and in their understanding as to the terms of technology transfer often give rise to some tensions between them.

2.3.3 Trade Performance: Gradual But Modest Entry into the Global Markets

As discussed above, until the mid-1980s, trade policies under the inward-looking trade regime discouraged exports of vehicles and components, and controlled imports of capital goods, raw materials, and components, as well as vehicles.

In the first half of the 1990s, however, as Table 2.4 indicates, exports of both vehicles and components increased considerably. But, for passenger cars and jeeps, the growth has been slower and is still very small in volume, with only 32,321 cars and jeeps, or 9% of total cars produced, being exported in 1995-96. In fact, the growth in exports of components has been much faster in the 1990s at an average of 13.4% per year, compared to that for cars and jeeps at an average of 5.9% per year.

Imports of cars and jeeps have also grown slowly, reflecting the high import duties that remain even after the 1991 liberalization. In fact, export growth for passenger cars and

jeeps has been much slower than their production growth during the same period (see Table 2.4). Clearly, the Indian auto industry has grown primarily because of the expanded domestic market rather than the export growth.[27]

Table 2.4: Trends in Export and Import Performance of the Automobile Industry

	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	Average Annual Change(%)
Vehicles &Engines **(Numbers of units)**							
Exports							
Total	n/a	63,964	73,886	115,807	179,346	193,944	32.0%
Cars & Jeeps	n/a	25,660	16,029	18,835	22,933	32,321	5.9%
Imports							
Total	478	520	502	816	1,598	n/a	35.2%
Cars & Jeeps (new assembly)	296	124	157	301	373	n/a	6.0%
Auto Components **(US $millions)**							
Exports							
Total	124.5	170.1	189.1	197.5	209.9	226.0	13.4%
Imports							
Total	279.2	223.0	265.9	257.1	323.2	n/a	3.7%

Notes: Exchange rates are derived from IMF 1997. One dollar was Rs. 18.81 for 1990-91; Rs. 27.06 for 1992-93; Rs. 30.71 for 1993-94; Rs. 31.64 for 1994-95; and Rs. 33.18 for 1995-96.
Source: Constructed and calculated from data in ACMA 1996.

With regard to the export of vehicles, Telco has been a main exporter in the industry even during the inward-looking trade regime. Telco started exporting its trucks to more than 80 developing countries in 1961-62 (Lall 1987).[28] Telco exported over 15% of its outputs abroad even in the early 1980s (Lall 1985a). While exports were much less profitable than domestic sales,[29] the firm promoted exports as a deliberate strategy to prove its capabilities in international markets (Lall 1987: 176). Telco exported 16,581 vehicles, or 7% of its outputs, in 1995-96, including 3,212 passenger cars, which accounts for 13%

[27] New joint ventures with European, U.S., Japanese and Korean auto makers began only in 1995; therefore, their performance is not reflected here.
[28] A total of 28,214 trucks had been exported in the 20 years between 1961-62 and 1981-82 (Lall 1987).
[29] But, because of export subsidies, exports were not made at a loss (Lall 1987).

of all passenger car exports from India.[30] In addition, Telco was the single largest exporter of engineerig goods from India as early as 1978 and a multinational firm in its own right (Lall 1985a: 271).

Maruti has also been a major source of recent export growth, exporting 26,103 vehicles in 1995-96 (25% increase from the previous year), and thus accounting for nearly 81% of all passenger car exports from India.[31] In 1986, Maruti started exporting 10% of its annually produced cars, as a response to the public criticism that Maruti was not contributing much to local technological development. Until recently, however, Maruti (and its collaborator Suzuki) was rather reluctant to export its products, fearing that they would not meet the quality standard required to compete in the global markets. Moreover, vehicles exported abroad, many to European markets, were not generating much profit--they used a higher content of imported components than those produced for the domestic market. As the price of imported components were determined in US dollars, an appreciation of yen against dollars affected the price significantly, thus making profit margins of exported cars negative.[32] But since 1986, the government has been pushing Maruti to export, to promote innovation; in its near-monopoly position, the firm had little incentive to innovate without exports. This export push has forced Maruti to meet the feedback from overseas dealers and customers, making the firm to produce more cost-efficient and better-quality cars.

While the component industry's export performance in recent years is quite impressive, many exporters tend to cater to the lower-grade "after market" for repair parts abroad rather than produce high-technology high-quality OEM (original equipment manufacturers) parts for foreign car makers. This is because the technological capabilities of these component manufacturers are generally limited (with few firms having their own R&D facilities) given their low quality, they cannot meet the product standards expected in

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[30] Telco's *Annual Report* 1996-97.
[31] Maruti's *Annual Report* 1996-97.

the international market. For example, Denso India Ltd., a joint venture between Maruti and Denso, one of the largest global component suppliers and a key Toyota group firm, has not ventured into exports due to its products' low quality below the standards acceptable to Denso in Japan, even though the latter has actively promoted a cross sourcing operation with other overseas affiliates. However, supplies to OEMs abroad have also gradually increased in recent years. For example, Sundaram Fastners supplies 85% of GM's need for radiator caps in the U.S.[33] Moreover, the entry of several new FDI car manufacturers has recently created the problem of over capacity within the domestic market, due to a smaller demand increase in the domestic market than predicted by industrial analysts in the early 1990s; this forces the component industry to turn increasingly to export markets. Such interests in exports have provided component manufacturers with an acute sense of their need to improve their product quality to gain international acceptance and recognition.

As seen above, economic reforms since the mid-1980s have led the automobile industry to grow rapidly, to increase its linkages with the global automobile industry through increased FDI, and to be more open to trade. Clearly, Maruti and Telco, the industry's two leading firms, have played a key role in these transformations in terms of both promoting growth and improving export performance, while acquiring competitiveness in the face of the increasing integration of the Indian automobile industry with the global auto industry.

2.4 Changes in the Structure of the Automobile Industry

The rapid transformation of the Indian automobile industry, with a number of new entrants with joint ventures with foreign car manufacturers, as discussed above, has drastically changed the structure of the automotive component industry. The Indian automobile industry consists of about two dozen assemblers of different vehicle types and

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[32] The price of CKD components was set in US dollars; even though the dollar value remained the same, the yen value became 31% less, due to the appreciation of yen.

the automotive component industry. The latter consists of 350 large- and medium-scale firms in the organized sector, and approximately 6,000 small-scale firms in the unorganized sector, which accounts for 30% of total production (ACMA 1995b). This coincides with the distribution of manufacturing enterprises in India, reflecting the government's policy of promoting and protecting small-scale industry (SSI) firms, as discussed in Chapter 1. Of these 6,350 component producers, about 400 firms are members of the Automotive Component Manufacturers Association of India (ACMA), a single association representing component makers.

Table 2.5: Growth of Automotive Components/ Parts Production (by Type of Components) (value in US$ millions)

	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
Engine Parts	453.3	445.7	468.9	495.6	605.1	720.4
Electrical parts	105.1	94.0	94.3	102.7	133.0	163.6
Drive transmissions and steering parts	288.9	288.1	271.8	278.0	350.0	459.4
Suspension braking parts	161.2	157.0	195.8	205.9	310.7	408.2
Equipment	52.2	47.5	49.4	74.2	89.1	132.5
Other	85.5	75.4	102.8	127.6	147.6	216.0
Total organized sector	1,146.1	1,107.7	1,183.0	1,283.9	1,635.6	2,100.0
SSI sector (estimated)	342.8	332.3	354.9	410.9	490.7	630.0
Total auto component Industry (% increase)	1,490.0	1,440.0 (-3.4%)	1,537.9 (6.8%)	1,694.8 (10.2%)	2,126.2 (25.5%)	2,730.0 (28.4%)

Source: ACMA 1996

Despite this large number of enterprises in the automotive industry, however, the Indian automotive component industry is still fairly small by international standards

[33] The Economic Times New Delhi, May 8, 1996.

(ACMA 1995a, Kumar et al. 1995). Its total annual sales, of US $2.6 billion, place the industry on the same scale as a single fairly large first-tier supplier like Sumitomo Electric (Kumar et al. 1995). In fact, only eight component manufacturers had sales turnover exceeding US $100 million in 1996 (see Appendix 2.3). This implies that the Indian automotive firms face a very serious problem in attaining economies of scale.

However, the component industry also grew by 13% annually in the 1990s, much higher than the growth rate of 7.4% for the automobile industry (see Table 2.2); production almost doubled in the first five years of the decade (see Table 2.5).[34] This is partly because, despite the 1991 liberalization policy, imported components still bear disproportionately high customs and excise duties,[35] forcing vehicle assemblers to develop a domestic supplier base.[36] Moreover, as seen earlier, exports of components have grown rapidly (see Table 2.4), and the replacement market has been growing fast, as I discuss later.

While the component manufacturers in the organized sector account for 77% of the total automotive component production in value terms in 1995-96, the production by the SSI sector is estimated to account for 23% of component production. As discussed earlier, the government's reservation policy has helped protect small-scale producers while they develop, but has also discouraged domestic firms from competing in the global market. In particular, it has prevented the industry from attaining economies of scale in production, resulting in considerable inefficiencies. Moreover, a series of policies provided SSI firms with preferential treatments with regard to land acquisition, water, electricity and telephone connection, and concessionary excise duties. These policies have encouraged entrepreneurs to enter the business as small-scale firms; they have also led some large firms

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[34] This is in dollar terms. In rupee terms, the component industry's growth is even more impressive: 26.4% annually in the 1990s, with production tripling between 1990 and 1995 (calculated from ACMA 1996).

[35] Eurotech International 1995.

[36] Customs duty of up to 50% is levied on imported components (while import duties on components were as high as 131% until 1991).

to split into several small-scale firms in order to qualify as SSI firms, despite a loss in efficiency (Lall 1987). There are no official data on the profile or performance of SSI firms in the unorganized sector of the automobile industry. However, given the rapid growth of the SSI sector over the last few years (Government of India 1994), the distribution between the organized and unorganized sectors may have actually shifted in favor of the latter more than the estimates in Table 2.5 indicate.

2.4.1 Creating A Local Supplier Base

Due largely to the policy measures described above, which encouraged the import substitution industrialization, and "self-reliance" since the 1950s, existing auto manufacturers have traditionally achieved high levels of local contents. Local producers, such as HML, PAL, and Telco currently rely on almost 100% local components, while Maruti has also achieved 96% local contents for its 800cc small car and mini van (ACMA 1995a).[37]

Several factors explain Maruti's unusually high level of local contents. First, as discussed earlier, the government's phased manufacturing program (PMP) mandated foreign firms to promote localization; Suzuki's MOU (Memorandum of Understanding) with its joint-venture partner, the Indian government, included its commitment to achieve 50% local contents within the first three years, and 70% by the fifth year. Second, the appreciation of the yen in the early 1980s, along with the high customs duty imposed on CKD (110% until 1991), made imported components from Japan extremely expensive,[38] leading Maruti to fear that if it used CKD (complete knock-down) imports, it could not compete with other domestic producers.[39] Thus, not only local content requirements but

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[37] This figure applies to HML's passenger cars (Ambassador, Contessa); PAL's passenger cars (Padmini,NE118); and Telco's multi-utility vehicles (Tata Sierra, Estate, and Sumo). Maruti's local contents are lower for other models (80% for Gypsy; 85% for Maruti 1000; and 75% for middle-sized Esteem) (ACMA 1995a).

[38] The price of CKD was determined in US dollars, and thus the exchange rate between the US dollar and the Japanese yen significantly affected the cost of production (talk by Mr. R.C. Bhargava, former CEO of Maruti, at Harvard University, February 1998).

[39] Mr. R.C. Bhargava, talk at Harvard, 1998.

also cost considerations led Maruti to develop local suppliers. Third, initially, Maruti focused on the domestic market and not on exports, allowing it to compromise on the quality of the components produced by local suppliers; this would not have been acceptable if it were exporting its products.

Fourth, Suzuki, as a small assembler in Japan (ranked only the sixth among the nine Japanese car manufacturers), let alone on a global scene, has a relatively weak supplier base at home, compared to other larger assemblers such as Toyota and Nissan. It has a "*kyoryokukai*" (supplier associations formed by a car manufacturer for its "*keiretsu*" supplier firms) only for its small-scale suppliers located near its plants.[40] When Maruti started its operation in India, few dedicated suppliers of Suzuki could afford to follow Suzuki to India to supply parts for Maruti. Finally, as discussed earlier, many local small-scale firms that could serve as ancillaries already existed, although their technological level was not compatible. Maruti stands in sharp contrast to the cases of the Japanese affiliates in Southeast Asia, such as Thailand, Malaysia, and Indonesia, where they had to develop suppliers from scratch, as no local supporting industries had existed prior to their entry.

Faced with the dilemma between the poor quality of locally-produced components on the one hand and the need to increase local contents on the other, what strategies did Maruti take? The firm arranged a joint venture between local suppliers and Suzuki's suppliers in Japan. Maruti itself holds equity in about a dozen such joint-venture suppliers of key components, many located in Maruti's premises, to gain greater control over the management of their operation and performance standards. Moreover, it has made enormous efforts to develop the capabilities of its suppliers (see Chapter 4). The development of suppliers has been particularly important for Maruti, given its high reliance on outsourcing which accounts for 80% of the value of a car, even higher than the level of outsourcing in Japan (70%).[41] Further, while Maruti supplies key components from a

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[40] See Fujimoto and Takeishi 1994.

[41] Fujimoto and Takeishi 1994 for the figure on Japan.

small number of large-scale suppliers in the southern state of Tamil Nadu, its growth has also encouraged many small-scale entrepreneurs to start business in close locations; about one third of 404 Maruti suppliers were established after Maruti started its operation in 1983.[42] These new small firms became more easily attuned to Maruti's quality standards and style of operations than old ones.

New entrants do not necessarily start with a high degree of localization. For instance, Mercedes-Benz India relies on about 95% CKD imports (while it aims at increasing local contents up to 50% in the first five years), while Daewoo relies on 83% to 85% imported components.[43] But, as Table 2.6 shows, until 1993, they were forced to propose a gradual increase in their local contents under the PMP to accelerate their procurement of local components. Even though the PMP was lifted in 1993, new entrants were actually forced to continue increasing the level of localization, due to two factors: the high customs duty (currently 50% for CKDs and components, in addition to a countervailing duty of 60%) and the licensing required for CKD imports (Mukherjee and Sastry 1996).[44] Moreover, Maruti, their main competitor, has achieved more than 90% localization and already written off its initial capital investment. Therefore, new joint ventures with foreign manufacturers, many starting as "greenfield" projects, could never compete with Maruti's prices if they had to rely on expensive imported components. This means that they either have to search out desirable suppliers from the existing pools to create tiered supply chains, or set up their own subsidiaries, or bring their own suppliers from their home countries.

New entrants generally prefer to work with suppliers that have joint ventures with their own suppliers in the home country. Companies like GMI, Ford, Mercedes-Benz, and Toyota are all encouraging their group companies or their established suppliers to create

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[42] Data are from Maruti's Supplier Data Base.
[43] My interview with a market research officer at Japan External Trade Organization (JETRO).
[44] A study by Humphrey et al. (1998) reports that the government increased tariffs on imported components in 1997. But it reduces tariffs on component sets for firms which achieved 50% local contents.

manufacturing facilities in India (ACMA 1995a). In fact, some newcomers, such as Daewoo, GMI, and most recently Toyota, are investing in auto component supplier bases near their plants. The increasing presence of these global suppliers in India has posed serious challenges to local vehicle assemblers to develop and consolidate their supplier bases which have largely relied on a large number of small-scale local suppliers.

Table 2.6: Local Contents for Car Models Agreed by New Entrants under PMP (%)

Models	1st	2nd	3rd	4th	5th
DCM Daewoo (Cielo)	30	40	60	70	80
PAL-Peugeot Ltd.(Peugeot 309 GL)	15	25	65	70	80
GM (Opel Astra)	40	50	60	70	70
Mercedes-Benz (Mercedes E220)	10	30	50	60	70
PAL (UNO)	30	40	50	70	80

Source: ACMA 1995.

The increased competition with new suppliers arriving in India with new vehicle manufacturers has forced local component manufacturers to improve the quality of their products. However, despite its recent growth, the automotive component industry is still limited in terms of technology, quality, and productivity. To strengthen their own supplier bases, local large business houses such as the Tata group (of which Telco is a member firm) and the Birla group (of which HML is a member firm), as well as local vehicle producers such as Mahindra & Mahindra, have all set up joint ventures with global suppliers to produce components (Kumar et al. 1995, ACMA 1995a). For example, in 1997, the Tata group set up a new firm, Tata Auto Component Systems (TACO), to manage 20 new joint-venture suppliers in a "greenfield" supplier park in the state of Tamil Nadu. Similarly, in 1997, Maruti also set up a new supplier park close to its main plant in Gurgaon as a joint venture between Maruti and the Haryana State Industrial Development Corporation (HSIDC) as part of the industrial model township developed by HSIDC, to house Maruti's 65 first-tier suppliers which produce essential and critical components for Maruti cars, and to ensure unhindered supply of these components. The cost of the

development of this industrial park, at nearly Rs.100 crore (or approx. US $30 million), was shared between Maruti and HSIDC. A tripartite plant-level committee comprising representatives of Maruti, the government, and HSIDC oversaw the process of planning and implementation of this project. Clearly, Maruti's close collaboration with the government has facilitated the development of Maruti's local supplier base.

2.4.2 Changing Supplier Relations

As discussed above, small-scale firms account for a large proportion of Indian component suppliers. During the inward-looking trade and industrial regime, a small production volume and absence of competition provided auto assemblers with few incentives to strengthen the capabilities of their suppliers. Thus, Indian supplier relations have been generally "arms' length" in nature, as in the U.S. until the 1980s (Florida and Kenney 1991), where assemblers form short-term contractual relationships with a large number of suppliers largely driven by prices. However, Maruti took a dramatically different approach to its suppliers, with a more long-term close relationship with them based on reciprocal interactions, with a greater emphasis on quality and on-time delivery, adopting some elements of the Japanese model of supplier relations (see Chapter 4 for more detailed discussions).

The recent entry of several new joint-venture car manufacturers, which has increased the number of product varieties, has led local component manufacturers to diversify their customers. This has also induced these suppliers to adopt more flexible production techniques to ease the changeover of tools and lines and allow low-cost tooling (ACMA 1995a). In fact, unlike the widely-believed Japanese model of "*keiretsu*,"[45] where

[45] Contrary to the popular belief that the Japanese auto component suppliers have exclusive contractual relationships with a single car manufacturer in the "*keiretsu*" system, many Japanese suppliers do have multiple customers. While Toyota's suppliers usually do not have contractual relations with Nissan, and *vice versa*, it is common for these suppliers to cater to other Japanese car manufacturers. In addition, there are many independent suppliers who do not belong to any "*keiretsu*." Fujimoto and Takeishi (1994), based on their study on the Japanese supplier relations, show the relationship between the type of components and the degree of autonomy (as indicated by the number of customers). According to their study, over 60

a single customer forms a group of loyal suppliers based on long-term stable supplier relations, car manufacturers in India generally encourage their suppliers to take on multiple customers due to a relatively small volume of production, thus allowing them to seek economies of scale. Car assemblers also need multiple sources, because factors such as poor infrastructure (roads, electricity, and telecommunication) make it costly to rely on a single source of supply for each component. Despite such moves, a considerable number of suppliers remain loyal to one customer. For instance, of Maruti's 404 suppliers, 58 firms depend on Maruti for more than 90% (in many cases 100%) of their sales.[46]

Given India's vast country size, as in the U.S. (Florida and Kenney 1991), the location of assembly plants greatly influences the location of suppliers at different levels in the supply chain. In fact, the geographical dispersion of auto manufacturers to different parts of the country has historically led to the evolution of industrial districts in various regions such as Pune, Faridabad, and Madras, where many small-scale component suppliers are concentrated, actually supplying only customers in the region.[47] Thus, while every car assembler has suppliers from all over the country, each has a supplier base in its respective region. For example, 60% of the 5,800 all manufacturing firms in industrial districts in Pune in the state of Maharashtra, constitute a supplier base for three local auto manufacturers (Telco, Bajaj Tempo and Bajaj Auto) located in the city, enjoying the largest geographical concentration of auto suppliers in the country (see Chapter 4).[48] Similarly, the majority of Maruti's first-tier suppliers are concentrated in the north, of which 248 are in Gurgaon and its neighboring cities in Haryana. More than 100 of these firms are small-

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Japanese large-scale first-tier suppliers belong to more than five "*kyoryokukai*" (supplier associations formed by a car manufacturer for its "*keiretsu*"). Among the nine Japanese auto manufacturers, 7 have such "*kyoryokukai*"; Honda has no "*kyoryokukai.*"

[46] Data are from Maruti's supplier database. Thus, there might be false reporting on the part of Maruti suppliers to indicate their loyalty to Maruti. The actual dependency rate might thus be lower.

[47] For extensive discussions on industrial districts and the role of industrial districts in economic development, see, for example, Pyke, Becattini, and Sengenberger 1990, Pyke 1994, Schmitz 1995.

[48] Interviews with a director, the Maratha Chambers of Commerce, Pune, in April 1997.

scale. Most second-tier suppliers are located in the same city as their customers. And the smaller-scale first-tier suppliers often have their second-tier suppliers in the same locality.

The recent entry of new joint-venture car manufacturers in India, with increased competition within the Indian market, has further intensified this geographical concentration of supplier bases, as discussed earlier. This is largely because the increased awareness about the importance of on-time delivery through the adoption of some elements of just-in-time (JIT) inventory systems, has motivated first-tier suppliers to establish new plants close to each customer. For example, several of Maruti's first-tier suppliers located in Haryana are establishing new plants in Maharashtra to cater to Telco, and *vice versa.* With the introduction of the JIT concept, which aim to reduce assemblers' inventory costs, some first-tier suppliers with more than two customers are setting up new plants in proximity to their major customers in three or four different regions to cater to each of them. While the presence of these suppliers in proximity helps reduce inventory costs on the part of assemblers, it also places some constraints on the suppliers, as they have to manage and finance simultaneous expansions in widely dispersed locations (Humphrey et al. 1998). However, even Maruti and its suppliers, let alone local manufacturers, have not fully adopted the JIT inventory system. In fact, Japanese managers think that the Indian automobile industry, including Maruti, is still far from operating under the JIT principle.[49]

Some even have different FDI partners in different plants catering to different car makers. For example, Motherson Sumi, a wiring harness supplier, started in the early 1980s as a joint venture firm with one of Suzuki's main suppliers in Japan; the matchmaker was a Japanese general trading firm, whose major client is Suzuki. In the early 1990s, Motherson set up a new plant in Pune to cater exclusively to Telco's Pune plant. With the entry of Mercedes-Benz as a joint venture with Telco, Motherson started a new joint venture with Mercedes-Benz's German supplier. Interestingly, there is little technical

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[49] My interviews with senior managers of Maruti and Denso India. Also, the CEO of Toyota India Corp., which starts production in 1999, commented that "current Indian condition is still one step behind JIT."

collaboration or information exchange between Motherson's Japanese FDI-involved plant and its German FDI-involved plant, as the specifications for products differ according to the customer.[50]

Only a few large-scale suppliers have their own design capabilities; most rely on drawings provided by their customers. Moreover, many suppliers I interviewed had no long-term production plans. They think that their production volume, as well as the growth of their firms, depends completely on their customers. Thus, many suppliers enjoy only limited autonomy (see Chapter 4).

2.4.3 Formation of Tiers

The growth of the industry has also led the industrial structure to divide into tiers: the car assembler deals with only the first tier of suppliers which in turn obtain supplies from lower tiers of suppliers. This may have increased the number of firms involved in the supply chains with a greater number of suppliers at the lower ends of chains.

Car assemblers like Maruti and Telco have started increasingly consolidating and streamlining their first-tier suppliers to make the production processes leaner. For example, in 1997 Maruti began consolidating its supplier base from 404 to 300 first-tier suppliers over two years.[51] It started ranking these suppliers into three tiers, and sourcing the maximum number of components from the tier 1 suppliers that are relatively large-scale and have high capabilities. Likewise, the Telco Pune plant planned to consolidate its supplier base from 1,200 to 500 in three years beginning in 1997.[52] The large-scale first-tier suppliers are increasingly required to semi-assemble modules such as steering systems and rear axle systems that are put directly on the final assembly line at the car assemblers.

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[50] My interviews with a Japanese manager in Noida and Indian managers in Pune, both working for this firm.

[51] My interviews with a manager, Maruti's Vendor Development Department, in August 1996.

[52] My interviews with a manager, Telco's Purchase Department, April 1997.

Such consolidation moves among car manufacturers have also drastically changed the nature of supplier relations. Car manufacturers have imposed higher performance standards on their suppliers with tighter control over the operations of suppliers; on the other hand, suppliers are pressured to either improve their performance, or lose business. This has resulted in a dramatic shift in the power relations in the supply chain, giving the assemblers much more leverage. Until recently, few first-tier suppliers could produce high quality products, so good-quality first-tier suppliers had enjoyed some leverage vis-à-vis customers, who had to rely on them to promote localization. These changing dynamics between car manufacturers and suppliers have significantly affected the way in which skills development occurs in suppliers (see Chapter 4).

The picture of a clear hierarchical structure in the supply chains seems to emerge, with the FDI-related car assemblers at the top of the hierarchy (the exception is Telco). However, this pyramidal structure is shallower than those in Japan and the U.S., partly because the entire Indian automobile industry produces such a small volume. My own interviews with 50 first-tier suppliers revealed that many have only second-tier suppliers and none in lower tiers. Even these second-tier suppliers are often tiny-scale subcontractors doing some "job work" (i.e., processing material provided by their clients, the first-tier suppliers). Of course, the situation is different for large-scale first-tier suppliers like Denso India, whose suppliers are comparable in size to the smaller-scale first-tier suppliers of vehicle assemblers. In these cases, third-tier suppliers do exist, performing "job work," as do many second-tier suppliers. For example, some of Denso India's suppliers (i.e., in tier 2) are also first-tier suppliers for Maruti.

Virtually no data are available on the lower end of supply chains, where small-scale subcontractors, largely in the informal sector, take on hazardous tasks like heat treatment, painting, and coating. The literature predicts that globalization, by bringing about more flexible production processes, increases the practices of outsourcing and subcontracting work to such lower-wage firms. I found, however, that at least one third of sample firms

did not increase such practices. When I asked 50 first-tier suppliers of Maruti and Telco whether they had taken on more subcontractors over the last five years, 17 said they hesitated to increase subcontracting, citing the lack of reliability and the low level of quality as their main reasons (see Chapter 4).

2.4.4 Division between OEM Suppliers and Replacement Market Suppliers

Another change to note in the structure of the automotive component industry is the increasing separation between OEM parts suppliers and the low-quality, often spurious, parts suppliers. Indian owners often try to keep their cars going for over 25 years (Kumar et al. 1995), as compared to 12 years in the U.S., and licensed repair shops have only been introduced recently; cars have commonly been repaired on the roadside using any parts available. This tradition resulted in a huge replacement market (or "after market"), for parts used to repair or maintain vehicles after their original sale. Many such low-quality parts producers, mostly in the informal sector, are located in Punjab and Old Delhi. More than half of the total domestic demand for auto components originates from this replacement market, nearly 35 to 40% from the OE demand and the rest from exports.[53] These spurious component manufacturers have a great cost advantage; many evade various kinds of taxes,[54] and Indian customers have generally preferred low price to high quality. The replacement market is so large partly because few car owners appreciate the value of high-quality components; until recently, only half of Indian owners actually drove their own cars. This may change as the proportion of owner-driven cars increases; owners who drive their own cars may prefer to pay a little more for higher quality spare parts rather than continue having breakdowns and buying cheap low-quality parts.

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[53] The Economic Times, Bombay, July 19, 1995.

[54] According to a study conducted by the National Council of Applied Economic Research (NCAER), these spurious auto parts manufacturers raised an illegal turnover of about Rs. 2,700 crore in 1991-92 alone; the loss of duty in the form of sales tax, excise duty, corporate tax, and octroi during 1991, totaling nearly Rs. 1,200 crore. (The Economic Times, Bombay, July 19, 1995).

However, as it introduced more technologically advanced vehicles, Maruti also developed a nationwide service network and recommended that cars be serviced only at their approved service shops. More recent foreign producers followed this policy.[55] As a result, many component manufacturers which had been producing inferior parts for the "after market" have gradually started concentrating on producing components directly for their assembler customers to become "OEM (original equipment manufacturer)" parts suppliers, though they might have earned higher profits on products sold in the "after market." There are two main reasons for this shift. First, because the quality of OEM parts and spurious parts differs so much, manufacturers find it difficult to produce both types of parts in the same production processes. Second, concentrating on OEM parts will help them maintain their reputations as OEM parts producers, letting them gain more confidence from future customers, including foreign customers. This trend has led to a clearer division between OEM component manufacturers and those who cater mainly to the "after market." This split could lead to further segmentation of employment and skills.

Indeed, the structural change discussed above suggests a serious problem facing the Indian automobile industry: the low quality output of sub-suppliers to the first-tier suppliers (Kumar et al. 1995). With all these changes, even small-scale first-tier suppliers are also increasingly upgrading their facilities and training their workers to improve their skills to meet customer requirements (ACMA 1995a). However, second-tier suppliers are left out of such moves, creating a wider gap in production processes between these tiers. Consultants report that average incoming defect rates for Indian component suppliers are still significantly high at 31,500 ppm, compared with 2,065 ppm for average Japanese firms and 4,500 ppm for average European firms.[56] A similar concern was shared by a Japanese manager of Denso: "Given a large gap in the quality of products between Indian

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[55] For example, Mahindra Ford India Ltd., a 50:50 joint venture between Mahindra & Mahindra Ltd and Ford Motor Co. has developed a nationwide network of dealers in several large cities in India (The Economic Times New Delhi, August 20, 1996.

[56] A study by McKinsey (Kumar et al. 1995).

sub-suppliers and Denso's sub-suppliers in Japan, with the difference in defect rate being 100:1, the fact remains that we cannot use Indian sub-suppliers' products even if the ratio changes to 95:1."[57] The low quality from sub-suppliers lowers the operating efficiency at the first-tier suppliers, who have to waste considerable time in sorting, testing, and reworking parts. Thus, many large-scale FDI-related suppliers, like Denso India, are now increasingly promoting vertical integration within their own firms.

2.5 Conclusion

This chapter has shown that the ongoing rapid process of globalization, particularly since the introduction in 1991 of liberalization policy, has led to dramatic transformations of the Indian automobile industry. Since the beginning of the 1990s, the automobile industry has experienced rapid growth in production and sales, a huge inflow of FDI accompanied by intensified competition within the increasingly globalized domestic market, and gradual but modest growth in exports. However, the growth spurt actually started *before* the introduction of liberalization policy, and the main driving force of this rapid growth was Maruti, a joint venture between the Indian government and Suzuki, which entered the Indian passenger car market in the early 1980s. Maruti achieved remarkable growth not only in sales of small passenger cars but also in productivity. Even after the liberalization policy was introduced, which resulted in a huge inflow of FDI, Maruti remained dominant; its market share in the passenger car market actually increased after the entry of many other FDI affiliates into the market in the 1990s.

Telco, a leading local commercial vehicle producer, has also experienced considerable growth in the commercial vehicle sector. After the licensing policy was abolished in 1992, Telco entered the passenger car market, then almost monopolized by Maruti, and strengthened its market position, without significant FDI involvement, by starting to produce the first locally-made modern small car in India in 1997. Telco's

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[57] Interviews with a Denso manager.

successful performance, in spite of the huge inflow of FDI into the domestic market in the 1990s, is unique among local car producers not only in India but even in developing countries as a whole, as many recent studies report a growing preponderance of FDI-affliated firms in the automobile industries across many developing countries. Clearly, Maruti and Telco have played a key role in transforming the industry, in terms of both promoting growth and improving export performance, while acquiring competitiveness, even before the FDI flood started in the 1990s.

This process of rapid transformations has also led to a dynamic restructuring of the industry, as the component industry has grown even faster than the vehicle industry. Component suppliers have increasingly formed alliances with FDI component manufacturers and set up various plants for different customers in different locations. Efforts by car manufacturers such as Maruti and Telco to consolidate their supplier bases have gradually led to the emergence of a pyramidal structure within the automobile industry. However, given that the industry's production volume as a whole is still small by global standards, this pyramidal structure is shallower than those in countries such as Japan and the U.S.

Not only has Maruti led the growth of the industry but also contributed to this structural change, and in particular, to the development of backward linkages. Maruti's rapid growth resulted in the emergence of many local small-scale suppliers in proximity since the mid-1980s as well as the soaring growth of component industries in the 1990s. It also drastically changed the dominant model of supplier relations in the country, from short-term "arm's length" relationships to more long-term, close ones, involving reciprocal interactions with suppliers, similar to the Japanese model, with a great focus on improving the quality of components as well as of the efficiency in suppliers' operations (see Chapter 4 for more detailed discussions).

However, due to the still small production volume for the Indian automobile industy as a whole, Indian component manufacturers have not formed exclusive

relationships with their customers, unlike the Japanese "*keiretsu*" model; suppliers are instead encouraged to diversify their customers to attain economies of scale. While the intensified competition within the domestic market due to the entry of many new players has led the Indian automobile industry to introduce some elements of the "flexible" or "lean" production systems, it is still far from operating in the JIT principle. While the export of components has increased considerably, so far Indian component manufacturers have primarily catered to the replacement market abroad. Low quality of products remains a serious constraint for local producers that aim to enter the OEM global markets.

What factors have contributed to Maruti's successful performance? This study finds that the government has played an important role in developing Maruti as a firm that could lead the automobile industry, through not only its direct involvement in Maruti's operation and management by holding its 50% equity, but also through various policy measures carefully designed to protect and promote the firm: before introducing the drastic liberalization policy, the government had provided Maruti with subtle preferential treatments in duties, taxes, and foreign exchange clearance. At the same time, the government pressured Maruti to promote exports and achieve high levels of local contents, over 90%, an exceptionally high figure for FDI firms operating in developing countries. Given the importance of the automobile industry in industrialization in developing countries, Maruti has literally served as a driving force for India's industrial development.

In addition to the government's requirement of high local contents, several other factors also contributed to Maruti's unusually high level of local contents. These include the firm's cost considerations due to the appreciation of the yen in the early 1980s; Maruti's focus on the domestic market at the initial stage, allowing it to compromise on the quality of locally-produced components; few dedicated Suzuki's suppliers who could afford to come to India in the early 1980s; and the existence of a local engineering base among many small-scale enterprises, which had been promoted and protected by the government since the 1970s, prior to Maruti's entry. While the government's imposition of high local

contents on Maruti at the initial stage was primarily motivated by its balance-of-payment concerns rather than the development of backward linkages *per se*, the government's promotion and support of small-scale industries has clearly facilitated Maruti's development of its local suppliers.

Unlike the experiences of other FDI-affiliated firms in developing countries, Maruti has turned a high level of localization, coupled with a high level of outsourcing at 70 to 80%, into a competitive advantage in terms of lowering production costs. At the same time, however, this strategy has made the development of local suppliers even more critical than ever. How did Maruti develop these local suppliers whose product quality was so low when it started? Chapter 4 addresses this question.

A question still remains as to how Maruti and Telco have developed their competitiveness and succeeded in achieving their remarkable performance. One answer lies in their massive investment in human resources, a topic we turn to in the next chapter.

Appendix 2.1 Foreign Collaborations in the Indian Automobile Industry

1) Number of Foreign Collaborations (as of March 1995)

Country of foreign collaborator	Vehicles	Auto Components
Japan	15	74
U.K.	8	34
Germany	8	48
USA	6	32
Italy	7	13
Spain	-	8
Australia	3	1
Austria	3	-
Korea	2	10
France	2	12
Taiwan	-	6
Canada	-	2
Switzerland	-	4
Others	1	13
Total	55	257

Source: ACMA 1997.
Note: These figures do not include foreign collaborations with Indian small-scale industry (SSI) firms.

2) Joint Ventures in Vehicle Industry

Indian Partner	Foreign Partner	Name of JV Company	Vehicle Type	Targeted Installed Capacity
The Govt. of India	Suzuki Motor Corp., Japan	Maruti Udyog Ltd., Gurgaon	cars	450,000
Telco	Mercedes Benz, Germany	Mercedes-Benz India Ltd.	cars	20,000
DCM Group	Daewoo Corp., Korea	DCM Daewoo Motors, Ltd.	cars	70,000
Premier Automobiles, Ltd.	Peugeot, France	PAL-Peugeot Ltd.	cars	35,000
Premier Automobiles, Ltd.	Fiat, Italy	Premier Automobiles Ltd.	cars	60,000
Birla Group of Companies	General Motors, USA	General Motors India, Ltd.	cars	25,000
Mahindra & Mahindra Ltd.	Ford Motors, USA	Mahindra Ford India Ltd.	cars	12,500
Mahindra & Mahindra Ltd.	Mitsubishi Motor Corp., Japan	Mahindra & Mahindra Ltd.	mini vans	6,000
Shriram Industrial Enterprises Ltd.	Honda Motors, Japan	Honda SIEL Cars India Pvt. Ltd.	cars	3,000
Hindustan Motors	Mitsubishi, Japan	Hindustan Motors Ltd.	cars	30,000
Ashok Leyland Ltd.	IVECO, Italy	Ashok Leyland Ltd.	trucks	35,000
Greaves Ltd.	SAME, Italy	Greaves, Ltd.	tractors	15,000
Hero Honda Ltd.	BMW, Germany	Hero Motors, Ltd.	motorcycles	500 to 700

3) Other Financial Collaboration with Foreign Firms (Vehicle manufacturers)

Name of Indian firm	Item of Manufacture	Name of Foreign Collaborator
Hero Honda Motors Ltd. New Delhi	Motorcycles upto 350cc	Honda Motors Co., Japan
Kinetic Honda Motors Ltd. Pune	Two wheelers	Honda Motors Co., Japan
LML Ltd., Kanpur	Two & Three Wheelers	Piaggio V.E., Italy
Mahindra & Mahindra Ltd., Mumbai	Jeeps	Willys Overland Corp. Ltd., USA
Eicher Motors Ltd., New Delhi	LCVs	Mitsubishi Motors Corp., Japan
Swaraj Mazda Ltd., Punjab	light & medium comm. vehicles	Mazda Motor Corp. Japan
TVS –Suzuki Ltd., Madras	Motorcycles 100cc	Suzuki Motor Corp., Japan

4) New Joint Ventures in the Auto Component Industry (1995)

Name of Indian Company	Name of Foreign Collaborators	Item of Manufacture
Amtek Auto Ltd., Gurgaon	Bendo Kogyo, Japan	Fly Wheel Ring Gears
Jay Bharat Maruti Ltd., Gurgaon	Allied Signal, USA	Seat Belts & air bags
Subros Ltd., New Delhi	Allied Signal, USA	Catalytic Converters
Mark Exhaust Systems Ltd., Gurgaon	Sankei Giken, In. Co., Japan	Exhaust Systems, Catalytic Converters
Atul Glass Industries Ltd., New Delhi	Saint Gobain Vitgrage, France	Laminated Safety Glass
Menon Pistons Ltd, Kholapur	Alcan Deutschland GmbH, Germany	Pistons & Piston Rings
Automotive Axles Ltd, Mysore	Rockwell International Corp., USA	Axle systems
Autolec Industries, Madras	Blue Chip Products Inc., USA	Water Pumps
Spicer India Ltd., New Delhi	Dana Corp., USA	Engine Bearings
Sona Steering Systems Ltd., New Delhi	Somic Ishikawa, Japan	Ball Joints & Suspension Joints
Sona Steering Systems Ltd., New Delhi	Fedoro, UK	Asbestos Free Brake Linings
Sona Steering Systems Ltd., New Delhi	Matsuda Industries, Japan	Cold Forging
Haryana Sheet Glass Ltd., Haryana	Pilkington Plc., UK	Laminated Sheet Glass
Tata Industries Ltd., Bombay	Johnson Controls Inc., USA Sommer Allibert, France Yazaki, Japan ZF, Germany NIFCO, Japan ITT, USA	Seating Systems Interiors and Plastics Wiring Harness Transmission of steering sys Plastic Fasteners Brake systems, electrical & wiper systems

Appendix 2.2 Automotive Products Reserved for the SSI Sector

1. Armature tester	31. Clutch pedals
	32. Door channels
2. Arms & blades of windshield wipers	33. Dust covers
3. Ashtrays – car fittings	34. Rearview mirrors - auto
4. Auto leaf springs excluding tapered leaf springs	35. Ring compressors
	36. Ring expanders
5. Automobile radiators	37. Screw extractors
6. Battery cables & fittings	38. Seat cushions
7. Battery cell tester	39. Seats for buses & trucks
8. Battery terminal lifters	40. Shackle pins (automobile use)
9. Brake & pedal pads - auto	41. Side lamp assembly - auto
10.Bulbrief horns	42. Spark plug tester & cleaners
11.Bus caps – auto	43. Spot lamp assembly - auto
12. Camber testing equipment	44. Steering wheels - auto
13. Condensers & resistance testers	45. Stud removers - extractors
	46. Sun shades - auto
14. Electric horns - auto	47. Tail lamp assembly - auto
15. Electrical fuse boxes - auto	48. Toe in gauges
	49. Truck body building: wooden structure
16. Electrical fuses - auto	50. Tube cutters
17. Exhaust mufflers other than double coil	51. Tire inflators, both hand & foot operated
18. Exhaust mufflers	52. Tire valve pullout tools
19. Feeler gauges	53. Valve lifters
20. Fenders spoons and hammers	54. Valve replacing & resetting tools
21. Flanging tools	55. Window channels - auto wiring harness
22. Flaring tools	56. Luggage carrier
23. Fuel lines – auto	
24 Fuel tank caps - auto	57. Ornament fittings
25. Gear flashers	58. Painting equipment.(e.g., spray guns)
26. Grease nipples	
27. Gun metal bushes	59. Pulleys grills – auto
28. Horn bushes	60. Rubber beadings
29. Horsepipe & radiator hoses	61. Rubber mat
30. Brake pedals	62. Sun visors
	63. Windscreen beadings
	64. Wiper blade components

Appendix 2.3: The Profile of the Indian Vehicle Manufacturers								
Name	Year of Commencing Production	# of plants	Main plant location	State	Sales US$ M. 1996-97	Export # of Units 1995-96	# of Employees	JV Partners
Ashok Layland Ltd.	1952	7	Chennai	Tamil Nadu	696.8	1854	13616	Fiat
Bajaj Tempo Ltd.	1958	1	Pune	Maharashtra	193.0	158	7000	
Daewoo Motors India Ltd.	1985*	1	Ghaziabad	U..P.	269.4	281	497	Daewoo
Eicher Motors Ltd.	1986	2	Dhar	M. P.	90.3	393	780	Mitsubishi/AVL
General Motors India Ltd.	1996	1	Halol	Gujarat	-	-	59	GM
Hindustan Motors Ltd.	1948	4	Calcutta	W. Bengal	243.2	-	12715	Mitsubishi
Honda Siel Cars India Ltd.	1997	1	New Delhi	Delhi	-	-	656	Honda
Hyundai Motor India Ltd.	1997	1	Chennai	Tamil Nadu	-	-	-	Hyundai
Mahindra Ford India Ltd.	1997	1	Chennai	Tamil Nadu	-	-	-	Ford
Mahindra & Mahindra Ltd.	1945	6	Mumbai	Maharashtra	1002.1	804	17629	Peugeot/AVL/ Mitsubishi
Maruti Udyog Ltd.	1983	1	Gurgaon	Haryana	2128.6	30761	5404	Suzuki
Mercedes-Benz India Ltd.	1995	1	Pune	Maharashtra	89.3	-	350	Mercedez-Benz
PAL- Peugeot Ltd.	1995**	1	Thane	Maharashtra	-	12	2499	Peugeot
Swaraj Mazda Ltd.	1985	1	Chandigarh	Punjab	51.7	-	551	Mazda
Telco	1954	3	Pune	Maharashtra	2813.5	14475	36899	7 technical collaborators
Premier Automobiles Ltd.	1944	2	Mumbai	Maharashtra	72.1	108	4123	Fiat
Volvo India Pvt. Ltd.	1998	1	Bangalore	Karnataka	-	-	-	
Toyota	1998	1	Bangalore	Karnataka	-	-	-	

Note: * The firm was first established as DCM Toyota, a joint venture with Toyota to produce commercial vehicles. But in the early 1990s, Daewoo took over the equity shares from Toyota and started producing passenger cars in 1995.
** Peugeot withdraw its partnership in 1997.
Source: ACMA 1997, 1998.

Appendix 2.4: The Top 25 Component Suppliers in India (By Sales Turnover)								
Name	Year of Starting	Sales (US$M)	Export (US$M)	# of employees	Main Plant Location		# of	Products
	Production	Year 1996	Year 1996		City	State	Plants	
Modi Rubber Ltd.	1974	271.1	38.1	?	Meerut	U.P.	2	Automobile tyres, tubes & flaps
Motor Industries Co. Ltd.(MICO)	1951	233.0	25.0	9370	Bangalore	Karnataka	3	Diesel fuel injection equipment
Tube Investment of India Ltd.	?	206.6	?	1400	Chennai	Tamil Nadu	1	Cold rolled strips, ERW&CDW tubes
Lucas TVS Ltd.	1963	153.5	3.8	2950	Chennai	Tamil Nadu	2	Starters, generators, distributors
Bharat Forge	1966	139.3	14.0	2499	Pune	Maharashtra	4	Steel forgings/machined crankshafts
SKF Bearings India Ltd.	1965	125.6	2.8	2580	Pune	Maharashtra	2	Ball & roller bearings
The Supreme Industries Ltd.	1942	116.0	6.0	1200	Mumbai	Maharashtra	5	Steering columns
Subros Ltd.	1986	106.2	0.0	580	Ghaziabad	U.P.	2	Air-conditioning systems for cars
Brakes India Ltd.	1964	90.5	5.1	2657	Chennai	Tamil Nadu	7	Drum Brakes, Disc brakes/ Rotors
Wheels India Ltd.	1962	85.3	4.0	1355	Chennai	Tamil Nadu	2	Truck wheels, agricultural wheels
Sundaram Fasteners Ltd.	1966	78.0	11.2	1600	Chennai	Tamil Nadu	2	High tensile fasteners
Tube Products of India Ltd.	1955	73.6	3.0	1871	Chennai	Tamil Nadu	3	Cold rolled strip steel, ERW,CEW
Goetze (India) Ltd.	1956	61.9	0.6	2720	Patiala	Punjab	2	Piston rings, Cylinder liners
Asahi India Safety Glass Ltd.	1987	52.9	0.2	418	Rewari	Haryana	1	Tempered atuomotive safety glass
Sundaram-Clayton Ltd.	1992	51.6	0.8	1098	Chennai	Tamil Nadu	1	Air assist and full air brake systems
Escorts Mahle Ltd.	1958	48.8	0.4	4113	Patiala	Punjab	1	Pistons
Fenner (India) Ltd.	1956	46.0	1.6	2000	Madurai	A.P.	1	V Belts, Auto Belts, Oil seats
Gabriel India Ltd.	1961	45.1	2.7	1110	Mumbai	Maharashtra	6	Shock absorbers, struts, front forks
Amforge Industries Ltd.	1948	42.4	2.1	1400	Mumbai	Maharashtra	4	closed die forging in carbon steel
India Pistons Ltd.	1949	37.5	1.6	2266	Chennai	Tamil Nadu	2	Pistons, Piston pins, Piston rings
Denso India Ltd.	1986	37.5	0	801	Ghaziabad	U.P.	1	Starter motors, alternator
Sona Steering Sys. Ltd.	1987	36.5	0.2	400	Gurgaon	Haryana	1	Complete steering sys.
Automobile Corporation of Goa, Ltd.	1982	35.3	2.6	1078	Sattari	Goa	1	Pressed sheet metal component
Sri Ramdas Motor Transport Ltd.	1955	35.0	0	800	Kakinada	A.P.	1	King pins, King pin repair kits
Premier Auto Electric Ltd.	1994	34.8	0	489	Chennai	Tamil Nadu	1	Automobile starter motors/alternators

Source: ACMA 1998

Chapter 3

Building Institutional Alliances for Skill Development: A Tale of Two Successful Learners

3.1 Introduction

This chapter analyzes the patterns of skill development in two leading auto manufacturers in India, Maruti and Telco (see Appendix 3.1 for a brief profile of each firm). Both firms have invested heavily in skill development for their workers, since the time when the Indian economy was still heavily regulated and protected, and even before competition became intensified within the domestic markets. Both have internalized learning within the firms by institutionalizing various measures for skill development, albeit differently. Yet both firms have considerably changed the patterns of their skill development in recent years, in response to transformations in the Indian automobile industry. How has this dynamic transformation process, as illustrated in the previous chapter, affected and reshaped the patterns of in-firm skill development? This chapter first examines the mode, contents, and extent of in-firm skill development in these two firms, and then considers what has shaped these successful practices in each firm. A larger picture this chapter paints is the process of institutional change as it relates to skill development.

Training, whether on-the-job or off-the-job, is an institutionalized form of knowledge and skill transfer. Particularly in the work context, training is a means of acquiring and enhancing firm-level learning, through which what the organization has learned gets translated into the learning by members of the organization, and knowledge acquired by the firm gets shared among them in different part of the organization, i.e., the intra-firm diffusion of knowledge and skills. This also involves the process of

socialization,[1] through which certain values are infused within the organization. Thus training can also be considered as an integral part of process innovations that occur within the firm to acquire "competitive assets" (Amsden 1995). In short, in-firm training has three distinctive but interrelated components: 1) the transfer and diffusion of knowledge and skills within the organization; 2) the embodiment of knowledge by individuals; and 3) the institutionalization of learning mechanisms. This chapter shows that Maruti has focused on the first component, while Telco has focused on the second: Maruti has focused more on enhancing collective performance to improve production capabilities,[2] and in particular line management. Telco, on the other hand, has focused more on accumulating individual trade skills, reflecting its traditional emphasis on strengthening innovation capabilities. And, both firms have been successful in the third area: both have developed elaborate institutional mechanisms for promoting skill development inside the firm while linking it with outside institutions.

Many recent studies have focused on the effects of globalization and the increased adoption of more "flexible" or "lean" Japanese (Toyota to be more precise) production systems[3] on changes in work organization and employment practices (Florida and Kenny 1991, Doeringer et al. 1996, Sargent and Matthews 1997, Kochan et al. 1997).[4] Some variants of these studies have examined whether production processes, including work organization, in the automobile industry is converging into more "flexible" or "lean" production systems across countries, or national distinctive systems of employment

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[1] See Adler 1993.

[2] Technological capability development entails the enhancement of three types of capabilities: a project execution capability, a production capability, and an innovation capability. Project execution capability refers to the skills required to establish or expand operating and other corporate facilities. Production capability refers to the skills required to operate the facilities once they are established. Innovation capability refers to the skills associated with basic and applied research and related engineering or creating major new products and processes (Amsden and Hikino 1994: 129).

[3] A large body of literature exists on analyses of the Japanese (or Toyota) production systems. See, for example, Monden 1983, Womack et al. 1990, Fujimoto and Takeishi 1994, and Fujimoto 1997.

[4] "Flexible" or "lean" production systems have four distinctive dimensions that are different from those of mass production: 1) the use of more general resources (multi-skilled workers, general-purpose machines, fewer functional specialists); 2) small buffers and lot sizes to facilitate the handling of a greater variety of

practices still remain strong and influence the pattern of firm-level labor practices despite globalization of the markets, resulting in wide variations in experiences across countries (Womack et al. 1990, MacDuffie 1996, Kochan et al. 1997).

Paradoxically, however, this study supports both the "convergence" and "divergence" arguments. This study finds that, clearly, the Indian automobile industry has recently adopted some elements of "flexible" or "lean" production systems, including the Japanese model of work organization characterized by multi-skilling, small-group activities, and decentralized decision making on the shop floor (Womack et al. 1990, Sabel 1994), which has led to a considerable change in the content of in-firm training. Yet, at the same time, it also finds a robust national-level institutional framework that has greatly influenced the patterns of in-firm skill development, particularly in employment practices, including hiring and promotion, stable employment, and an extensive use of apprentices.

But, beyond this debate on convergence versus divergence, the cases of Maruti and Telco show how and why they have developed their particular institutional mechanisms inside the firm over time while forging institutional alliances with outside organizations, in particular training organizations. Such institutional alliances have helped them institutionalize the process of learning, while externalizing the costs of training and internalizing the benefits from such training. Historical conditions have led the two firms to take different paths to skill development.

This chapter is organized as follows. Section 3.2 analyzes the patterns of skill development in terms of five elements in the two firms. Section 3.3 examines the conditions under which these two firms have facilitated skill development. Section 3.4 summarizes the findings.

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product designs; 3) a more decentralized decision-making process; and 4) a higher degree of integration of conceptual activity with the execution of production tasks (MacDuffie and Pil 1997: 10).

3.2 The Patterns of In-Firm Skill Development: The Cases of Maruti and Telco

Despite their considerable differences in firm characteristics, both Maruti and Telco place great emphasis on skill development for their workforce. In fact, a former CEO of Maruti emphasized employee training as one of the three most important factors contributing to Maruti's remarkable growth (see Chapter 2); the other two are its technologies and its insulation from political interference.[5] On the other hand, Telco, a long-term industrial leader, has committed itself to developing a skilled workforce. In fact, when Telco set up its main plant in Pune in the mid-1960s, its Training Division was the first unit created, more than a decade *before* Telco produced its first vehicle in that plant (Puthli 1992). This study specifically focuses on five elements of in-firm training to understand the nature of in-firm skill development in Maruti and Telco: 1) internal labor markets and on-the-job training; 2) apprenticeship programs; 3) formal training programs; 4) overseas training; and 5) work organization. Here, I mainly focus on Telco's Pune plant, and my discussions here may not apply to the other two plants. Discussions in this section mainly draw on my interviews with various managers and workers in these firms, unless otherwise noted.

3.2.1 Internal Labor Markets and On-the-job Training

Both firms have well-established internal labor markets.[6] Here, I focus on three aspects of their internal labor markets, namely, 1) recruitment; 2) promotion; and 3) wages.

1) The Case of Maruti

a) *Recruitment*

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[5] A talk by Mr. R.C. Bhargava, a former CEO, Maruti, at Harvard, in February, 1998.

[6] The concept of internal labor markets goes back to Doeringer and Piore 1971. See Chapter 1 for a review.

The total number of Maruti employees has nearly doubled in the last eleven years from 2,815 to 5,405 in 1996-97. As Table 3.1 indicates, however, this growth has been modest, compared to the firm's remarkable growth in production and productivity (as measured by value added per employee) during this period. This suggests a very efficient and "lean" use of labor, leading to a high productivity growth in terms of the total number of vehicles produced per employee per year (see Figure 2.2 and Table 2.3 in Chapter 2). Maruti's slim employment size also reflects a high level of subcontracting, currently at 72% of all parts (60% of the value of a car),[7] which allows the firm to concentrate on several production areas, such as assembly (of vehicles and engines), painting, panel stamping, machining, and welding.

Table 3.1: Employment and Production Growth at Maruti

Maruti Year	Total Number of Employees	Number of Vehicles Produced (Units)	Value Added per Employee (Rs. Million)
1985/86	2815	47,694	0.17
1986/87	3497	82,308	0.31
1987/88	3526	94,033	0.38
1988/89	3629	105,592	0.41
1989/90	3721	117,255	0.50
1990/91	3945	120,308	0.57
1991/92	3993	121,167	0.58
1992/93	4042	128,138	0.62
1993/94	4141	158,109	0.90
1994/95	4840	206,330	1.19
1995/96	4968	277,776	1.91 **
Average Annual Growth Rate (%) *	5.8%	19.3%	27.4%

Note: * Calculated by the author. ** including apprentices
Source: Compiled from Maruti Udyog Ltd., *Annual Reports*, various years.

Maruti's employees, including production workers, are all salaried and permanent, a common practice for Indian public sector employees. For production worker jobs, the

[7] My interviews with several Maruti managers. However, the firm's share of costs of the purchase of raw materials and parts in the total production costs for 1996-1997 is 57% (calculated from Maruti's annual report 1995-96), which is actually lower than that for Telco at 64% for the same year (calculated from Telco's annual report 1995-96), indicating Maruti's 'leaner' use of suppliers (see Chapter 4).

firm initially recruited workers from other industries,[8] but soon, it started hiring only fresh graduates from Industrial Training Institutes (ITI)[9] across the country who had served as apprentices for a year. Maruti prefers these fresh ITI graduates over workers with experience in other industries for several reasons. First, the skills required at Maruti are firm-specific; as the firm uses such advanced technologies, hiring those who worked elsewhere would require costly retraining. Second, new graduates are more receptive in absorbing new work practices and adopting a new corporate culture. Finally, Maruti fears that workers with experience in other firms might "contaminate" other workers with undesirable attitudes, such as influences of highly politicized labor unions backed by major political parties. In fact, many firms in the industry, including HML and PAL, both located in traditional industrial regions, have suffered from such adversarial labor relations, resulting in frequent labor turnover, low labor productivity, and disrupted production.

These new recruits are trained on the job by senior workers and supervisors who have already been trained at Suzuki in Japan. After one year of on-the-job training as an apprentice, they still go through another two years of probationary training before they are placed on the regular payroll. New production workers are thus all well educated and recruited out of a large pool of best-performing apprentices (for discussions on apprentices, see the next subsection). Table 3.2 presents the occupational hierarchy at Maruti. At Maruti, labor turnover is extremely low (only a few workers per year); thus new job openings for production workers are very limited. This is partly because workers at Maruti are extremely well-paid and well-treated, as discussed shortly.

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[8] Some of the employees, mainly from nearby villages, were previously hired by Maruti Ltd., which was established by Sanjay Gandhi in 1977. Some were formally landowners of the land in Gurgaon acquired by Maruti.

[9] ITI is a government-run technical school (now 100% sponsored by state governments), which offers one- to three-year industrial training for students with 10 years of education. For instance, Delhi alone has 13 ITIs for 8500 trainees in 50-60 trades. In addition, some ITIs attach Advanced Vocational Training System (AVTS) centers, where training for the acquisition of a higher level of craftsman skills is offered for three to 12 weeks in selected areas such as Tool Design, Tool and Die Making, Measurement Techniques, Heat Treatment, Maintenance of Machine Tools, Production Technology, Industrial Chemistry, Process Control, Welding Techniques, and so on (My interviews with a senior officer in the Directorate of Employment and Training under the Ministry of Labor, March 2, 1997).

Managers and engineers at Maruti are also fairly well educated, all with college or postgraduate degrees. In fact, Maruti's Japanese managers find its Indian engineers to be very competent, highly intelligent, and have a higher absorptive capacity than their counterparts in Indonesia and Thailand, though they say Maruti's production workers perform at the same level as their counterparts in Southeast Asia. This may reflect a relatively high level of engineering education and a large supply of engineering graduates in India, albeit a tiny fraction of the large population. Engineers are recruited from all over the country, through a highly competitive selection process involving interviews and tests. In 1984, only 30 engineers were selected from over 1,000 applicants. Many engineers are, however, directly recruited from colleges nationwide, especially several Indian Institutes of Technology (IITs), the nation's best engineering colleges. Maruti also recruits engineers in specialized fields, such as painting, metallurgy, and design, from specialized institutes of technology.

Table 3.2: Occupational Structures in Maruti (1996)

Occupational ranks	# of Incumbents	Level	Qualifications
Chairman (Indian)	1		Political appointment (usually Sec. To Govt. of India, Heavy Industry)
Managing Director (Indian)	1		Appointed by Govt. and Suzuki, alternately
Joint Managing Directors / Directors (3 Indian + 3 Japanese)	6		
Divisional Managers etc.	6		
Deputy Divisional Managers	14		
Department Managers /DM in charge	89	Level 15	
Managers	80	Level 14	Some MBA, college degree
Deputy Manager	114	Level 13	
Senior Executives	139	Level 12	When promoted
Executives	465	Level 11	Engineering degree /some postgraduates
Supervisors (foremen)	294	Level 9-10	Diploma holders
Assistant Supervisor	104	Level 8	Promoted from technician
Technicians (operators)	3 ,616	Level 3-7	ITI graduates
Attendants (helper)	474	Level 1-2	Below 10th standard
Trainees	900	Not on roll	Completed two-year ITI training

Sources: Maruti's internal documents. Interviews with Maruti managers and workers.

Maruti's 914 managerial and professional employees as of 1996/97 account for about 17% of its total employee strength of 5,405 employees. The engineers all have degrees or diplomas in engineering. Out of about 600 junior-level managers, about 500 have engineering degrees and the other 100 have degrees in business and commerce. Those with engineering degrees mostly assume the position of production-in-charge.

Engineers go through one year of training after their recruitment. Following 15 days of general orientation, they spend five months in production, attached to different shops, on the actual production line, and then two months in the Engineering Department. Then, they work at service stations for 15 days to experience how the work is actually done there, and then spend two more months on-the-job in areas such as management, value engineering, and finance. At the end of this one-year training, engineers are assigned to different sections, mostly in Production, Engineering, and Vendor Development Departments (see Chapter 4).

Maruti's Engineering Department, which was relatively recently created with only four engineers initially, now comprises such sections as technical administration, design, quality, and service and parts inspection, with about 150 employees including 40 engineers. While the literature emphasizes the role of R&D and Engineering Departments in deepening technological capabilities (Najmabadi and Lall 1995, Lessard and Amsden 1996, World Bank 1998), Maruti's R&D effort in its Engineering Department started only since the mid-1990s, developing such capabilities as testing components and making minor model changes. In fact, Maruti spends much less on R&D than most firms in the industry (see Table 3.3), and in particularly sharp contrast with Telco (see discussions below).

But Maruti is still far from developing basic R&D capabilities, including those for product design, as it relies totally on Suzuki for vehicle designs. The Engineering department's Parts Inspection Section evaluates the existing components (for factors such as friction and heat durability), and helps suppliers develop their components. When

Maruti needs to modify the Japanese design to suit Indian conditions, it seeks Suzuki's clearance, even to modify components; then, Maruti's Vendor Development Division looks into the matter (see Chapter 4). In terms of day-to-day problem-solving, however, Maruti's own Engineering Department handles technical and operational problems. In other words, Maruti has accumulated enough problem-solving skills, but not design skills.

Table 3.3: R&D Expenditures in Indian Automobile Firms: 1986, 1990, and 1995/96

Year	1986		1990		1995/96	
Firms	R&D expenditure (Rs. in million)	R&D as % of sales turnover	R&D expenditure (Rs. in million)	R&D as % of sales turnover	R&D expenditure (Rs. in million)	R&D as % of sales turnover **
Telco	115.8	1.15	144.6	0.73	1,192.9	1.56
Ashok Layland	10.9	0.27	81.1	0.94	185.8	0.92
Premier Auto	21.5	0.88	32.4	0.71	158.2	2.20
Bajaj Tempo	12.2	0.97	19.9	0.91	119.9	1.75
Maruti	9.2	0.12	5.7	0.06	86.3	0.13
Hindustan Motors	9.4	0.29	17.8	0.29	51.0	0.42
DCM *	n/a	N/a	2.04	0.21	2.4	0.04
Swarj Mazda	0.2	0.06	0.2	0.17	0.9	0.05

Notes: * DCM Toyota was a joint venture with Toyota producing commercial vehicles until 1995, when the firm became DCM Daewoo, as the joint-venture partnership was taken over by Daewoo, a Korean car manufacturer.
Sources: For the 1986 and 1990 data: Bhat 1992; For the 1996 data: AIAM 1997; ** calculated by the author.

b) Promotion

As shown in Table 3.2, the occupational structure between unskilled workers and Department Managers is divided into 9 categories. This is far fewer than the 90 job classifications in U.S. plants but much more than the 2 to 4 in Japanese plants (Florida and Kenney 1991). For production workers, there are only three levels. It normally takes four years to move up from one level to another of the occupational ladder. Common to the practices of Japanese, as well as Indian public sector, enterprises, promotion is primarily determined by seniority. Better performing employees are specially promoted faster based

on the firm's assessment of their individual confidential annual performance report. Criteria for faster promotion include attendance and work efficiency.

In order to keep motivating workers to learn new skills, in 1988, Maruti stopped recruiting diploma holders for assistant supervisor positions, so it could fill supervisory positions with promoted workers. As internal labor markets theorists (Doeringer and Piore 1971, Koike and Inoki 1990) argue, the main locus of workers' learning is still on-the-job training and promotions provide an incentive for such workers' learning.

Maruti has no system to measure the extent to which individual workers have improved their skills over time, reflecting the firm's lack of belief in the concept of trade skills. A Japanese senior manager pointed out the difficulty of measuring each worker's skill levels[10] and how much they have improved through training. Still, the level of technical skills required varies depending on the department. As observed elsewhere, assembly workers require fewer experiences or particular technical skills, compared to workers in maintenance, painting, or die-making. Once assigned, workers rarely move to other shops. Therefore, they accumulate skills and knowledge in the same skill areas. Thus, the firm rewards its production workers' skills by promoting them from Level 3 to Level 5 (see Table 3.2). Thus, in 12 years after the initial entry, competent workers become eligible to become assistant supervisors. Those at Levels 4 and 5 are sent to a Foremen Training Institute (FTI) in Bangalore to prepare for assistant supervisor jobs. This training focuses on the role of the supervisor; planning; time management; material management; labor management; and basic engineering.[11]

However, unlike Japanese auto firms where workers can be promoted from workers to team leaders to supervisors and further to managers, Indian workers can be promoted only up to assistant supervisor levels, because of more hierarchical social

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[10] For example, in Japan, employers often encourage workers to take a national-level skill proficiency examination administered by the Japan Vocational Ability Development Association (JAVADA), a non-profit organization, under the auspices of the Ministry of Labor of the Japanese government, although the skill proficiency levels do not necessarily affect their wages and promotion opportunities. India has no such systems for measuring skill levels in a uniform way.

relations. As academic credentials play a more important role in determining employees' occupational level in India, internal labor markets play a far more limited role, in terms of filling positions through internal promotion. Thus, at Maruti, even with the transfer of the Japanese management system as described below, the prevailing social relations still play an important role in shaping the human resource practices on the shop floor, including the pattern of skill development.

c) Wages

Comparing wage levels across firms or industries, let alone across countries, is difficult, due to difficulties in adjusting differences in various benefits added to the basic salary, accounting treatments, and exchange rates. Thus, a better measurement may be the labor costs to the firm per employee. While a serious lack of data prevents any sophisticated analysis of wages in India, Table 3.4 provides a rough idea about Maruti's labor costs per employee relative to Telco's; to the prevailing labor costs per employee in the Indian industrial sector; to minimum wages in the automobile industry; and to wages in Japan and the U.S.[12] As of 1998, Maruti's average labor cost per worker was Rs. 15,000 per month,[13] which is 1.75 times higher than the industrial average.[14] Clearly, Maruti employees are well paid and well treated. In particular, its production workers receive the best salaries in the industry. In 1987, the firm also introduced a productivity-linked incentive scheme. Therefore, workers' remuneration consists of the basic salary, allowances, and the productivity incentive (Rs. 5,000 to Rs. 6,000), calculated monthly using an elaborate formula to reflect a productivity increase in workers' pay. The

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[11] Training in basic engineering is provided only for assistant supervisors who have engineering diplomas.
[12] Unfortunately, however, data on this measurement, based on the firms' balance sheet, does not allow one to separate wages for production workers and indirect (administrative and managerial) workers.
[13] A talk by Mr. R. C. Bhargava, a former CEO of Maruti, at Harvard, in February 1998. This includes income tax (approx. Rs.2,500) and fringe benefits.
[14] The wage gap between Maruti and the industrial average has narrowed in recent years. As Table 3.4 shows, in 1993-94, Maruti's average annual earnings were in fact 2.5 times higher than the industrial average. By the mid-1990s, many FDI-affiliated car manufacturers had entered the Indian passenger car sector, raising the overall wage level (see Chapter 2).

introduction of this scheme resulted in a dramatic increase in productivity (see Chapter 2). Small intra-firm wage differentials do exist according to the shop. For example, workers in the stamping shop are considered more skilled than others and are therefore the best paid among production workers.

Table 3.4: Comparison of Relative Average Annual Earnings per Employee: Maruti and Telco

	Year	Average Annual Earnings per employee	Converted into US dollars (US$)	Index (Maruti 1993-94 = 100)	Adjusted by Purchasing Power Parity (PPP) (I$)	Index (Maruti 1993-94 = 100)
Maruti	1996-97 1993-94	Rs. 220,143 Rs. 131,374	6,213 4,278	145 100	25,282 17,394	145 100
Telco	1996-97	Rs. 167,168	4,718	110	19,426	112
Passenger Car Manufacturers (SIC 374)	1993-94	Rs. 52,798	1,719	40	6,989	40
Transport Equipment and Parts Sector (SIC 37)	1993-94	Rs. 45,610	1,485	35	6,038	35
All Industrial Sector	1993-94	Rs. 32,889	1,071	25	4,355	25
Transport Equipment and Parts Sector (minimum wage earners)	1992	Rs. 11,889	459	11	1,867	11
Japanese Auto Employees (SIC 371)	1993	Yen 5,593,752	50,404	1178	33,301	191
US Motor Vehicle and Equipment Production Workers (SIC371)	1993	US $33,524	33,524	784	33,524	193

Notes: 1) Figures represent average annual remuneration and allowances per employee, except the data on the U.S., which represent wages for the motor vehicle and equipment sector production workers.
2) Different exchange rates apply to different years: Rs.1 = US$35.43 for 1996; Rs.1 = US$30.71 for 1993-94; Rs.1 = US$30.49 for 1993.
3) The figure for the U.S.wage was estimated from the 1994 wage differentials between U.S. employees and Japanese employees (103%) and the average hourly earning differentials between US auto employees ($25.52) and US auto production workers ($16.10) in 1993, based on the data from the U.S. Department of Labor, Bureau of Labor Statistics (BLS), as cited in American Automobile Manufacturing Association (AAMA) 1997.
4) See Appendix 3-2 for technical notes on more details of how these figures were derived at.
Sources: Data on Maruti and Telco were calculated from their respective *Annual Reports*. Other Indian data: Government of India, Central Statistical Organization. 1996; Data on minimum wages: Government of India, Ministry of Labor 1997a; Data on Japan: International Labor Office (ILO). 1997. For exchange rates: International Monetary Fund 1997. For PPP: World Bank 1995 and 1997.

Maruti's high wage level creates a marked wage dispersion among auto manufacturers as well as within the automobile industry. This high level, however, pushed

up the wage level in joint-venture suppliers near Maruti, where production workers receive roughly 80% of the salaries of Maruti workers. Reflecting a hierarchical industrial structure and the highly segmented nature of external labor markets as discussed in Chapter 1, however, Maruti's good salary level stands in stark contrast with the wage level of workers in small firms who typically receive a minimum wage of Rs. 1,200 per month on average, only one tenth that of Maruti workers (see Table 3.4). Indeed, this high wage level places Maruti workers in the top 5% of India's income distribution![15]

Table 3.5: Regional Disparity in Wages and Value Added per Worker in the Transport Equipment and Parts Sector, 1993-94 : Selected States

States	No. of Factories	No. of Workers	Annual Wages per Production Worker (US$)	Wage Index (All India=100)	Net Value Added Per Worker (US$)	Net Value Added Per Worker Index (All India=100)
All India	4,180	374,852	1,248	100	4,149	100
Bihar	125	27,223	1,428	114	3,018	73
Gujarat	250	15,983	672	54	2,630	63
Haryana	220	23,314	1,140	91	8,106	195
Karnataka	190	16,609	1,536	123	4,638	112
Maharashtra	767	55,762	2,112	168	8,275	199
Punjab	772	37,892	792	63	2,440	59
Tamil Nadu	548	65,625	1,164	93	3,991	96
Uttar Pradesh	305	32,995	1,104	88	3,253	78
West Bengal	215	59,608	1,080	86	1,944	47
Delhi	381	8,201	1,152	92	2,819	68

Notes: 1) Workers refer to all persons directly engaged in any manufacturing process, and do not include indirect workers or administrative and managerial staff.
2) The exchange rate is US $1 = 30.71 for 1993-94.
3) The total numbers of factories (4,180) and of workers (374,852) do not agree with the estimates provided by ACMA. This is partly because the factories covered in these statistics are only those registered with the government and do not include informal sector firms.
Sources: Constructed and calculated from Government of India, Central Statistical Organization, 1996. *Annual Survey of Industries 1993-94: Summary Results for Factory Sector*: Table 6-13.

Why are Maruti workers so well paid? This may be worth considering, as Maruti's high-wage policy contrasts markedly with the experience in some emerging economies.

[15] According to a recent national household survey conducted by the National Council of Applied Economic Research (NCAER), only 2.48% of the sample households earn annual incomes of Rs.86,000 or

For instance, in Mexico, government policy keeps wage levels low, and auto firms, to cope with the problem of high labor turnover, deliberately pay low wages to attract less educated workers who are unlikely to leave jobs (Shaiken 1994).[16] Indeed, Maruti's high wages stand out even in the Indian context with its large regional wage disparity: Haryana, where the firm is located, is not a very high-wage region compared to Maharashtra and Karnataka (see Table 3.5).

Interestingly, Maruti's union (a company union) played only a small role as the firm introduced the productivity-linked incentive scheme. Also, the high educational level of Maruti workers does not explain the firm's exceptionally high wage level: in India, virtually all large firms employ graduates of ITIs for production jobs, just as Maruti does (see the next subsection). Rather, several factors led Maruti to develop its productivity-linked high-wage policy. First, this structure is partly a legacy of Indian public sector firms. Until 1992, when the equity share between the Indian government and Suzuki became 50-50, Maruti was a state enterprise. Because government salary rules for Indian civil servants governed Maruti's wage setting and prevented the firm from increasing wages to attract better-qualified workers, the firm chose to provide incentives.

Second, this kind of productivity-linked incentive has greatly increased productivity by boosting workers' motivation, thus bringing the company's interests in line with its workers'. While Maruti employees do not receive any bonus as such,[17] this productivity-linked salary system not only attracts well-motivated workers to begin with, but also motivates them to improve their performance. In fact, one worker commented, "our salary goes up day by day, as our productivity increases every day."[18] This productivity-linked incentive mechanism has worked very well, given the national context in which protective

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more (Rao and Natarajan 1996: Table 5.21.3).

[16] The evidence on wages varies among emerging countries. Amsden (1988, 1989) argues that in Korea, workers have been paid relatively high wages during the process of rapid industrialization not because of a shortage of skills but in order to induce them to exercise their intelligence and make imported technology work (1989, p 190).

[17] Indian law forbids paying bonuses to workers who receive more than Rs. 3,000 as a monthly salary.

[18] Interview with a Maruti employee in January 1997.

labor legislation provides few incentives for workers in the organized sector to work hard and to increase productivity.

Third, because income tax rates are high in India, substantial portions of wage increases would be taken away as taxes. Thus, workers prefer to receive incentives rather than basic wage increases. Fourth, such good wages, in fact the best in the industry, successfully discourage labor turnover.

Finally, despite this high wage, the total labor costs to the firm are surprisingly low, at only 1.8% of sales turnover as of 1997.[19] By comparison, at Telco, labor costs are 8% of sales turnover. Two factors have helped Maruti achieve this low figure: first, its relatively small size of employment, only one eighth that of Telco despite their sales turnover being almost at the same level (see Appendix 3.1); and second, a high rate of subcontracting, at 72% of a car's components (60% by value). This figure is as high as the figure for Japanese (70%) and much higher than that for U.S. auto firms (30% to 50%).[20] These two factors, taken together, clearly indicate the leanness of the firm's use of labor. Given the wide wage dispersion within the industry as discussed above, Maruti could take advantage of the extremely low costs of components produced by its suppliers that use much cheaper labor.

Moreover, Maruti's wage structures are relatively flat. Interestingly, unlike Maruti's blue-collar workers, Maruti's managers and engineers are not the best paid in the industry; newcomers such as GMI and Daewoo offer higher wages to these categories of employees. Hence, since the beginning of the 1990s when many FDI-related firms started operation in India, Maruti has experienced a high labor turnover among its engineers, in sharp contrast with extremely low turnover among its production workers, as mentioned earlier.

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[19] Calculated from Maruti's *Annual Report 1996-97*. This figure was also confirmed during my interviews with several Maruti managers. However, this figure rose to 2.1% in 1998 because of a recent salary increase.

[20] The figures are cited from Florida and Kenney 1991.

At Maruti, the wage differential between labor and management, if measured only by the basic salary, is about a factor of 10, as managing directors receive Rs. 40,000 per month. But, the actual differences between the two are even much smaller, because of productivity-linked incentives for production workers. Its managers receive higher salaries than its directors, because a cap on government salaries affects the salaries of Maruti's directors--government officials appointed by the government.[21] These directors tend to suppress efforts to increase managers' and engineers' salaries; they do not like seeing Maruti managers and engineers receiving higher salaries than their own, even though Suzuki supports it. The result is flatter wage differentials between management and labor within the firm. This is unusual in a society like India, where labor markets are highly segmented and society at large is highly stratified. But this flatter wage structure has given the firm's production workers a feeling that they are equally treated, further boosting their motivation and commitment to the firm.

In addition to basic salaries and production incentives, workers receive fairly good allowances as part of the labor costs to the firm, such as dearness allowances (compensation to reflect a rise in inflation); house allowances; and many other fringe benefits.[22] For instance, Maruti has formed a cooperative society to encourage home ownership among its employees, offering low-interest loans and bearing the construction costs of cooperative apartment buildings.[23] These generous labor welfare measures differ drastically from the prevalent labor practices in India, and have helped Maruti workers develop a strong sense of identity with the company.

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[21] In the theory of wage determination, the wage serves as an indicator of social status; thus employees become accustomed to certain levels of income relative to the income levels of those around them, and it becomes as important to maintain these income levels as to exceed them (Doeringer and Piore 1971: 88).
[22] These fringe benefits include allowances and subsidies for house rent; uniforms; child education (Rs.100 per child); meals; leave travel (employees can return to their regions of origin every two years); transport; medical treatment (both outpatient and hospitalization); Provident Fund (retirement pension: 10% of basic salary is deducted for the Fund, with the firm paying equal amount each month); gratuity (separation grant); and consumer durable loans (to purchase large consumer durable goods).
[23] Thus, virtually every worker takes housing loans from the firm at the subsidized interest rate of 4% (as compared to 14% market rate). Thus the other 10% is in effect an additional benefit.

Some scholars attribute group-oriented behavior, such as high levels of identification of employees with their companies and consideration of fellow workers, to the high efficiency of the Japanese shop floor (Sabel 1994). Koike and Inoki (1990), on the other hand, emphasize the technical content of production workers' skill, particularly what they call "intellectual skills" in terms of the ability to handle unexpected problems and to solve problems on the shop floor, as the most important foundation of Japanese systems.[24] They argue that a high level of intellectual skill among production workers can account for small differentials in compensation, egalitarianism, and participative systems on the shop floor. But, Maruti's case shows a rather reverse causality: Small wage differentials between production workers and indirect employees, as well as egalitarian and participatory practices on the shop floor, institutionalized through various measures and rules, have induced a high level of employee identification with the company and created incentives for workers to develop and use their skills to produce more cars and improve their production processes.

2) The Case of Telco

a) Recruitment

Telco's Pune plant has a total of 16,132 permanent employees. Its occupational structure, which is similar to Maruti's, is shown in Table 3.6. As at Maruti, all Telco employees are permanent, except a relatively small number of casual laborers. As at Maruti, Telco's production workers are also all graduates of ITIs in different parts of the country, but mainly Maharashtra. Also, as at Maruti, Telco recruits managers and engineers through college visits, tests, and interviews. As at Maruti, newly recruited engineers undergo one year of training after the first eight-day induction training. As at Maruti, labor turnover among engineers and managers, are high, especially since the early

[24] Koike and Inoki (1990) argue that the real content of the shop-floor-oriented principle is an outcome of th intellectual skill acquired by production workers. With this skill, they say, workers can devise better

1990s, due to the entry of FDI with its higher wages. As internal promotion opportunities are limited, and as engineers have immense opportunities outside, for example the software industry, they tend to seek work elsewhere after several years of service. However, again as at Maruti, labor turnover among production workers is extremely low, reflecting Telco's high (though lower than Maruti's) wages.

Table 3.6: Occupational Structures in Telco, Pune

Occupational Category	# of Incumbents	Levels	Qualification
EG (Executive)	300	EG4 (Senior Manager) EG3 (Div. Manager) EG2 (Gen. Manager) EG1 (Asst. Gen. Manger/ Dy. Gen. Manager)	
TM (Middle Manager)	2,300	TM5 (Manager) TM4 (Deputy Manager) TM3 (Assistant Manager) TM2 (Senior Officer/ Engineers) TM1 (Officer)	College graduates (B.Eng., B.Tech) /post graduates / non-engineering post graduates (for TM 1)
S (Supervisor)	2,600	S3 (Junior Officer / Asst. Foremen) S2 (Senior Supervisor) S1 (Supervisor)	Diploma holders / Promoted from operators
OP (Operators)	9,600	OP2 - OP 7	ITI and NCVT exam. Pass for OP2; 3-year apprenticeship for OP4
MR-A (official work/ clerk)	200	MR-A1 - MR-A3 (Senior assistant) (Parallel to OP6 to S1)	
MR-B (official work/ clerk)	200	MR-B1 - MR-B4 (Assistant) (Parallel to OP2 to OP5)	

Note: MR stands for "monthly-rated." Operators (OP) used to be called CMR ("converted monthly rated"). Those in the OP and MR categories have a right to participate in collective bargaining (i.e., an in-house union).
Source: Interviews with Telco's Human Resources officers, Telco Pune, in August 1998.

Interestingly, Telco started its internal up-skilling in the 1970s, long before the globalization of the Indian economy began. In response to the rapid technological change, particularly through the process of automation, Telco eliminated the occupational category

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methods of production.

of helpers (unskilled workers), converting them to skilled workers by redesigning their jobs, though it keeps 100 to 200 casual temporary workers. Thus, at present, Telco employs no unskilled workers. This is not because its demand for unskilled jobs has diminished with technological change, as some scholars predict (Prais 1994), but because skilled workers now do what unskilled workers used to do, in addition to their skilled work. Thus, as the literature suggests, the range of tasks performed by workers has certainly increased on the shop floor in Telco. But, Telco's experience suggests that this does not always mean adding more tasks which require more sophisticated skills (upward extension). Rather, the multi-skilling can also mean a downward extension of tasks performed by already skilled workers.

b) Promotion

Telco places a greater premium on individual trade skills than does Maruti. Telco's system of promotion and job placement is clearly defined by the type of trade skill of each worker. Each level in the OP grade (see Table 3.6) is established according to the skill level assessed job evaluation. For example, production workers, turners, tool and die makers, and machinists can go up to Level OP7, the highest level of operators, as these skills are highly specialized and in high demand.

In 1976, in response to rapidly changing technology, which reduced the dependence on manual skills in manufacturing processes and instead called for operational flexibility across jobs and functions (Puthli 1992), Telco developed a well-integrated formal system of linking skills to its promotion and wage structures. It totally replaced its old system of multiple grades and pay-scales for production workers with a new concept of skill levels. Until 1976, similar to practices in U.S. firms, Telco employees were promoted to higher grades only when vacancies arose in the section where they worked (Puthli 1992). Thus, even if an employee became more skilled in his trade, he would not be necessarily promoted. This led to dissatisfied workers, discouraged from learning new

skills. In addition, fearing that technological change would make many of its workers' skills redundant and many workers underutilized, Telco started developing multi-skilled workers. It is striking that Telco quickly responded to the issue of "de-skilling" due to technological change (see Chapter 1) by reforming its promotion and reward structures, almost at the moment the issue became of concern among industrialized countries (Braverman 1974), even though India was technologically backward and its economic growth sluggish during the 1970s (Lall 1987; also see Chapter 2).

The 1976 change involved the creation of several new schemes to motivate its production workers to upgrade their skills, become multi-skilled, and reward them for the acquired skills. First, under the Skill Benefit Scheme, a production worker who has been at the same level for two years is eligible to receive "skill benefits" for vertically upgrading his skills to a higher level in the same trade, after applying for the benefits with the report from his boss and taking a test, which results in two accelerated increments in the salary scale.[25] Second, under the Versatility Benefit Scheme, workers in one trade can apply for the "versatility benefit" of three accelerated increments, to upgrade their skills horizontally by acquiring knowledge of jobs in other trades (for example, a welder acquiring a turner's skills at the equivalent level). A worker can become eligible for versatility benefits once his/her application is accepted, after completing two years in the same trade in the same shop. Workers rarely move from one shop to another during the course of their career. Under the versatility scheme, they experience a sort of three-tier loop system of skill development, while keeping their original trade identity (such as a welder or a miller). After going through six different skill trades in one tier,[26] workers take an exam. If they pass, they move up to the next tier of skill levels. Again, after experiencing three or four different skill trades at the second tier, they take a test to move up to the next tier to become

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[25] For example, by the time a turner would reach Skill Level VI, he would have taken four tests and earned eight accelerated increments as skill benefits (Puthli 1992). This system has allowed Telco to separate its promotion and reward system from the availaiblity of vacancies for a given level of skills.

[26] This is explained by the concept of "mobility clusters" in Doeringer and Piore 1971.

more advanced skilled workers in a variety of trades. The combination of particular trades to cover varies depending on the shop. Workers may apply for versatility benefits as long as the trades they wish to learn are required within the shop where they work.[27]

Third, Telco introduced the Performance Benefit Scheme in 1979, similar to the Skill Benefit Scheme, to provide growth opportunities to white-collar employees (MR-A and MR-B), and the Cross-Versatility Benefit Scheme for both blue-collar and while-collar employees to develop skills in a variety of trades across different functions. Under the latter scheme, a production worker, say a borer (in the OP category) could opt for the cross-versatility benefit in the maintenance trade of say, millwright mechanic (also OP) or the quality assurance inspector (MR category) and *vice versa* (Puthli 1992: 37). He would receive three accelerated increments as his cross-versatility benefit after passing a test.

As Table 3.7 shows, as of 1990, about 80% of Telco's 8,385 production workers had taken one or more benefits since these schemes were introduced in 1976. Further, of these beneficiaries, 80% (5,414 production workers) have acquired skills in more than one trade under the Versatility or Cross-Versatility schemes. It is interesting that Telco had already developed an institutionalized system to motivate and encourage workers to become multi-skilled while keeping traditional job boundaries based on trade skills as part of its internal labor markets already in the mid-1970s, when the Indian market was still heavily protected from competition. While multi-skilling has been regarded as a key feature of Japanese production systems, Telco adopted its multi-skilling practices, though differently, long before the concept of 'lean production' came into the country.

In addition, in 1976, Telco instituted three special schemes to develop workers' craft skills: Master Craftsmen, Trade Specialist, and Supervisor schemes. Workers are free to choose different career tracks, and they voluntarily apply if they are interested in any

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[27] Telco has six divisions in its Production Department: 1) Auto; 2) Machine Tool; 3) Foundry; 4) Growth (producing equipment for future manufacturing use); 5) Production Engineering (tool room); and 6) Electronics. Required skill levels vary depending on the division. For example, the Auto Division requires semi-skilled workers, while Growth and Production Engineering Divisions require highly skilled workers.

of the schemes. For each scheme, applicants are screened through an entrance test. After the training, participants take an exit test. Depending on their achievement in each scheme, they are promoted and receive monetary compensation. So far, Telco has 103 Master Craftsmen and 45 Trade Specialists.

Table 3.7: Multi-skilled Workers at Telco, Pune as of December 1990

Combination of Schemes	No. of Production Workers as Beneficiaries at Telco Pune	% as a share in the Total Production Workers at Telco Pune *
1. Skill + Versatility + Cross-Versatility	446	5.3
2. Skill + Cross-Versatility	445	6.6
3. Skill + Versatility	3005	44.8
4. Only Cross-Versatility	71	0.8
5. Only Versatility	1340	16.0
6. Versatility + Cross-Versatility	107	1.3
7. Only Skill	1292	15.4
Total Beneficiaries	6706	80.0

Notes: * Calculated by the author.
Source: Puthli 1992.

Under the Master Craftsman scheme, five to six workers with five to 10 years of experience are selected each year for two-year training: one year in Telco's own training center and the second year on the job as a probationary master craftsman. Trainees learn all the trades and become all-round multi-skilled workers. After completion, participants are promoted to TM1 level, and go up the career ladder through TM5 (see Table 3.6). By contrast, under the Trade Specialist scheme, eligible workers undergo one year of training to become a specialist in one trade--really the highest level in that skill trade. The third scheme is to convert workers to supervisors, as a way to motivate them. Since 1973, between 80 and 100 workers have been promoted to supervisors through this program.

To implement these schemes, Telco has developed a set of clearly defined rules and an operating system, involving the Productivity Systems Division, which is responsible for defining the skill and performance levels for various jobs, and the Training Division, which actually administers tests (Puthli 1992). Those who apply for these schemes can take voluntary after-hours tutorials, offered by the Training Division. These covered on average

28 courses with 299 participants per year during the period between 1987-88 and 1990-91(Puthli 1992).

These schemes have enabled Telco to "create a highly motivated pool of talent and skills" (Puthli 1992). They have also helped Telco gain more flexibility in deploying its manpower according to demand changes and fluctuations, and changes in production processes and priorities. These schemes have also helped reduce the absenteeism levels on the shop floor, as the attendance is an eligibility condition for taking a test. These schemes encourage Telco's production workers who have developed certain trade skills to not only to stay on the job but also advance their skills.

Compared to the well-established internal systems to promote production workers and clerical staff, those for managers and engineers are more flexible and thus closely linked with external labor markets. For any vacancy, through internal advertisements, those who meet the minimum qualifications apply, are interviewed, and if successful, get the job. If the right candidates are not available, the firm recruits outside people through advertisements. Engineers also go through two-year training programs, including two months of on-the-job training to gain hands-on experience and learn how workers are working, including the cleaning of machines.

c) Wages

Telco employees are well paid and well treated, though not as well-paid as Maruti's. Telco's labor cost per employee is approx. Rs. 167,000 per year, as compared to Maruti's Rs. 220, 000 per year: 32% higher than Telco's (see Table 3.4).[28] Telco's high wage level is partly because its Pune plant is located in a high-wage region, Maharashtra (see Table 3.5), and partly because Telco's corporate management tradition treats its employees well. Workers' wages increase annually based on seniority and experience. Unlike Maruti, however, this increase reflects not just years of service but is

[28] Calculated from Maruti's and Telco's *Annual Reports 1996-97* respectively.

closely tied to the internal skill-based career development systems described above. The average worker at the entry level (OP2) receives Rs.5,500 per month as basic salary, and those at the highest level receive around Rs.7,000 per month. Like Maruti, Telco provides a good set of benefits, such as hostels for workers, medical allowances, and meal subsidies.

3) Discussion: Collective vs. Individual Skill Development

As seen above, despite considerable differences in their characteristics, such as ownership, firm size, product mix, and locations, Maruti and Telco share surprisingly similar characteristics in their practices concerning skill development, such as recruitment, promotion, and wages. First, both firms provide their employees with permanent, long-term, stable employment. Second, both rely on a highly educated workforce. Both firms hire production workers with two years of post-secondary industrial training. Their hiring practices are almost identical, both searching out the best-qualified ITI students from all over the country. Managers are all professionally-trained, with university or postgraduate degrees. Entry into the job in each occupational category is highly competitive in both firms. Third, both provide extensive in-firm training for new entrants before they are assigned to one department. In both firms, production workers undergo three years of training before they become regular workers (see the next subsection for more details). Fourth, in both firms, turnover is extremely low among production workers and very high among engineers and managers. Finally, unlike Japanese employment practices, where production workers can sometimes be promoted to lower-level managerial positions, both Maruti and Telco provide their production workers with limited promotion opportunities, only up to the level of assistant supervisors, despite their high educational attainment, even higher than among Japanese workers. Thus, in both Maruti and Telco, internal upward mobility is limited.

Some of these features resemble those often associated with the adoption of Japanese production and employment practices elsewhere (Florida and Kenny 1991, Kochan et al. 1997). However, Telco had developed these practices long before Maruti entered India. Rather, the commonality in employment practices between the two firms suggests the existence of a robust local institutional framework in which even an FDI-affiliated firm becomes embedded. In fact, the Indian labor market is very rigid, because the labor policy makes it extremely difficult for employers to fire workers—and has made firms very prudent about hiring their production workers.[29] Many studies report that these constraints have often caused overstaffing, stagnant labor productivity growth, and inefficiency (Eurotech International 1993). Nevertheless, this rigidity of the external labor markets has actually made the long periods of initial in-firm training ever more critical as a screening device to recruit the best-performing workers from a large pool. This has in turn made stable employment practices viable, while in effect reducing the cost of retraining.

Clearly, both Maruti and Telco use high wages and excellent benefits, far beyond those required by labor regulations and market-determined wage levels, not only to attract and motivate high-quality workers but also to reward their efforts to improve their skills and thereby performance (see Table 3.4). Given the rigid external labor markets, this high wage has been important to motivate their production workers, who otherwise have few incentives to work harder and better. At the same time, both firms could afford such high wages, because of high levels of local contents (96% for Maruti and 95% for Telco) and of subcontracting (72% for Maruti and 65% for Telco).[30] This allowed both firms to take

[29] The Indian labor legislation of 1976 required large firms with 300 employees or more to obtain government permission to fire any worker who has been employed over 240 days. In 1984, this requirement was extended to firms with 100 employees or more. This rule does not apply to managerial-level employees. If such permission is granted, the firm must give three month's notice to workers, as well as retrenchment compensation of 15 days wages for each year of service with the employer. However, in reality, such government permission is never granted due to political pressures from unions which are backed by major political parties. Small-scale firms with less than 100 employees may fire workers but they must give one month of notice in writing and compensation equal to 15 days' pay for each year of service if employed at least 12 months (Agarwal 1997: 161).

[30] Telco plans to increase this share for its passenger cars.

advantage of low wages among their subcontractors, given the wide wage dispersion within the Indian manufacturing sector (see Table 3.4).

Despite considerable similarities in the characteristics of the internal labor markets in both firms, their patterns of skill development differ significantly. First, though the two firms produce about the same value of outputs annually, Maruti has far fewer employees, thus achieving much higher productivity. Second, while the two firms have similar occupational structures, their occupational mix differs. The proportion of shop floor workers is much higher at Maruti (76%; including apprentices, 79%), compared with that of Telco (60%), suggesting Maruti's flatter organizational structure. Third, with a higher proportion of engineers, including many assigned to R&D, Telco's organizational structure focuses more on technological deepening, helping the firm develop its design capabilities. In fact, Telco's Engineering Research Center at Pune (an R&D facility) employs about 800 highly trained technicians, engineers and scientists, by far the largest R&D staff in the industry (see Table 3.8).[31] However, Table 3.8 also shows that in terms of the proportion of R&D personnel to the total workforce, there is no clear difference between FDI-affiliated firms and local firms. Clearly, however, Telco's investment in R&D has been critical for developing its competitiveness, as it has significantly contributed to product development, such as the first indigenously developed light commercial vehicles in 1986, three multi-utility vehicles in the early 1990s, and small passenger cars in the mid-1990s (Bowonder 1998).[32]

[31] Telco currently has a strength of 1,100 in its Engineering Research Center (Bowonder 1998).
[32] For the details of Telco's product development, see Bowonder 1998.

Table 3.8: Ratio of R&D Personnel to Total Employees in Selected Automobile Firms : 1990

Name of Firms	Total No. of Employees	No. of R&D Personnel	Ratio of R&D Personnel to Total Employees
TELCO	36,321*	800	2.2
PAL	11,027	252	2.3
Ashok Layland	10,720	242	2.2
HML	17,924	212	1.2
Bajaj Tempo Ltd.	5,172	173	3.3
Maruti	3,636	66	1.8
Swaraj Mazda	501	26	5.2
DCM Daewoo	500	15	3.0

Note: * The figure covers all three plants.
Source: Bhat 1992

Fourth, to cope with the rigidity of the external labor market, which provides workers with few incentives to learn more, both firms came up with a different strategy to motivate workers and develop their skills. At Maruti, various measures link workers' *collective* performance with its reward system and on-the-job training systems. In other words, decentralized learning, which is described as distinctive in the Japanese production system (Sabel 1994: 141), was designed to involve the firm's wage and training systems. Maruti's productivity-linked wage system has effectively created a condition where "the interests of the parts are consistent with the interests of the whole" (Sabel 1994: 141). Maruti's on-the-job training focuses on behavioral and attitudinal aspects to improve *collective* efficiency and productivity. This mechanism of skill formation motivates workers to acquire skills to produce more *in quantity* rather than *in variety*.

By contrast, Telco focuses on upgrading *individual* trade skills to promote multi-skilling. Clearly, Telco places a higher premium on individual skills, and its skill development system is directly reflected and built into the firm's wage and promotion systems. This skill development system, instituted in the mid-1970s, was an organizational adjustment to external institutional conditions (technological change), redefining workers' skill development within its internal labor markets; workers move up the occupational ladder as they acquire and upgrade their trade skills. The emphasis is on

multi-skilling, in terms of a mastery of various trade skills, which are ranked in juxtaposition horizontally and in gradation vertically.

Finally, the two firms have very different concepts of flexibility and "multi-skilling": in order to achieve more flexibility despite the rigidity of the external labor market, these two firms sought different kinds of multi-skilling. Maruti, like many Japanese auto manufacturers, attained flexibility by allowing a worker to exercise his judgment in performing his tasks while using different machines and increasing the level of mutual monitoring. On the other hand, Telco attained flexibility by increasing the deploiability of workers in a variety of tasks and trades. Taken together, Maruti and Telco have different models of skill development. One focuses on production capabilities and the other on innovation capabilities, hence requiring different types of skills and developing different modes of training. Thus, this study does not necessarily support the cultural argument in the literature (Dore 1973) that idiosyncratic cultural factors inherent in different countries shape distinct employment practices in each country.

Telco's innovative skill development schemes have enabled it to develop the dedicated skilled workforce it needs for its tradition of "self-learning" technological development. Indeed, the firm has intensively invested in the critical technological elements such as gear box and direct injection engine (Bowonder 1998). A closely linked feedback system among R&D, engineering, production, and training has facilitated the firm's technological development. For example, at Telco, new design specifications developed by Design Division are sent to the Autoprojects Division and the Prototype Shop for analysis and modification. After incorporating their repeated feedback and testing results from the Engineering Research Division, new models are sent to the Manufacturing Division (Bowonder 1998). These new projects and new production processes are in turn incorporated into training subjects for disseminating necessary knowledge and skills.

Despite enormous changes in the Indian economy and rapid transformations of the automobile industry in the 1990s (see Chapter 2), however, Telco has made no significant

adjustment in its wage and skill structures since the mid-1970s, as these are now so well-established and costly to alter. Even after Telco introduced some elements of the lean production system, however, its robust feedback system of skill development remained unchanged, so deeply was it embedded in its job and reward structures. However, the system allowed the firm some internal flexibility to deploy labor in response to changes in the external institutional environment.

The literature suggests that while they impart training in specific skills, employers may not raise employees' wages, since there is no alternative demand for such skills (Prais 1995). Telco, however, kept encouraging its workers to upgrade their specific skills and kept rewarding the efforts by increasing their wages. Wages not only served as a premium for skills but also as an incentive to motivate the workforce. Internal labor market theorists (Doeringer and Piore 1971) argue that in long-term employment relations, wages are not determined by an individual's productivity but correspond with the job classifications so carefully designed internally. In Telco, however, such wages are determined by individuals' achievement in skill enhancement, not just reflecting job classification or outputs. On the contrary, in Maruti, wages are mainly determined by collective performance (i.e., the firm's productivity), in addition to job classifications, seniority and attendance.

3.2.2 Apprenticeship Training

In many developed countries, apprenticeship is often considered a "last resort" for academically and/or economically disadvantaged young people to learn skills and get a job, mainly in small firms (Merle 1994: 33, Prais 1998).[33] In India, however, apprenticeship can be a springboard to a well-paid job in a large firm. India's 1961 Apprenticeship Act[34]

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[33] An important exception is the "dual systems" of German-speaking countries, and particularly that of Germany; the German "dual system" links general schooling with vocational apprenticeship in enterprises and workshops in a parallel way.

[34] The Act has been amended in 1964, 1973, and 1986, and the Apprenticeship Rules enacted in 1991 supplements the Act.

mandated that each year, the large firms take, depending on the size of the firm, a fixed number of apprentices, who have completed one- or two-year post-secondary industrial training at the Industrial Training Institutes (ITIs).[35] Recent literature, with its renewed interest in training (see Chapter 1), focuses on an alternative form of apprenticeship involving both school and firm, particularly in developed countries (OECD 1994).[36] Such partnerships have already existed in India for nearly forty years! This section illustrates how differently Maruti and Telco implemented their apprenticeship programs as part of their efforts to foster skill development among their workers.

1) The Case of Maruti

In addition to its formally employed production workers, Maruti took on about 900 apprentices as of 1996-97,[37] accounting for about 15% of its total workforce (see Table 3.9). Apprentices, who have completed two-year training courses at ITIs, undergo on-the-job training for one or two years, depending on the type of skills they acquire.[38] For instance, trainee welders and fitters spend one year, whereas those in tools and dies or plastic molding spend two years.[39] Maruti has a small training facility,[40] but training is conducted mainly on the job. Apprentices are assigned to different shops, such as welding, assembly, paint, machine, vehicle inspection, and service shops. After a one-day orientation and one-day session on safety, they are placed with a more experienced worker

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[35] A firm has to take one apprentice for every seven production workers.

[36] Interests in apprenticeship are particularly strong in Europe, where a high rate of unemployment among the youth has created serious social problems, and in the U.S., where the issue of skill mismatch has generated a public policy debate even at the national level.

[37] Maruti further increased its apprentices to 1,300 as of March 1997.

[38] The apprenticeship program consists of three parts: 1) basic training; 2) shop-floor on-the-job training; and 3) related instruction training. Two-year basic training takes place at ITIs, while one-year on-the-job training occurs at firms. Employers can freely select either fresh or former ITI graduates.

[39] The duration of apprenticeship training is fixed by government rule for each of the 145 trades that the scheme covers.

[40] According to the 1961 Apprentices Act, any enterprises with 500 workers or more must create a separate training facility from the workshop. Enterprises with less than 500 workers can depute their apprentices to local ITIs for in-class basic training sessions. As of 1996, 869 central government enterprises and 25,332 state government enterprises and private firms have in-house training facilities to accommodate apprentices (Government of India 1997b).

to learn the tasks they need to perform to get the work done in that particular shop. Apprentices learn their skills on the job from their co-workers and superviors, as they spend their training days exactly like the rest of the production workers. Thus, the mode of training is largely "learning by doing."

Table 3.9: Share of Apprentices in Total Workforce: Maruti and Telco-Pune

	# of Apprentices enrolled per year	# of Total formal employees (# of production workers)	% of Apprentices in total workforce	% of Apprentices in total production workers
Maruti (1996/97)	900	5,403 (4,995)	14.3%	15.3%
Telco-Pune Plant (1997/98)	150 (100 for three-year program and 50 for one-year program)	16,132 (9,600)	0.9%	1.5%

Source: Maruti, Telco.

Maruti obviously implements the apprenticeship scheme because it is statutory, but Maruti takes positive advantage of it in several ways. First, Maruti's extensive use of the apprenticeship, more than required by the government quota,[41] substantially lowers its labor costs, to only 1.8% of its annual sales turnover in 1996-97 (even lower at 1.4% in 1995-96), as apprentices actually substitute for regular production workers, thus offsetting Maruti's high wage bills for its regular employees. While regular production workers receive Rs. 15,000 per month as salaries and allowances, apprentices receive only Rs. 770 per month as stipends.[42] Moreover, as trainees, apprentices are not entitled to incentive bonus, provident funds, and health insurance schemes.[43]

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[41] To take on more apprentices than the quota allows, the firm must cite justifiable reasons and get approval from the government for each year.

[42] According to the government rule, apprentices receive from employers minimum stipends of Rs. 580 per month in the first year, Rs. 670 per month in the second year, Rs. 770 per month in the third year, and Rs. 880 per month in the fourth year. In addition, employers with 500 or more workers bear the recurrent costs, including tuitions for basic training at ITIs, while those with less than 500 workers share the recurrent costs with the Central Government according to a fixed formula (Government of India 1997b).

[43] But, they are entitled to a maximum of 15 days of medical leave and 12 days of annual leave.

Second, Maruti currently uses the apprenticeship scheme to screen for good apprentices for longer-term formal employment, as discussed earlier. Until 1994, 80% to 90% apprentices were retained as regular employees after the apprenticeship; the current retention rate is only about 10% to 20%. Third, Maruti uses apprentices as a labor reservoir for its phased plant expansions. Many apprentices became employed when the firm's second plant started its operation in 1996, because they had already acquired considerable firm-specific knowledge and skills. The current apprentices are also expected, on completing their apprenticeship training, to work as regular production workers in its third plant when it starts in 1999.

Finally, apprenticeship also serves as an important source of spillover of knowledge and skills to other firms as most apprentices must seek jobs elsewhere after their apprenticeship ends. Many are absorbed by Maruti's suppliers which have emerged in close proximity to Maruti. Some are recruited by Maruti's new competitors such as Daewoo, GMI, and PAL-Fiat, but many others are absorbed by Maruti's authorized service networks, which prefer Maruti-trained apprentices, who know exactly how Maruti cars work. In fact, they obtain a list of Maruti apprentices for their priority recruitment. Because Maruti brought about a major technological breakthrough in the Indian automobile industry, its service stations require workers with a higher level of technical skills than those trained elsewhere. At the same time, before Maruti's entry, other car manufacturers had paid little attention to servicing. A high level of customer services even after the sale, by high skilled workers, was a totally new concept for the Indian consumers as well as domestic producers. Thus, quality service by the workers trained at Maruti have certainly added to its competitiveness. Thus, knowledge and skill spillovers through the apprenticeship at Maruti actually benefit the firm, in terms of higher quality of components and a higher level of servicing of its cars, and this benefit appears to outweigh the cost of training, including the gains captured by its competitors.

Further, after this one-year apprenticeship, trainees still go through two more years of probationary training before they become regular employees. During this period, shop-floor supervisors closely monitor their attitudes, behaviors, and ability to perform given tasks in every six months. Thus, by the time they are formally recruited as regular production workers, they are fully skilled and familiar with their respective skill areas, their tasks, and the way the firm operates. During these two years, they receive stipends of only Rs. 1,250 to Rs. 2,000 and 50% of incentives, with some fringe benefits. This extensive on-the-job training without legal protection has let Maruti hire reliable and competent workers with considerable firm-specific skills, while lowering labor costs.

2) The Case of Telco

Telco has historically taken an active initiative in implementing the apprenticeship program. Like other firms, the 1961 Apprenticeship Act required Telco to take a fixed number of apprentices each year. But, Telco did more than required under this Act: not only does it train apprentices, but it also runs an industrial training institute (ITI) of its own within its main plant premises. In fact, Telco was one of the first Indian firms to introduce the apprenticeship scheme (Bowonder 1998). It had a strong sense of corporate mission to train workers, as the then chairman of the firm, Mr. Moolgaokar, considered the development of skilled labor to be of utmost importance for the country's industrialization, as skilled labor were not readily available in India in the 1950s and 1960s. He had a clear vision that all future Telco workers should be trained to become skilled. Telco's top management thought that in-firm training would provide the firm with a workforce that could be easily molded as the firm required specific knowledge, skills, and behaviors, which was particularly important given its high degree of vertical integration. In 1966, Telco created a state-of-the-art training center, far better than most government-run ITIs anywhere in the country. The training facility is almost one-fifth the size of Maruti's main

plant,[44] with advanced training equipment, specifically designed to cater to Telco's production needs, as well as well-equipped classrooms.

Since 1966, Telco has been running two programs for apprentices in its training center: a three-year Full-Term Apprenticeship (FTA) program, and a one-year job trainee program. Since 1967, 2,741 workers have completed the FTA program and a total of 1,254 have been trained under the job trainee program. Of 16,132 current employees, about 10% are graduates of the FTA, of whom many have become supervisors by now. Thus, Telco used the apprenticeship program to develop "core" skilled workers from whom other workers can learn. The FTA program takes 100 fresh high school graduates each year, from a pool of 5,000 to 6,000 applicants responding to local newspaper advertisements.[45] They offer hands-on training in 13 specialized trades,[46] at the in-house training center for two years (one year for welders and three years for die-makers), using the standard syllabus designated by the government for ITI use. To attend some classroom lecture sessions, trainees are sent to a local ITI once a week.[47]

The first year entails basic training for three months, training in a specific trade for four months, and multi-skill training for five months; trainees experience different skill trades in rotation.[48] In the second year, they specialize in their own trades. During the third year, trainees experience in-plant on-the-job training; they are assigned to all different divisions, including R&D division. Faculty of the in-house training center are 47 training officers selected from Telco's master skilled workers, most of whom themselves graduated

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[44] Telco's training center has 52,000 m^2 workshop space, plus 1,600 m^2 classrooms and 1,400 m^2 for a hostel; Maruti's main plant (building) is 270,000 m^2.

[45] The selection process involves 1) screening based on criteria such as a high school diploma in that year or the previous year, a 60% pass in science and calculation on the SSC exam, and an age range of 16 to 20; 2) a written aptitude test; 3) interviews by Telco's training committees; and 4) a medical checkup.

[46] These 13 trades are : fitter; turner; machinist; sheet metal; tool & die making; maintenance; electrician; electronic mechanic; motor vehicle mechanic; welder; painting; molder; and grinder.

[47] The Indian apprenticeship program was modeled after the German dual system of apprenticeship. But, in the German system, apprentices are mainly taken by small-scale craft production firms, whereas in India, apprentices are mainly absorbed in large-scale firms. For a review of the German dual apprenticeship system, see OECD 1994, Tsuchiya 1998.

[48] The syllabi for different trades are prepared by the respective Trade Committees comprising trade experts from the industries (Government of India 1997b).

from this in-house training center some twenty or thirty years ago. This training center focuses on trades directly related to those required in Telco's production processes. Telco's in-firm training thus overcomes a common problem of a wide gap between the content in the textbooks and the actual practice on the shop floor. Even outside the official coursework, instructors provide some trainees with one to two hours of special coaching to "make them become 100% skilled artisan."[49] In accordance with government rules, trainees receive small stipends: Rs. 600 per month for the first year; Rs. 700 per month for the second year; and Rs.900 per month for the third year, in addition to free accommodation and subsidized meals. Telco's excellent apprenticeship training has resulted in 24 awards in national annual competitions and 57 awards in regional annual competitions for best apprentices, as well as 5 awards in national competitions and 17 in regional competitions for best training establishment. Somewhat surprisingly, Telco does not permit apprentices to substitute for production workers during the first two years, even at times of sudden demand fluctuation, allowing them to be totally relieved from any activities directly related to actual production. After trainees complete their three-year training at this in-house ITI, they take a national-level test administered by National Council for Vocational Training (NCVT).[50]

In addition, Telco offers a one-year job trainee program, which is equivalent to Maruti's apprenticeship training: 50 trainees each year receive practical hands-on training on the actual shop floor, after their two-year training at ITIs. They specialize in one of five trades: drawing man, grinder, sheet metal, welder, and iron machinist. Like FTP trainees, trainees under this program are also provided with hostel facilities, subsidized meals, and sports facilities.

Until 1984, all apprentices were absorbed as regular employees in Telco. Since then, the retention rate has declined, due to a lack of vacancy within the firm. In 1996,

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[49] Interview with a training officer of Telco, Pune, in August 1998.

[50] Apprentices who completed the apprenticeship training appear for the All Indian Trade Test conducted by the NCVT.

Telco retained only 30% of its apprentices in particular skill trades. According to Telco's Human Resources manager, graduates of the three-year FTA have shown higher productivity than other workers. Clearly, Telco's skill formation system is more thorough than Maruti's and oriented toward individuals' acquiring specific trade skills. The remaining 70% are quickly absorbed by the surrounding industries, including other automobile manufacturers located in Pune (such as Bajaj Auto and Bajaj Tempo). About 25% to 30% of Telco apprentices find jobs in Telco's suppliers, most of whom are small-scale, in the region. Like Maruti's trainees, Telco's trainees have a high premium because of the "Telco Stamp": Apprenticeship at Telco provides them with a credential additional to their academic certificates in the external labor market.[51] As at Maruti, Telco provides a ready-made trained and skilled workforce for local industries, serving as an important source of skill spillover to its suppliers in the region.

3) Discussion: Apprentice Training as Government-Private Institutional Synergy

Clearly, both Maruti and Telco have utilized apprenticeship schemes beyond what is required as statutory, albeit differently. They have adapted the scheme to suit their respective internal labor markets. The 1961 Apprenticeship Act has in effect set the educational standard of production workers in large firms at the level of post-secondary industrial training plus a one- or two-year industrial apprenticeship throughout the Indian industries, ensuring the secure supply of high-quality industrial labor, with ready-to-use firm-specific skills. At the same time, the imposition of apprenticeship by the government rule, which, on the surface, appears to have served as a large constraint on firms, actually provides firms with flexibility in deploying labor. Both firms effectively use the apprenticeship schemes as a buffer to adjust to changes in demand for production labor; as a screening device to select the best-performing workers for long-term employment; and as a source of knowledge and skill spillover to their suppliers and service stations. These

[51] Interviews with a senior manager of Telco, Pune, in August 1998.

gains from spillovers certainly makes the firm's return on investment in training greater when the ratio of local contents is so high, as in the cases of Maruti and Telco. Human capital theorists fail to capture these increasing returns (rather than just costs) on investment in training accrued to the firms through spillovers to the supply chains.

Indeed, for both Maruti and Telco, the extensive three-year in-house training (one-year apprenticeship and two-year probationary training in Maruti and three-year apprenticeship in Telco) without full commitment for long-term employment, legal protection, or handsome remuneration, has helped the firms employ workers of good quality, while using their labor at an extremely low cost as only a tiny fraction of regular salaries. Their high-wage policies have also ensured a low rate of labor turnover, thus keeping the cost of training low in the long run.

Neo-classical human capital theorists regard labor legislation like the 1961 Apprenticeship Act that imposes a quota of apprentices on large firms, as distorting the functioning of the labor market (Middleton et al. 1993). However, this firm-level study finds that the firms have actually turned the imposition into a means to efficiently recruit workers trained in firm-specific skills. Indeed, both Maruti and Telco have developed a successful institutional alliance linking them directly with local vocational training institutions, i.e., ITIs. This institutional arrangement has certainly worked well, in terms of developing worker skills, particularly firm-specific skills, based on their own needs. Thus, in effect, it has created an efficient mechanism for supply of and demand for skills to meet. Moreover, it has effectively standardized the academic level of industrial workers as post-secondary industrial training at ITIs among all large firms throughout the country. This institutional mechanism was in place long before the Indian economy became globalized, but certainly became more effective after the industry started growing.

3.2.3 In-firm Formal Training

1) The Case of Maruti

Maruti has very well-organized in-firm formal training programs. New workers first participate in induction training, conducted by Maruti's training department. Newcomers spend one day to learn about the company, and another day to learn about Maruti's production processes. This is followed by one week of training on the line to observe how things work on actual lines. Following this induction training, they spend two years in probationary training, as discussed earlier,[52] learning about the operation of machines, production processes, material, and maintenance. Also, they learn from their shop floor supervisors about the Maruti Operation Standard (MOS), a particular sequencing of tasks and procedures. This standardization of work design and its thorough diffusion throughout the shop floor is a key strategy to induce firm-level learning.[53] In Maruti, the training on the MOS is standardized and procedurized through manuals. Paradoxically, while the literature often argues that knowledge required on the contemporary shop floor is increasingly becoming *tacit*, in-firm training actually increasingly requires a more and more *codified* method (see Chapter 4 for more discussion on this point).

Some scholars argue that flexibility in adjustment procedures, often seen as a main feature of Japanese production systems, makes production processes much more efficient than any standardization of adjustment procedures, because flexibility allows workers to make more use of their intellectual skill (Koike and Inoki 1990). Maruti's experience, however, shows that to achieve flexibility on the shop floor, the firm used in-firm training to introduce highly standardized procedures, which were thoroughly internalized by production workers. Such training has thus had a tremendous impact on labor productivity, because workers understood what to do when problems occurred, what to attend to, and how to solve such problems. In other words, Maruti's skill training also involved codifying knowledge to make tacit knowledge accumulated within the organization sharable among workers.

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[52] In 1997, Maruti extended this probationary training period from one year to two, because "there is so much more to learn for new comers," as a Maruti manager commented.

Maruti's regular training programs for production workers aim to upgrade skills, bring about attitudinal change, promote personal career growth, and develop communication and interpersonal skills to facilitate team work. Training for production workers is conducted by their own department on the shop floor. Interestingly, until 1988, the acquisition of technical skills was less of a focus than attitudinal changes and problem-solving skills. However, at present, production workers in specific skill areas are often sent to other Indian firms (such as a manufacturer of special types of electrical equipment), or to specialized training courses outside the firm, arranged by Maruti's Training Department, to enhance their specific skills.

For existing employees, every employee in each occupational group is trained regularly according to an individual annual training plan. The plan is prepared each year by the worker, his supervisor, and his division manager in consultation with the training department, through which the individual's training needs are identified. This annual training program is well-reflected and embedded in Maruti's wage and promotion structures. Unlike many other firms, even unskilled workers (called "attendants" at Maruti) are trained. All employees are trained in a classroom around the year on various subjects such as management, awareness, production systems, health, safety; and company future/ company targets (see Appendix 3.2 for the subjects covered in-firm training in Maruti and Telco).[54] Workers commented that they are most interested in topics on the company's future plan, because "if the company's future is better, workers' future is better." Such training apparently motivates Maruti's employees and implants a strong sense of corporate identity among its employees.

Interestingly, Japanese and Indian managers have different perceptions on what motivates workers to learn. Japanese managers find it difficult to motivate Indian workers to learn new knowledge and skills to widen their tasks without monetary rewards, in the absence of a system to publicly recognize an individual's efforts to improve his skills. On

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[53] A similar observation is reported about NUMMI in the U.S. (see Adler 1993).

the other hand, Indian employees, both management and labor alike, think that they have been greatly motivated, because they identify the company's future with their own. They see their future career growth as totally dependent on the future of the company. They think that if Maruti fails, they will be the ones to lose jobs. This strong sense of identity with and commitment to the firm among Maruti employees is demonstrated by Maruti's workers' exceptionally high attendance rate of 93%, compared to the average attendance rate of 80% for other Indian firms.[55] This has also helped the firm create an environment conducive to organization-wide *collective* learning through the development of shared expectations and goals, as well as the diffusion of norms regarding expected standards of performance. Clearly, Maruti's in-firm training programs have been oriented less toward technical skills and more toward the infusion and diffusion of values and norms that help raise the firm's productivity.

Several additional factors have also helped create attitudes among Maruti employees that are conductive to collective learning. First, relatively cordial labor relations at Maruti have helped; initially, Maruti's union was affiliated with the Indian National Trade Union Congress (INTUC), which represented the unions in the automobile industry. But, after a serious labor dispute in 1987, Maruti created its own company union, resulting in more harmonious relations between management and labor. Second, as discussed earlier, Maruti recruits only fresh ITI graduates. This has made it easier for Maruti to infuse corporate values that motivate workers to improve their performance, because they are more receptive to learning Maruti's styles of operation, rules and procedures, that are far more efficient than existing firms, and because they are free from those in existing labor unions which have been so politicised in India.

For supervisors, executives, and managers (see Table 3.2), professional consultants and already trained managers conduct separate training programs to improve their managerial skills. The objective of this training is to raise quality awareness in the

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[54] Each class has about fifty participants.

workplace: managers learn why improving quality is important and how to improve quality, through subjects such as quality, tools, monitoring, how to detect defects, man management, leadership training, and team building. The focus is particularly on developing diagnostic and problem-solving skills: they are taught, with the data, how and why things went wrong. This has led the firm to enormously improve both product and process quality, and safety in Maruti. Managers are also sent to training offered by industrial associations (such as CII) on selected topics.

Moreover, Maruti was the first Indian car maker to conduct training for managers, customer service personnel, and technicians from more than 1,000 authorized service stations and dealers. With intensified competition, car makers started focusing on not only producing and selling, but also servicing and other types of customer services. This was a totally new concept in India, where highly protected and regulated domestic markets had long been "sellers' market" rather than a "buyers' market." Thus, Maruti's training also ensures increasing returns through skill development among its workers at its authorized service stations.

2) The Case of Telco

Since 1973, Telco evolved an elaborate formal training program of its own, covering 60 subject areas. In contrast with Maruti's in-firm training, Telco's training has traditionally focused on upgrading technical skills. In addition, Telco runs one-time need-based training programs when it installs new machines at the request of each department. Often the trainers are Telco's own employees. In some cases, however, outside specialists are brought in to conduct training in such areas as welding technology.

In 1996, Telco made some important changes in its training policy as intensified competition in the domestic as well as international markets forced the firm to improve its product quality. Telco appointed a new manager in charge of training, who drastically

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[55] A talk by Mr. B.C. Bhargava, a former Maruti CEO, at Harvard, February 1998.

reformed the firm's training activities. He reorganized both the content and extent of in-firm regular training programs, reflecting the introduction of new management techniques based on the principles of the Japanese production systems. In the 10 months after his appointment, his department trained 11,615 employees, 72% of the total. The training expenditure amounted to Rs. 60 million in 1997-98, a little less than 0.05% of Telco's annual sales.

Table 3.10: In-firm Training Participants: Maruti and Telco, Pune (1994-95 - 1997-98)
(No. of participants)

	1994-95	1995-96	1996-97	1997-98	Total No. of Employees 1997-98
Telco, Pune	11,999 (79%)	23,285 (150%)	27,119 (169%)	40,507 (251%)	16,132
Maruti	20,036 (414%)	10,309 (208%)	10,886 (205%)	8,278 (145%)	5,690

Notes: (%) refers to a share of employees trained in total employees.
Source: Maruti and Telco.

The number of Telco's participants in training has rapidly increased in recent years (see Table 3.10), though the average number of days spent on training per employee remains much lower, 3 days at Telco, compared to 10 days at Maruti.

Since 1996, the new manager has introduced new subjects such as "5S," Total Productive Maintenance or TPM (how to maintain own machines), benchmarking, safety, housekeeping, more computerized technical skills such as Statistical Process Control (SPC), Geometric Diametering (GD), and Computer Aided Design (CAD), in addition to a environmental and behavioral focus in training. Thus, the focus of Telco's training programs has shifted from technical aspects of training, such as the use of cutting tools, engineering drawings, painting techniques, and welding defects and inspection, to new areas. These include 1) a customer-driven and customer-focused operation; 2) physical environment and safety (e.g., precautions for eye, finger, and hand injuries); 3) operational performance and environment (leadership/communication); 4) employee involvement and physical fitness (health/stress management/backache); and 5) materials handling. Also, like

Maruti, Telco recently promoted an extensive use of computers in the workplace, and hence increased more computer-related training, in such areas as painting and molding. Computer skills have become essential with the introduction of such techniques as Program Logic Control (PLC) and Computer Numerical Control (CNC), as well as the increased use of computer network among different departments (Bowonder 1998). Clearly, the nature of skills has changed due to technological change in recent years, which in turn changed the subjects covered in in-firm training. But, increases in the amount of training resulted from the changes in its institutional environment, and particularly the intensified competition within the domestic markets (see Chapter 2).

Despite the introduction of such new training components, however, Telco saw no visible sign of change in the performance of its workers or of the firm. Telco's new training manager diagnosed that no change had occurred because individuals were not sensitive enough to convert knowledge into action. Therefore, Telco started sensitizing its employees to promote organizational change. The management recognized the importance of creating an organizational culture to promote the diffusion of a norm that values higher product quality; then, he felt, employees would slowly respond to a change in the organizational culture. The department started requiring "implementation reports": individuals who participated in training activities were to state how they used their newly acquired knowledge in their own workplace.[56] Moreover, in 1997, Telco started an additional campaign to promote a different theme each year across both management and labor, such as "5S" for 1997 and "safety of hands and fingers" and "*pokayoke* " (a Japanese management technique to make workers alert to avoid errors to reduce defects on the line) for 1998.

Moreover, Telco's recent introduction of simultaneous engineering led its training to focus on the standardization of operation with a greater emphasis on quality control (Bowonder 1998). As at Maruti, reflecting the adoption of international quality standards

such as QS 9000 and ISO 9002, and a greater need for intra-firm coordination (Bowonder 1998), in-firm training has become more critical as a means of internalizing the procedures and disseminating knowledge throughout the organization (See Appendix 3-2).

As changes since 1996 suggest, the content of training has become more oriented toward changing behavioral traits, which requires a diffusion of values and knowledge in the workplace, rather than the improvement of technical skills, which would be embodied in individual workers. Thus, the focus of in-firm training has shifted from the *acquisition* of individual technical skills to the better *utilization* of individual cognitive skills in the workplace. As a training manager puts it, "Every worker must put skills into action; it is not enough to acquire his skills." Telco also started reorienting its training toward organizational skills; as the training manager put it, "Not only changes in the formal structure of the organization, but also it is important to recognize people. By changing the environment, people's behaviors can change and changes are actually happening."[57]

3) Discussion: The Diffusion of Values and Norms

As described above, both Maruti and Telco have well-organized formal training programs for employees in different occupational categories, based on individual annual training plans developed among the individual, his supervisors, and respective training departments. Both firms have measures to evaluate the effectiveness of individual training sessions. Both firms primarily use their own employees as trainers. Such institutionalized forms of in-firm training had evolved over time long before liberalization policy was introduced, and have served as an integral part of the firms' efforts to develop workers' skills and hence the firm's organizational capabilities.

However, in response to transformations in the industry, in the mid-1990s, both Maruti and Telco quickly introduced some new subjects to their training curriculums,

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[56] Also, at the end of the training, participants must give feedback on the content of the training, which is reflected in a meeting for divisional representatives for improvement.

[57] Interview with a Telco manager, August 1998.

reflecting the introduction of some management techniques, often considered a salient feature of Japanese production systems, such as TQM, 5S, and *kaizen* (or continuous improvement). Somewhat surprisingly, however, despite Maruti's presence in India since the early 1980s, only in the mid-1990s did the firm actually introduce these management techniques. Clearly, both firms have adopted the principles of "high performance organizations" (Doeringer et al. 1996, Adler 1993), with a greater focus on quality improvement and behavioral change.

On the surface, therefore, the cases of Maruti and Telco support the "convergence" argument in some recent literature, as discussed earlier (Womack et al. 1990, Florida and Kenney 1991, MacDuffie 1996). However, a closer examination still finds considerable differences between the way training programs are conducted in the two firms. First, Maruti's training has focused on the diffusion of values and norms about operational and quality standards, while Telco has focused on enhancing individual skills. Second, while both firms stress the standardization and use in-firm training to achieve the standardization, they in fact focus on very different dimensions: Maruti is concerned with the standardization of procedures related to line management, whereas Telco is more concerned with design specifications and protocols (Bowonder 1998). Finally, Maruti's in-firm training has facilitated a gradual diffusion of procedures through standardization and formalization of procedures, while Telco's in-firm training induced a rapid change in employees' attitudes and norms.

3.2.4 Overseas Training

1) The Case of Maruti

Maruti allocates considerable resources to overseas training activities in Suzuki, Japan, and relies heavily on Suzuki's cooperation in training.[58] When the Maruti project

[58] In fact, Maruti's balance sheets have a separate line indicating the amount of expenses allocated for overseas training in Japan.

started in 1982, many managers were sent to Japan. They laid out the project with their counterparts from Suzuki. Maruti was designed to be almost a replica of Suzuki's Kosai Plant, including the plant layout and the form of work organization. This initial dispatching of many managers, engineers, and supervisors, who learned how the Japanese plant actually operated helped the firm acquire project execution capabilities.[59]

As of 1998, a total of 1,380 Maruti employees at all levels including production workers, or a little more than one fourth of its total workforce, have been sent to Suzuki in Japan for training. As Table 3.11 shows, the majority of training for Maruti employees actually takes place in Japan. In addition, a total of over 834 Japanese engineers came to Maruti to transfer knowledge and skills to Maruti employees. At present, 10 Japanese are stationed in various functions at Maruti on a long-term basis (for 3 to 4 years), and another 10 Japanese are on short-term missions to Maruti, usually for 3 to 6 months. Maruti (and its partner the Indian government) and Suzuki have deliberately agreed that technology transfer between the two firms should occur by way of skill development through direct exchange of employees between the two firms.

Table 3.11: Maruti's Investment in Training : Training Manhours by Training Types (manhours)

	1993-94	1994-95	1995-96	1996-97
Annual Training Plan	12,698	37,316	34,913	56,975
External Training	14,504	7,716	13,640	13,248
Training in Japan	207,384	210,008	38,736	212,568
On-the-job Training (excluding on-line training	1,627	15,109	8,964	14,856
Total	236,213	270,149	96,253	297,647

Source: Maruti's internal documents.

[59] For discussions on project execution capabilities, see Amsden and Hikino 1994.

Two intermediary training organizations have facilitated and coordinated Maruti's training for managers, engineers, and supervisors in Japan: the Association of Overseas Technical Scholarship (AOTS), Tokyo, a non-profit organization sponsored by the Ministry of International Trade and Industry (MITI); and the Japan Vocational Ability Development Association (JAVADA), Tokyo, a non-profit organization sponsored by the Ministry of Labor of the Japanese government (see Appendix 3.3 for details of AOTS training schemes). In both cases, after the initial two-week introductory sessions, participants are sent to their respective "host" firms (i.e., Suzuki in the case of Maruti employees) for their on-the-job training. The duration of the overseas training varies depending on the occupational category of employees. In addition, each year, about 15 to 20 managers are sent for managerial training under the AOTS scheme. Clearly, AOTS and JAVADA as a training intermediary have played an important role in facilitating skill transfer between the two firms, and disseminating Japanese work organization, norms pertaining to process and product quality, and work culture among Indian managers and workers.

Moreover, about 120 production workers go to Suzuki each year for six-month training. It is a common practice for Japanese supervisors to visit their foreign affiliates' plants in developing countries and for supervisors from their transplants to work for short periods in their Japanese partner's factories (Koike and Inoki 1990). But, Maruti sends not only supervisors but also production workers to Suzuki on a massive scale for an extensive period. They are assigned to Suzuki's two plants in Japan, where they undergo on-the-job training in areas related to their tasks in Maruti, to gain "hands-on" experience and learn about new technologies and production processes. In addition, trainees in specialized skill areas (such as painting and die-making) participate in six-month on-the-job training and three-months off-the-job training.

Their training involves actual observation and experiences with Japanese shop floor practices, and in particular, in the areas of line management, safety management and quality

control. The main focus of training includes: 1) how to maintain and improve their floor and workplace (based on the concept of "5S"[60]); 2) how to distinguish good and components; and 3) the right sequence of procedures in the production processes; 4) how to improve the workplace (through *kaizen*); 5) how to find and handle problems when they occur, and 6) the importance of being punctual. Suzuki's managers maintain that "unless trainees actually see how the line flows and what happens, they cannot acquire real knowledge on a long-term basis."[61] The main objective of the training is to let workers understand the importance of "full proofing" in the production processes, particularly in the aspect of process control. Workers thus learn "to go back to the men who are sitting there to identify what's wrong and fix the problem right there,"[62] to acquire diagnostic and problem-solving skills. For example, suppose a trainee finds oil leaking through his cleaning as a part of "5S." Then, he would learn why the leak occurs, and how to fix the problem. He would then learn how to prevent a situation where he would otherwise have to stop the line. Or, he would use gauges and learn how to keep items within the expected standard, and how that affects quality. Or, he would learn what types of drivers they need to use to fasten certain bolts. This way, trainees eventually learn that product quality is actually determined by how they operate on the line. They also observe what group leaders do and how they behave when the line stops to solve problems.

All Maruti engineers, after one-year of initial training at Maruti and another year on the shop floor, are sent to Suzuki for three months of training through AOTS. Maruti believes that because its technologies are far more advanced than those in other Indian firms, the direct exchange of people between Maruti and Suzuki is the only way for workers to understand the nature of advanced technologies and how they work. Overseas

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[60] "5S" is a slogan widely diffused on the Japanese shop floor for improving safety, preventive maintenance, and efficiency. It stands for five Japanese words all starting with the letter S, namely, "seiri" (putting things in order), "seiton"(neatness), "seiketsu"(cleanliness or hygienic), "seisou"(cleaning), and "shitsuke"(discipline). Japanese managers emphasize "5S" as the essence of Japanese production principles.

[61] My interviews with a Suzuki manager.

[62] My interviews with a Maruti engineer.

training has helped employees realize that standards expected of them differ from those in other domestic firms.

Only in the last four years has Maruti started sending 4 to 5 design engineers to Suzuki for two-year training on the job in Suzuki's R&D department to develop Maruti's own design capability. Engineers who have returned from Suzuki have played a key role in accomplishing Maruti's recent first minor model change of "Maruti 800" on its own. Thus, overseas training contributes to gradual technological deepening in Maruti.

How can Maruti afford to invest so much in training in Japan? The cost of training is shared among Maruti (one-way airfare), Suzuki (25% of the return airfare) and AOTS (75% of the return air fare). Participants in the overseas training still receive salaries from Maruti during their training in Japan and receive allowances from Suzuki (including boarding costs). They stay at Suzuki's company dormitory with their Japanese co-workers and receive the same treatment. AOTS looks after other costs incurred on the introductory training sessions and other events for participants.

Moreover, this is a win-win arrangement for all the parties involved: Maruti workers gain new skills, and a six-month overseas living experience including free weekends in Japan; they bank their salaries from Maruti for these six months. Maruti keeps its otherwise expensive overseas training costs relatively low because of a heavy subsidy from AOTS and costs borne by Suzuki, and gains a long-term productivity increase from the overseas training. Maruti also uses this overseas training scheme as an incentive to motivate workers: only "good performers" are selected for overseas training. Simply being selected for overseas training carries some prestige. Finally, Suzuki saves on labor costs by accepting these overseas production workers, as cheap labor: paying allowances to them is much cheaper than hiring Japanese temporary workers.

Therefore, this training scheme is not just a two-firm partnership, but, a tripartite institutional arrangement among Maruti, Suzuki, and intermediary training organizations in Japan, well-institutionalized to facilitate the cross-country transfer of knowledge and skills.

These arrangements with AOTS and JAVADA are available to any firms in India as well as in other developing countries, regardless of whether they have FDI partners in Japan or not. But, Maruti and Suzuki apparently have made exceptionally good use of them to the extent that Maruti employees account for nearly one fourth of all trainees from India sent to Japan under the AOTS scheme and that Maruti institutionalized this arrangement by externalizing its internal labor markets beyond the boundary of the firm.

Such massive overseas training has provided trainees of all levels with instant exposure and access to "better practices" the latest technology, production processes, work practices, and working environment. Exposure lets workers observe Suzuki's production processes, how to handle problems, and what quality standards are required. They also realize what their future workplace could be like if they improve their performance (they visually realize that "they can work more accurately, use fewer movements, incur lower costs, and work faster to achieve the same outcomes. It will actually be easier to perform the same tasks, than the way they did it in India"). Exposure itself broadens the mindset of Maruti employees. For instance, at Suzuki, different types of cars are produced on one line; Maruti workers can imagine this will be introduced in Maruti in the future. Workers realize that "we should be getting there in the near future."[63] As a Suzuki manager pointed out, these outcomes of training cannot be obtained even if trainers are sent from Suzuki to overseas affiliates, because local workers cannot really grasp, understand, or believe in what the trainers tell them.

Thus, overseas training in Japan also serves as a constant reminder for Maruti workers as to how different Maruti practices are from those of existing Indian firms: more efficient, more disciplined, and more participatory in day-to-day operations. Maruti's training department manager emphasized, "from day one, Maruti workers learn three aspects: to feel part of the company; to respect Maruti culture, and to believe in teams."[64] Such exposure has also helped Maruti employees understand why the kind of change

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[63] Interviews with the Manager of Maruti's Training Department, in May, 1997.

introduced in Maruti yields better plant performance than conventional practices in India. In other words, this overseas training facilitates a change in the value and behavioral norms of Indian workers. A Maruti worker who joined the firm in 1984 commented, "at Maruti, the environment was very different from other firms in India, in terms of more discipline and more uniformity. Many workers liked this new culture, because they believed that it would be essential to adopt such new practices for the development of India." Another worker said, "when I was sent to Suzuki in 1995, everything looked new. Even the loading of materials was done on the conveyer, which has been done manually in India. But, gradually I see the system that I saw in Japan is being introduced to Maruti."[65] Clearly, constant exposure to foreign practices by *all levels* of employees has enabled Maruti to speed up the process of diffusing ideas, knowledge (both tacit and codified), and behaviors within the firm, and building a collective and less hierarchical learning mechanism.

Therefore, a focus on team work, which has often been claimed in the literature to be a salient feature of the Japanese shop floor, is not just about forming groups among the workforce; it requires the thorough dissemination and diffusion of information and understanding across all levels of employees. Transferring knowledge from Japan to India therefore has necessarily involved creating an institutional mechanism to allow such dissemination and diffusion.

Another focus of overseas training has been to let Maruti workers understand the importance of keeping the workplace and equipment clean, neat, and tidy, a new concept to Indian plants before Maruti's entry. Naturally, work organization affects productivity, through a reduction of waste in materials, change-over time, and rework, and thus a reduction in defect rates, but workers in India had not seen this positive link clearly. Particularly, in India, sweeping has long been considered a job of the lowest caste, in the caste system which has largely determined India's highly-stratified social relations. Thus,

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[64] Interviews with a training manager at Maruti, in March 1997.

to see the workplace in Japan, where Japanese managers actually clean the line themselves after workers go home has enabled Maruti workers to conceptually link a cleaner workplace with a higher productivity (thus higher wages), helping to break cultural values embedded in the dominant social relations.

After their return to India, trainees are required to make at least two suggestions to improve the way they work, under Maruti's suggestion scheme, to save costs. They are also expected to serve as a focal point in imparting knowledge to their co-workers who have not gone to Suzuki. Therefore, Maruti's overseas training has served not only as a means of direct knowledge and skill transfer and indirect skill spillovers but also as a reward, motivating workers to perform better. In short, this overseas training provides three benefits to workers: 1) skills (both analytical skills and behavioral traits); 2) motivation through incentives; and 3) realization of long-term corporate visions of where they (or the workplace) will be in the near future, helping them develop a sense of commitment to the firm.

2) The Case of Telco

Unlike Maruti, Telco provides its employees with few opportunities to train abroad. As a domestic local producer, Telco has had no direct collaboration with foreign firms in the area of training. Telco Pune plant sends only three or four engineers overseas a year to attain specific skills related to particular technologies. Typically, when a new piece of equipment is installed, a few engineers are sent to the foreign equipment suppliers; For example, when a German-made aluminum foundry was installed, some engineers were trained in Germany. In addition, only senior managers visit foreign firms or exhibitions, and only occasionally. Most Telco's employees' only exposure to foreign practices is the AOTS correspondence course, administered by the AOTS office in Delhi; about 150 Telco employees have participated so far.

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[65] My interviews with a Maruti worker in January 1997.

3) Discussion: Exposure versus Internalization

These differences in the amount of exposure to foreign practices actually reflect different patterns of learning in these two firms. At Maruti, learning involves a direct transfer of knowledge and skills through individual exposure, concrete instruction, and on-the-job training at the work site among employees at various levels, as was the case of other Japanese transplants in Southeast Asia (Koike and Inoki 1990). This allows employees to instantly visualize and realize what they should aim at; and easily convince them of the outcomes of the knowledge transfer while they are still undergoing that knowledge transfer (i.e., "seeing is believing"), thus achieving speedy dissemination of knowledge and skills. Indeed, the less time spent on diffusing information and knowledge, the more the firm can improve their productivity. In other words, in Maruti, overseas training on a massive scale, along with its flatter hierarchical structure and more participatory management, has facilitated a faster information flow within the firm and between Maruti and Suzuki.

On the other hand, at Telco, senior management first has to be convinced of the merits of certain knowledge, skills, and techniques, either embodied in foreign technologies that it purchases or disembodied, to determine whether to adopt them. The decision of senior management is influenced by the degree to which such knowledge, skills, and techniques have been diffused in the industry as a whole, at home and abroad.[66] In fact, Telco's decided to adopt certain new production techniques such as Total Quality Management (TQM), Statistical Process Control (SPC), and *kaizen* as a result of its benchmarking against the practices in the U.S. auto manufacturers (i.e., GM, Ford, and Chrysler).[67] Telco had no direct influence from Japanese-related firms in India, including

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[66] The concept of industry-wide institutional isomorphism is articulated in the recent literature on the new institutionalism in organizational sociology (see Powell and DiMaggio 1990).

[67] For discussions on the nature of organizational changes in terms of the adoption of some Japanese production techniques by the U.S. auto manufacturers, see Womack et al. 1990, Adler 1993, MacDuffie 1996.

Maruti, except for the introduction of *kaizen* activities, for which Telco has hired a short-term Japanese consultant.

The lack of direct exposure and/or contact with foreign practices among most Telco employees means a very different mechanism of intra-firm diffusion of knowledge in Telco from that in Maruti: Telco has fewer entry ports for acquiring foreign knowledge. This also reflects Telco's long tradition of self-learning with a strong focus on the internalization of bought-out foreign technologies. Therefore, any intra-firm diffusion necessarily requires indirect transmission of the experiences of a llimited number of senior managers and engineers, which necessarily involves the codification of that knowledge and skills: New ideas, knowledge, and practices brought into the firm by a few senior employees are gradually translated into policies, rules, documents, manuals, and so on, which in turn diffuse and filter down across organizational hierarchy to the level of production workers. In-firm training serves a means of this diffusion and subsequent embodiment of such ideas, knowledge, and practices in employees.

In short, Maruti's strategy in training was to *externalize* its on-the-job training beyond the boundary of the firm, while Telco's strategy was to *internalize* its technological development through training. In turn, these differences may also reflect different orientations in technological development: Maruti focuses on production capabilities, whereas Telco focuses on innovation capabilities.

3.2.5 Work Organization

1) The Case of Maruti

From the outset, Maruti consciously chose to create a corporate culture and work organization different from those of other Indian firms. The first managing director, Mr. Krishnamurty, sat down with workers to discuss issues related to organization of work,

which was a quite unusual, given the prevailing labor relations in India, often characterized as "hostile and a total distrust between management and labor."[68]

However, although various techniques and measures of Japanese production systems were transferred to Maruti from Suzuki, it turned out to be hard to create flexibility in the execution of various tasks by relaxing the clearly defined job description. According to a Japanese manager of Maruti, Indian workers do not like to become multi-skilled, because they tend to feel deprived and exploited if they do more than they were paid for. Thus, it has been very difficult to motivate workers to become multi-skilled. Moreover, job rotation, which is often considered a key practice in "lean" production systems, has not been introduced in Maruti (Chatterjee 1993).

Maruti introduced "QC circles" and "suggestion schemes" right from the outset to duplicate Suzuki's culture. The QC circles meet once a week during working hours to discuss problems encountered in the group and suggest improvements.[69] But, until 1995, the suggestion scheme merely required each employee to write down an idea and receive a token reward of Rs.2 per suggestion; the scheme rarely implemented those ideas but merely tried to keep workers thinking.

In 1995, Maruti introduced *kaizen* activities and modified its suggestion scheme; together these moves made Maruti's employees realize the importance of workers' participation. Newly recruited engineers participate in *kaizen* groups, composed of the best-performing employees in each department. Those who make many suggestions are usually included in the *kaizen* groups. Simply being selected for the *kaizen* group itself generates a source of motivation for employees. Suggestions from employees are graded A through E, depending on how much cost saving and performance improvement it will generate when implemented. Monetary rewards are granted according to the grade for each

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[68] A talk by Mr. B.C. Bhargava, a former CEO, Maruti, at Harvard, February, 1998.

[69] In Japan, QC circles meet *after* working hours. But, this was not acceptable to Indian workers.

suggestion.[70] In 1996-97, employees in the production division were given targets of 9 suggestions per year, which led to the implementation of 33,176 suggestions during the year, and Rs. 510 million in cost savings.[71] As a result, some of Maruti's procedures and practices have now been modified to fit in Indian conditions, some even deviating from standard practices at Suzuki. According to a manager, the philosophy behind this scheme was to keep its employees, even production workers, alert, as "thinking human beings," because "if they improve, the company will grow."[72] This feeling of organizational change occurring with workers' involvement and participation, that momentum is being created from the bottom, rather than top-down, through team work, and that change has to come from the people, seems strong and well embedded within the firm.

Maruti also introduced the "5S" scheme in 1995. To continuously motivate employees, Maruti rewards the "best" department for cleanliness, and keeps putting up posters. Likewise, its QC circles induce group competition for better group performance within and between divisions. In fact, the Best QC Division is annually awarded a free trip to Suzuki, Japan to attend the Best QC International Competition organized by Suzuki. The organization-wide incentives and pressures to improve Maruti's collective performance have clearly contributed to Maruti's remarkable productivity growth (see Chapter 2). Maruti also implemented the Taylorist scientific management in terms of reduction in space, in human movement, and material movement, to improve plant-level efficiency, all totally new to the existing Indian corporate cultures. Indeed, when Maruti started in India, many of the production process techniques brought in by Suzuki, such as quality control, preventive maintenance, and inventory control, were totally new to the Indian workforce. Therefore, Maruti needed to let its workforce understand new concepts and principles

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[70] Suggestions are graded and given points on the basis of 1) cost saving; 2) ingenuity of suggestion; and 3) applicability. Then, rewards for suggestions are classified into seven categories depending on the points. Rewards therefore range from Rs. 3,000 to Rs.10.

[71] Maruti's internal document.

[72] At Toyota group firms, performance improvement is also measured by the standard operation chart. But, this practice has not yet been introduced at Maruti (though Denso India, a key Toyota group firm, has introduced it in India).

underlying these techniques, which in turn determined the nature of its skill development as discussed earlier.

At the same time, the diffusion and penetration of both technical standards and behavioral norms involves a considerable degree of standardization and formalization of rules and procedures, such as the Maruti Operation Standard (MOS), which sets out parameters, temperatures, speed, and quality, for each line.[73] This standardization and formalization in turn has required that the firm develop a way to diffuse it throughout the organization, which determined the nature of in-firm training. This has tremendously improved product quality, as their improved awareness of quality has led to thorough implementation of the preventive maintenance.[74]

However, a closer examination reveals that the nature of teamwork at Maruti still differs significantly from that at Suzuki. At Maruti, teamwork involves small group activities organized for QC circles and suggestion schemes, but work on the line itself is not coordinated on a group basis. On the other hand, at Suzuki, group activities involve every aspect of the workers' lives in factories. Indeed, at Suzuki, production-related shops are divided into small groups or *han*, consisting of 6 to 10 members. Three to five *hans* comprise a larger group or *kumi*. When problems occur on the line, team members report to their team leader, who in turn diagnoses and solves the problems, often before calling maintenance workers. They also give group members guidance and instruction as to change-over procedures and machine operations. Team leaders even look after the health, safety, and mental conditions of workers in their groups, acting as mentors for their team members. In short, team leaders, though not part of management, actually assume significant responsibilities on the shop floor. This degree of decentralization in the organization of work, a basic feature of the Japanese (Toyota) production system, has not yet been adopted at Maruti.

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[73] A similar observation is made about NUMMI in the U.S. where a highly bureaucratic organization characterized by high levels of standardization and formalization actually encourages learning by a workforce assigned to share a common goal of production efficiency and quality (Adler 1993).

In addition, Maruti introduced a Japanese-style human resources policy, including a common canteen for managers and labor, same uniforms across the hierarchy from the CEO down to unskilled workers, and a single open office for all levels of employees, where even managers do not have individual offices.[75] These egalitarian gestures have also created a sense of confidence and trust among labor, with all levels of employees showing signs of bonding and identity with the firm. Both management and labor have been very clear that Maruti is totally unconventional compared to existing Indian firms. They see Maruti as a "model for change," not only in the automobile industry but also in the Indian industry as a whole; this has generated great pride and momentum for learning among Maruti employees. These changes were revolutionary given prevailing labor relations and the hierarchical social relations in the Indian workplace.

Maruti's remarkable success in adopting the new models of work organization, management, and production processes, has brought much attention at the national level, from government officials, managers of public-sector enterprises, small firms, training institutions like ITIs, and private firm executives, particularly those interested in joint ventures with Japanese firms. In fact, Maruti received so many daily visitors that it decided to designate Saturday as "visitors' day" to let them observe and learn its way of doing business. Thus, Maruti has also facilitated learning across the industry, and the economy.

2) The Case of Telco

While Telco has also adopted new forms of work organization in recent years, its processes of adopting and diffusing these new forms differ considerably from those of Maruti. Among Telco's three plants, its Pune plant was the first to start its recent organizational change; once it succeeds, Telco plans to extend its practices to other plants.

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[74] A talk by Mr. R.C. Bhargava, a former CEO, Maruti, at Harvard, February 1998.
[75] For details, see Chatterjee 1993.

The main aim of such changes is to sensitize its employees toward quality improvement to "make them feel that they can make a difference."[76]

Since the mid-1990s,Telco has introduced various new schemes to change its work organization. It introduced the suggestion scheme in 1995, and "5S" and *kaizen* in 1996. Interestingly, Telco did not adopt these new techniques from Maruti directly, though Maruti's different production practices have had a large impact on industry-wide learning. Rather, Telco adopted these practices from U.S. auto makers after conducting a benchmarking exercise against them. Telco incorporated these schemes into its formal training programs and apprenticeship programs to sensitize its employees. About 25,000 employees learned about "5S" in 1997, resulting in visible changes: in just one year, all shops and offices became much cleaner. Operators started cleaning their own machines, a task sweepers had done before. They are now more careful about how they maintain and use their machines and work spaces. Operators became more careful about the use of their machines and equipment. Moreover, in the FTP program as described earlier, it became compulsory for trainees to make suggestions; they get Rs.25 reward for an implemented suggestion, and Rs. 1,000 for a cost-saving one. In addition, many visual displays, like posters, were introduced to make workers more aware of the importance of quality.

To implement the *kaizen* scheme, Telco hired a Japanese consultant on a two-year contract to work with its *kaizen* team consisting of 7 persons from the Kaizen Department, and several employees from different parts of the organization.[77] Since 1996, *kaizen* activities have yielded a remarkable improvement: a 69% increase in productivity in one year, 43% inventory reduction in one year, fatigue reduction, and a reduction in idle waiting time on the production line.[78] Employees expressed little resistance: they saw visible benefits.

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[76] Interview with a training manager at Telco.

[77] The Kaizen team includes 3 employees from the Auto Production Department--1 line supervisor, 2 line operators, and 1 master craftsman, plus 1 from Quality Assurance Department, and others, to get the message across different departments within the firm.

[78] Telco internal documents.

On the other hand, as described earlier, Telco had already developed an elaborate system of job rotation and multi-skilling, often regarded as a salient feature of the Japanese production system, long before its more recent introduction of various other production management techniques. Thus, a simple focus on the recent adoption of such Japanese management techniques may overlook the robust system of skill formation that has evolved in Telco over many decades.

3.2.6 Summary: Different Paths to Skill Development

The cases of Maruti and Telco have shown the critical role of training in knowledge transfer and skill development. Certainly, one cannot attribute the firms' productivity growth solely to training, as productivity growth results from a combination of many factors: reduced waste, technological improvement on the shop floor, process improvement and innovations, and training, which reduces worker error. At the same time, training changes the very way workers do their jobs, by changing values and behavioral norms, standardizing procedures, thoroughly diffusing quality awareness, and instilling "forward-looking" visions.

A closer examination of these two cases reveals that such training effects have been achieved through the interplay of various institutional factors; stable employment practices, and a well-established apprenticeship systems that link government-sponsored industrial training with in-firm on-the-job training, which in turn helps supply a high quality workforce for long-term employment. Such stable employment has in turn been aided by a set of labor policies and the firms' deliberate high-wage policies. The both firms have improvised elaborate internal mechanisms to motivate workers and reward their skills, albeit defined differently, including productivity-linked or skill-linked incentives, suggestion schemes, and overseas training opportunities.

Yet, Martui and Telco have developed different kinds of institutional arrangements for skill development, due to the different conditions under which they have operated. The

pattern of skill development at Maruti is largely shaped by its institutional alliances with its joint venture partner and training intermediaries, which have become part of its internal labor market. These institutional alliances made the direct exchange of employees easier, less costly, and safer in terms of information leakage, and administratively less cumbersome. On the other hand, Telco, as a local firm with little direct exposure to foreign practices for engineers and workers, has had to develop its own capabilities to diffuse what the organization learned from imported technologies among its employees. The firm has used training as a mechanism to internalize the organizational learning, in terms of reading and studying the drawings, and reverse engineering, which was in turn translated into training manuals and subjects, all the while linking this training to its internal incentive structures. Such internalization has required the firm to develop the technical skills of individual workers. While both Maruti and Telco introduced and incorporated new management techniques such as TQM, QC circles and *kaizen* into their training activities in both around the same time, the direction of diffusion of knowledge and skills within each firm differed: in one horizontal, and in the other vertical, resulting in different types of capabilities developed: one on production capabilities, and the other innovation capabilities.

These differences in the learning models are also reflected in a different way of developing multi-skilled workers to increase flexibility. Maruti develops multi-skilled workers who can handle many standardized tasks on the production lines, whereas Telco increases the deployability of multi-skilled workers who have mastered various trade skills.

The two different models of skill development, as illustrated by the cases of Maruti and Telco, are summarized in Table 3.12 below. These models may or may not be generalizable for analyzing the patterns of in-firm skill development in developing countries, and thus await future research.

Table 3.12: Two Models of In-firm Skill Development and Learning

	Maruti	Telco
Learning Model	Exposure-based	Experience-based
Objective of Training	Production Capability Development	Innovation Capability Development
Goal of Training	Collective skill enhancement	Individual skill enhancement
Focus of Training	Knowledge diffusion	Knowledge accumulation
Type of Skills Emphasized	Behavioral traits	Trade skills
Directions of Intra-firm Diffusion of Knowledge and Skills	Horizontal	Vertical
Sources of Motivation for Learning	Recognition of collective (group) performance	Recognition of individual performance

3.3 What Shapes the Patterns of Skill Development?

This section summarizes the findings while exploring possible explanations for what has allowed the firms to foster skill development as described in the previous section. Four factors have played an important role in shaping the patterns of in-firm skill development: 1) historical imperatives; 2) the role of the government; 3) the development of institutional alliances; and 4) firm-level strategies for technological capability development.

3.3.1 History Matters

Why did Maruti and Telco develop such elaborate internal training systems even when they faced virtually no competition in the Indian automobile industry? One explanation lies in the historical imperatives that dictated the firms' direction of skill development. Both firms' experiences show that the pattern of skill development was shaped by the historical conditions under which they needed to acquire knowledge and skills.[79]

[79] North (1990) constructs a theory of path-dependent institutional change, using the frameworks of transaction costs economics and property rights. He argues that the two forces of increasing returns and imperfect markets characterized by significant transaction costs shape the path of institutional change (North 1990: 95).

Telco's strong emphasis on developing individual specific trade skills partly reflects the firm's historical tradition of "self-learning" technological development. From the mid-1960s through 1980s, the "License Raj" regime (see Chapter 2) restricted the import of raw materials, equipment, and components, and the purchase of foreign technologies; this pushed Telco to develop specific strategies regarding product development, production, and organizational capability development (Bowonder 1998); these, in turn, determined how the firm allocated labor and developed skills. When Telco started commercial vehicle production in the mid-1950s, the only auto component industries in India were those producing tires and batteries. Telco had to produce a wide range of components, particularly mechanical parts, in house. For basic items, Telco developed proprietary design capabilities with its suppliers for such items as injection pumps, alterators, tail lamps, braking systems, and steering systems. Yet, imported contents remained high until 1970.

When Telco set up its second plant in Pune, in 1970, the government did not approve its expansion there until 1977, to protect three other commercial vehicle manufacturers under the MRTP Act (see Chapter 2), as Telco was more efficient than the others. Hence, from 1970 to1977, Telco was making only components in the new plant, while waiting for the government's approval to produce vehicles; thus it developed its capacity to produce components. Telco internally developed its capabilities in design, R&D, manufacturing of engineering equipment and tools, and large tool rooms. Thus, the Telco Pune plant even has in-house foundry, machine tooling, and casting and forging shops, a unique feature among vehicle manufacturers. The global trend among auto manufacturers, including Maruti, has been increased outsourcing of nearly all components to concentrate on assembly, but Telco could not follow this trend. While this high degree of vertical integration has inevitably raised its production costs, it also created a strong foundation for developing own technological capability in house.

This means that Telco has a wider range of internal division of labor, and therefore, specialization, than firms like Maruti. Restricted in its access to foreign technologies has led the firm to develop its own R&D capabilities involving a great deal of reverse engineering, which in turn required competent workers with a wider range of engineering skills, than contemporary assemblers like Maruti. This meant that the firm needed to develop the skills and knowledge necessary to produce those components, and subsequently commercial vehicles, given the absence of workers with those skills in the external labor markets. This experience led the firm to focus on developing skills in its workforce through its extensive training, and in particular, in developing individual technical skills.

This study finds that even amidst recent rapid changes in the institutional environment (in terms of globalization), the pattern of skill development in Telco has remained robust, with only incremental changes such as additions to subjects (reflecting the adoption of Japanese production techniques such as *kaizen* and "5S" on the shop floor). Such internal mechanisms for skill development have clearly enabled the firm to develop its innovation capabilities, as demonstrated by its high level of investment in R&D, including investment in the personnel engaged in R&D. At the same time, Telco's internal reward structures, along with a tradition of "family-like treatment" of its employees,[80] have attracted competent employees and kept them committed to the firm.

Likewise, when Maruti started production in 1983, as it uses technologies much more advanced than in other Indian auto firms, the existing educational and training institutions, such as the Indian Institute of Technology (IIT) and the Industrial Training Institutes (ITIs) were not equipped to provide the kind of skills Maruti needed. Therefore, it had to train its own employees in house and send them to Suzuki in Japan.

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[80] Many employees of Telco I interviewed emphasized this.

3.3.2 The Role of the Government

Clearly, the government has played a critical role in shaping the patterns of skill development in both Maruti and Telco. This role has been twofold: first, creating national institutional frameworks in terms of setting labor policy and training policy; and second, more direct involvement in managing Maruti. First, the protective labor policy, which prevented large firms from firing workers, constrained the firms in their recruitment and deployment of workers, thus creating rigidities in the external labor markets. However, this institutional framework actually led the firms to develop their own internal incentive structures, including elements of both motivation and rewards for developing skills: long periods of apprenticeship and probationary training; productivity-linked (at Maruti) or skill-linked (at Telco) reward systems; and overseas training as part of internal labor markets. Contrary to the argument by neo-classical economists that such institutional constraints distort the functioning of labor markets and thus discourage employers from investing in human capital (Middleton et al. 1993), both Maruti and Telco have actually turned these constraints into a motive to develop their internal capabilities.

Second, the legal obligation to train apprentices has also shaped the pattern of skill development in Indian firms, while effectively setting the educational level of entry-level production workers at one year of in-firm apprenticeship training plus two years of post-secondary vocational education at ITIs. Though the retention rate has fallen in recent years, the investment by both firms in statutory apprenticeship training has still paid off for several reasons. First, it lowers the cost of searching for labor with the right kind of skills and knowledge, and thus enhances the skill match between demand for and supply of labor: by the time they are formally hired, workers have already acquired basic knowledge and skills that are firm-specific. Second, it has spillover effects, as many apprentices are absorbed by the firms' suppliers and service stations after the training, thus sustaining increasing returns to the investment in training at the level of the supply chain. Third, this system reduces net training costs, because of the economies of scale: for smaller-scale

suppliers to individually train apprentices in their own facilities would increase the net training costs for the supply chain as a whole. Finally, the system has clearly allowed the firms to develop firm-specific skills at relatively low costs; coupled with long-term stable employment practices, this increases returns on investment in subsequent in-firm training, and allows high premiums on firm-specific skills. Thus, again, both firms have actually taken advantage of the institutional constraints created by the apprenticeship policy.

However, though this institutional framework has been in place for the last forty years, it has not always been effective. Moreover, it is unlikely that the government could clearly see all these positive gains from apprenticeship training when it set the policy in the early 1960s. Maruti and Telco, motivated by changes in the institutional environment, i.e., globalization of the Indian automobile industry as discussed in Chapter 2, have adapted to the conditions created by the apprenticeship rule, as an unanticipated consequence, beyond what the government originally intended.[81] Indeed, the apprenticeship training perhaps became more effective in the 1990s, not because the government reformed the program in response to the changing skill demand in the external labor markets, but because it allowed its program partners--the firms--to use the program to accelerate their internal learning process and adjust themselves to the changing environment.

Unlike the experiences of developed (particularly European) countries, where the apprenticeships have been institutionalized but were used mainly in small craft production firms, the apprenticeship in India has involved large firms, allowing them to more directly link it to the firm's overall human resources strategies. The Indian experience in fact can offer lessons for developed countries that have only started active discussions on possible partnerships between technical schools and the corporate sector as "alternative training" (OECD 1994).

The case of Maruti shows more direct government involvement in shaping the firm's pattern of skill development. The government insisted on including training as part

of its initial joint-venture agreement with Suzuki.[82] In fact, even after the gradual liberalization of FDI policy in the mid-1980s (see Chapter 2), the government set a series of clear guidelines for any foreign collaboration proposals to adhere, including the provision of training to Indians in the areas of production and management. As Maruti was a "model" foreign collaboration project, the government was particularly concerned with the enforcement of this guideline. Indeed, Maruti's governance structure, which maintains a fine balance between the government and Suzuki, has allowed the government great autonomy and control, including training. In fact, many of Maruti senior managers were former senior government bureaucrats.[83] Suzuki's appointment of a senior government bureaucrat as Maruti's CEO, who was well connected with the central government administration and politics and who was eager to adopt Japanese management styles, helped Maruti gain the confidence of the government, which would have otherwise been more cautious about FDI operation. The strong link with the government also helped Maruti gain considerable legitimacy within the government, as a national project for India's industrial development even during the anti-FDI regime before liberalization.

At the same time, Maruti's leadership by Indian managers, supported by a few Japanese managers, has led to its employees accepting new and unconventional ways of running businesses: management styles, production processes, and employment practices, including training. This has in turn reduced potential conflicts and employee resistance to the introduction of such new practices.

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[81] For discussions on unanticipated consequences of institutional arrangements, see Perrow (1986), North (1990).

[82] A talk by Mr. B.C. Bhargava, at Harvard, February 1998.

[83] For example, Maruti's Managing Director (CEO) is chosen by the government and Suzuki by turn every five years. The Board of Directors consists of representatives of both the government (Secretary to the Government of India, Heavy Industry, and other senior bureaucrats) and Suzuki (senior managerial staff). But, at Suzuki's turn, as a surprise to even Indians, Suzuki picked an Indian elite bureaucrat (Indian Administration Service: IAS) who was involved in the Maruti project from the inception.

3.3.3 Forging Institutional Alliances

The cases of Maruti and Telco reveal that they have not only made good use of national institutional frameworks as discussed above, but also positively built institutional alliances with other organizations, such as local industrial training institutes, training intermediary organizations, joint-venture partners, and the supply chain and service networks.

As argued earlier, the institutional arrangement between industrial training institutes (ITIs) and large firms has worked well for developing the skills of workers and reducing a gap between classroom-based vocational education and actual shop-floor practices. In fact, India has a long history of this partnership between government-run industrial training institutes and firms: it started in the 1950s, and gradually spread in all the states. The central government set the rules and developed training manuals for industrial training. Clearly, the apprenticeship training has been more efficient and effective, compared to training conducted at such vocational training institutions' own facilities, which has been widely speculated as inefficient, unsatisfactory, and ineffective for providing the types of skills demanded in the labor markets (Middleton et al. 1993). Even an ITI training officer admits that the type of skills provided by ITIs "cannot be utilized in the contemporary workshop."[84] In the 1990s, as the Indian economy has increasingly become globalized, the number of apprentices has risen by 40% nationwide, especially in the automobile, hotel, and electrical servicing industries.[85] Both Maruti and Telco closely interact with local ITIs for coordinating the apprenticeship training. For example, local ITIs frequently send their trainers to the firms sponsoring apprentices to monitor their training performance and learn the nature of their operations. Their observations are in turn reflected into basic training held at ITIs.

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[84] Interview with a training officer, ITI, Delhi, in March 1997.

[85] Interview with an officer from the Directorate of Employment and Training, the Ministry of Labor, the Government of India.

A large body of literature points to the role of multinationals in transferring knowledge and skills (Kokko 1991, Caves 1996). The case of Maruti reveals, however, that not only its joint-venture partner, Suzuki, but also training intermediaries such as AOTS and JAVADA have played important roles in facilitating inter-firm knowledge transfer by institutionalizing overseas training for workers from developing countries. As discussed earlier, this tripartite arrangement among Maruti, Suzuki, and the intermediaries not only lowered the costs of such overseas training but also helped the firm institutionalize its cross-border mechanisms to transfer knowledge, skills, norms, and values related to production practices (see Appendix 3-3).

3.3.4 Strategies for Developing Technological Capability

The experiences of Maruti and Telco represent two different models of in-firm skill development: one based on exposure, and the other based on experience (see Table 3.11). One explanation for their different models lies in the firms' strategies for developing different types of technological capabilities: Maruti focuses on production capability, while Telco focuses on innovation capability, though these two types of capabilities are not mutually exclusive. Consequently, Maruti's training has primarily focused on behavioral and attitudinal aspects to develop skills for improving both product and process quality, and in particular, diagnostic and problem-solving skills for improving line management. On the other hand, Telco's training reflects its strong orientation toward strengthening engineering and R&D capabilities (Kathuria 1995, Bowonder 1998), as demonstrated by its remarkable achievements in component manufacturing, product diversification, and design development. Such differences have led the firms to develop different mechanisms for their internal knowledge dissemination.

3.4 Conclusion

This chapter examined the patterns of skill development in Maruti and Telco, two leading Indian auto manufacturers, by analyzing the mode, content, and extent of their in-firm training. Both firms have placed great emphasis on training for their employees. Both have successfully developed an elaborate system to promote skill development built into their internal incentive structures; they have positively utilized apprenticeship schemes beyond what the government legislation required, and have developed well-designed formal training programs. Such mechanisms are embedded in their internal labor markets, in that they recruit employees with high educational levels, and provide long-term stable employment, high wages and generous benefits, flat wage structures, incentive schemes, and promotion opportunities (albeit limited for production workers).

These practices are strongly influenced by a robust local institutional framework. For example, Maruti's high wage policy, involving productivity-linked incentive schemes, has been influenced by inherent institutional conditions such as national labor policy, rules governing public sector enterprises, income tax policy, and wide wage dispersion in its supply chain. In particular, the rigidity of the external labor markets has actually made high wages and long periods of initial in-firm training crucial to employing and keeping high-quality workers. These high wages have in turn served as a means of motivating workers to learn new skills and strengthening employees' sense of identity with and commitment to the firm.

Moreover, the statutory apprenticeship training has greatly shaped the patterns of in-firm training. While the literature regards such schemes as institutional constraints that distort the functioning of labor markets, both Maruti and Telco have turned these constraints to their advantage as mechanisms to efficiently deploy workers trained in firm-specific skills, promote their organizational learning, and lower production costs. The national institutional framework has remained robust and played a critical role in shaping the patterns of in-firm skill development even in the process of globalization.

Like many other auto manufacturers in different countries, in the mid-1990s, both Maruti and Telco have adopted some elements of the "lean" production techniques as a response to recent rapid transformations in the Indian automobile industry, as described in Chapter 2. This adoption process has led the firms to change some aspects of their work organization; thus shifting the content of training from technical toward more behavioral and attitudinal, and increasing the amount of training particularly at Telco. Thus, the focus of in-firm training has shifted in recent years, from diffusing knowledge and skills to infusing norms and values to be shared across different corners of the organization. In addition, increased computerization has led both firms to include more computer-related subjects in their in-firm training programs.

Despite these similarities in the patterns of skill development between Maruti and Telco, this study still finds significant differences in these patterns. Indeed, they represent different models of learning: Maruti's learning is exposure-based, while Telco's learning is experience-based. Maruti's training aims at improving collective efficiency and productivity, while Telco's training aims at improving individual technical skills. Maruti emphasizes the direct transfer of ideas, knowledge, and norms between Maruti and Suzuki, thus allowing constant exposure to foreign practices among all levels of its employees, which has led the firm to develop production capabilities. Its training thus focuses on developing diagnostic and problem-solving skills to improve quality. Telco, on the other hand, emphasizes the accumulation of technical knowledge, reflecting the 'self-learning' tradition in developing technological capabilities, especially innovation capability, as exemplified by its remarkable R&D efforts to develop design capability. In other words, each firm's patterns of training are closely linked to their strategy for developing technological capabilities. The particular historical conditions have greatly influenced each firm's strategies for technological development, and hence let them take different paths to skill development.

This study finds that the government has played an important role in shaping the patterns of in-firm skill development in two ways: first, through its policies, and second, through more direct involvement in Maruti's governance and decision making. For example, the government's imposition of apprenticeship has effectively set a high educational standard for production workers in large firms throughout the country, thus ensuring a secure supply of high-quality industrial labor with ready-to-use firm-specific skills, and providing firms with some flexibility in deploying labor. While such an institutional framework had already existed for many decades, it became more effective, as the automobile industry underwent rapid transformations, as described in Chapter 2. The pre-existing policy framework actually eased the process of the firms' adjustment to the fast-changing institutional environment. Moreover, as Maruti's joint-venture partner, the government has directly been involved in Maruti's governance and operations, including those related to human resource development. When the Maruti project started in the early 1980s, the government insisted on including extensive overseas training as part of the technology transfer from Suzuki, which has greatly influenced the patterns of skill development at Maruti.

In sum, this study finds that the patterns of skill development are shaped by the interplay of various institutional forces: historical imperatives, national labor and training policies, institutional alliances with the government, and with foreign firms and training institutions, and firm-level technological development strategies. While a growing body of literature attributes recent changes in the patterns of skill development in developing countries to the adoption of "lean" production systems and/or FDI, this study suggests that they are only part of the whole story. The patterns of in-firm skill development are shaped by a complex interaction between such "new" forces and "old" historical and institutional factors, including national-level policy.

Appendix 3.1: Profile and Performance at Glance: Maruti and Telco (1997)

	Maruti	Telco
1. Establishment	1981	1945
2. Ownership	50:50 Joint venture between the Government of India and Suzuki Motors, Japan	Privately-owned local firm (100% owned by the Tata Industries Group)
3. No. of Plants	2	3
4. Location of Plants	Gurgaon (Haryana)	Pune (Maharashtra); Jamshedpur (Bihar); Lucknow (Uttar Pradesh)
5. No. of Employees	5,404	16,132 (Pune Plant only) (about 40,000 for all plants)
6. Product Mix	Passenger cars (small cars, medium cars; jeeps, utility cars)	Heavy/medium commercial vehicles; light commercial vehicles; multi-utility cars; passenger cars
7. Installed Capacity (Units)	250,000	254,160
8. Vehicle Production (No. of units)	336,811	218,393
9. Capacity Utilization (%) *	135%	86%
10. Market Share (%)	80% of the passenger car segment	72% of M/HCV segment; 67.2% of LCV segment
11. No. of 1st-tier Suppliers	404	1,200 (for Pune Plant only)
12. Local Content	Maruti 800/ Omni: 95%; Gypsy : 80% Esteem: 75%	Tata Sierra/ Estate/ Sumo: 95%
13. Capital (Rupees in million)	16,016.3	17,153.9
14. Sales (Rupees in million)	79,564.8	101,284.3
15. Exports (No. of units) (% of Production) **	35,031 (10.4%)	16,005 (7.3%)
16. R&D Expenditures (Rs. In million) (% of Turnover)	153.9 (0.2%)	3,489.5 (3.4%)
17. No. of Authorized Service Workshops	1,010	224 ***

Notes: * Calculated from lines 7 & 8 above.
** Calculated from line 8 above.
Sources: Maruti, Telco; *** Bowonder 1998.

Appendix 3.2: In-firm In-class Training Subjects: Maruti and Telco

Subjects	Maruti	Telco
A. Quality		
A1. Total Quality Management	√	√
A2. Benchmarking	√	
A3. Business Process Re-engineering	√	
A4. ISO 14000 Engironmental Mot. Systems	√	
A5. Practical Improvement Program for Factories	√	
A6. Quality Concepts and SQC Techniques	√	√
A7. Failure Mode and Effect Analysis	√	√
A8. Process Audit	√	
A9. Personal Growth and Information Sharing	√	
A10. 5S	√ (on the shopfloor)	√ (both video and practice)
A11. Housekeeping	√	√
A12. ISO9000 QA System Standard		√
A13. Measuring Instruments & Care		√
A14. Quality		√
A15. Self Inspection		√
A16. Seven Tools for Problem Solving		√
A17. Design of Experiments		√
A18. Pokayoke		√
A19. Measurement System Analysis		√
A20. Waste Control		
B. Finance		
B1. Basic Financial Management	√	
B2. Forex Regulation/ Risk Management	√	
B3. Exim Policy - Its Interpretations	√	
B4. Excise & Modvat (Tax)	√	
C. Health & Safety		
C1. Personal Health and Hygiene	√	√
C2. Stress Management	√	√
C3. Safety	√	√
D. Computers		
D1. MS Office/ FoxPro/ Dbase	√	√
D2. Auto CAD	√	√
D3. Multi-media – Basic	√	
E. Behavioral		
E1. Supervisory Development	√	
E2. Executive Development / Creative Leadership	√	√
E3. Managerial Development	√	√
E4. Communication	√	√
E5. Creative Thinking	√	√
E6. Customer Orientation	√	√
E7. Counseling Skills	√	
E8. Effective Office Management	√	

E9. Excellence in Work		√
E10. Small-Group Activity		√
E11. Kaizen	√	√
F. Technical		
F1. Value Engineering	√	
F2. Product Orientation	√	
F3. Basic Engineering for Supervisors	√	
F4. Statistical Process Control (SPC)		√
F5. Geometorical Diametering (GD)		√
F6. Cutting Tools		√
F7. Engineering Drawing		√
F8. Introduction to CNC		√
F9. Hydraulics & Pneumatics		√
F10. Painting Technology		√
F11. Welding Defects and Inspection		√
F12. Workshop Calculations		√
G. General		
G1. Materials Management	√	
G2. Japanese Language	√	
G3. Training for Trainers	√	
G4. Preventive Maintenance	√	√
G5. Corporate Philosophy & Welfare Activities	√	√
G6. Automobile Industry in A Changing Scenario		√
G7. Common Errors in English		√
G8. Energy Conservation-Introduction		√
G9. Productivity Concepts		√
G10. Retirement Planning		√

Source: Company data.

Appendix 3.3: AOTS Training Schemes

AOTS is a non-profit Japanese organization set up in 1959 to promote technical assistance to developing countries and to enhance mutual understanding. Since then, AOTS has accepted a total of 69,000 people from 150 countries for training in Japan. In addition, it has organized various training programs in developing countries involving over 20,000 participants. The activities of AOTS are financed by subsidies, as part of ODA (Official Development Assistance), from the Japanese Ministry of International Trade and Industry (MITI), contributions from private corporations, and other sources. AOTS offers two types of training: 1) individual training in respective technical fields by private firms in Japan; and 2) group training through various management courses offered for top managers, engineers, and shop floor supervisors. In the case of in-plant practical training, the sponsor firms must ensure that one third of the training is in classrooms, and two thirds of training is on-the-job training, and that the on-the-job training does not involve simple repetitive tasks.

For both types of training, applications are made to AOTS through a host company in Japan. An applicant is required to be a citizen of a developing country with at least a bachelor's degree or equivalent education. Once the application is accepted, AOTS obtains the training visa for entry into Japan. The host company pays the participation fee to AOTS and AOTS in turn reimburses the subsidy for air fare, a per diem allowance and other

expenses to the host company (which also bears one fourth of recurrent costs of training), even if the training costs are finally to be borne by an overseas firm in a developing country.

In 1995, ACTS accepted 4,752 trainees in its various courses. Of these, 1,576 (33.2%) were sent by Japanese joint venture firms in developing countries, 10.4% were from overseas firms engaged in technical collaboration with Japanese firms, and 5.5% were at the request of governments of developing countries. As the table below shows, the automobile sector has received by far the largest number of trainees from about 150 countries both ever since 1959. In 1994, 90 Indians participated in technical training, and 121 took management courses offered by AOTS; a total of 2,357 trainees have used the AOTS scheme since 1959.

Table 3.13: Distribution of AOTS Regular Training Program Trainees by Sector

Sectors	1994	1994 (%)	1959-94	1959-94 (%)
Transportation Equipment (Automobile)	777 (707)	17.4 (15.9)	13,947 (11,986)	23.6 (20.3)
Electric & electronic	752	16.9	12,457	21.1
Machinery	488	11.0	7,993	13.5
Chemical	217	4.9	4,135	7.0
Metallurgical	203	4.6	3,292	5.6
Textile	96	2.2	2,369	4.0
Food	39	0.9	747	1.3
Other Manufacturing	45	1.0	929	1.6
Agriculture, Fishery & Mining	33	0.7	894	1.5
Construction	147	3.3	2,575	4.3
Others (Management Courses)	1,647 (1,481)	37.1 (33.3)	9,768	16.5
Total	4,444	100.0	59,106	100

Source: AOTS Annual Report 1995.

The management courses offered by AOTS include: 1) Top Management Seminar; 2) Executive Program on Corporate Management; 3) Program for Cross-Cultural Managemnt; 4) Program on Production Management in Manufacturing Industry; 5) Program for Innovative Operations Management; 6) Program on Company-wide Problem Solving; 7) Practical Imrprovement Program for Factories; 8) Production Management Training Center; 9) Executive Seminar on Total Quality Management; 10) Program for Quality Management; 11) Quality Control Training Course; 12) Program on Industry and Environmental Protection; 13) Program on Solving Human & Organizational Problems; and 14) Program for Supervisory Methods and Effectiveness. Clearly, the emphasis is on quality control, process control, and development of problem-solving skills. For example, the course on Effective Problem Solving for Production Managers provides participants with an understanding of the concept of holistic problem-solving, economic efficiency analysis, the lean production system, the adoption of human behavioral engineering through lectures, case studies, and factory visits, with a view to improving problem-solving skills to improve production process control. Given the scale of the training and close coordination between the firm in developing countries and the sponsor firms in Japan, intermediary organizations such as AOTS certainly play an important role in diffusing values, ideas, and techniques, and transferring cognitive and analytical skills, particularly problem-solving skills to developing country firms.

In addition, AOTS has local liaison offices in several Asian countries where some management courses, along with training in Japanese language, are provided. Moreover, AOTS has an active alumni network in various regions in 40 developing countries. These are run in close coordination with AOTS and its local liaison offices. They constitute local-based secondary associations, organizing seminars and training courses among themselves, inviting some specialists from abroad (mainly from Japan), and promoting correspondence courses in TQC, to improve their knowledge and skills, particularly in TQC, QC circles, and *kaizen*. They also nominate some trainees from their local areas to be sent to Japan. For instance, in India, there are 7 alumni organizations: in New Delhi, Mumbai, Pune, Calcutta, Chennai, Kerala, and Bangalore.

According to a recent AOTS survey to evaluate the effects of its training, on ex-trainees and their firms, trainees from India found AOTS training useful in improving quality awareness, production control, introducing techniques such as "5S," and QC circles, providing more effective guidance to their suppliers, and reducing wastes and increasing productivity (AOTS 1997). Particularly, one fourth of 117 respondents found training in specific engineering technologies very useful. In addition, a large proportion of participants from India found that their understanding of Japanese employment relations enormously improved through training.

Chapter 4

Supply Chain as a Learning Chain: Skill Development and Transfer at Automotive Component Suppliers

4.1 Introduction

The previous chapter examined the patterns of skill development in two leading Indian car manufacturers, Maruti and Telco, in the process of a global integration of the Indian economy. This chapter analyzes the nature of skill development in their first-tier suppliers and examines the extent to which these large firms influence the patterns of skill development among their suppliers. How has the rapid process of globalization of and resulting transformations in the Indian automobile industry affected the patterns of skill development among smaller component suppliers? The chapter draws on extensive interviews and a questionnaire survey that I conducted with 50 first-tier suppliers of Maruti and Telco in 1997 and 1998. Thus, discussions in this chapter focus mostly on first-tier suppliers, and may not apply to lower-tier suppliers.

In the 1990s, the Indian automobile industry has experienced dynamic transformations, with considerable restructuring within the sector, remarkable growth in both vehicle and component sectors, and increased competitiveness (see Chapter 2). In fact, the auto component sector has grown even faster than the vehicle sector during this period. As discussed in Chapters 1 and 2, the Indian government has promoted small firms through various policy measures for the last three decades. Through its localization policy, the government has mandated car manufacturers, including Maruti and Telco, to accelerate their localization (see Chapter 2). This has led them to achieve high percentages of local content and to create backward linkages with local firms that are largely small-scale, leading to the gradual formation of tiers within the industry.[1] Thus, given the high

[1] Various strands of the economic development literature point to the importance of organizations of firms, and vertical inter-firm relations, as a way to promote economic development. For example, Stigler (1951) argued that as in Adam Smith's famous theorem that "division of labor is limited by the extent of the

level of subcontracting that these large firms rely on (see Chapters 2 and 3), whether they can become more competitive in the global market depends largely on the performance of these local suppliers, and to a large extent, on the skill acquisition and development among them. How then did the component industry upgrade their skills?

Despite the government's generous support for the small-scale industry (SSI) sector since the 1970s, this issue of skill development still presents an enormous challenge to local Indian component suppliers: Many of the vertical inter-firm linkages created between Indian firms had largely been inefficient and internationally uncompetitive until the mid-1980s (Lall 1985b: 123).[2] Even in more recent years, resource constraints kept small firms from developing their own skills. They have also typically relied on outdated technologies, and had limited access to the market (FICCI 1994). Moreover, unlike large firms, smaller firms do not have the elaborate internal labor markets that would facilitate internal on-the-job training. Given these serious constraints, the role of inter-firm linkages appears to have become ever more critical as a mechanism to transfer knowledge and skills from large to small firms and develop workers' skills at the latter.

Scholars from various disciplines have recently studied the nature of supplier relations in manufacturing,[3] and those in the automobile industry in particular (Womack et

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market," as the industry grows, an increased degree of the division of labor and specialization makes firms more profitable to promote vertical "disintegration." This affects the extent and amount of knowledge to be kept and diffused within and between organizations. On the other hand, the market failure approach regards the establishment of inter-firm linkages as a way to overcome market failures—as a firm's compromise between buying inputs and raw materials from the "perfect market" and establishing its own vertical integration by completely internalizing production activities of related firms as a manifestation of "complete" market failures (Lall 1985b). Transaction cost economists also discuss vertical integration versus disintegration, by focusing on the cost of conducting transactions, especially of reaching contractual agreements on information transfer as a determinant of firms' "make or buy" decisions (see Williamson 1975). In the development literature, Hirschman (1958) elaborated the concept of backward linkages and focused on its role in economic development, in the context of his argument for "unbalanced growth."

[2] Lall's (1985b) concept of "linkages" is similar to Hirschman's (1958), to the extent that both deal with inter-industry relationships and both are concerned with externalities to the market function. They do differ considerably, however: Hirschman is more concerned with the mechanism of production growth in selective industries (e.g., the automobile industry) leading to demand growth in other industries (e.g., the automotive component industry), while Lall is more concerned with the direct inter-firm relationships in complementary activities as an externality to "pure" market functions.

[3] Gereffi (1994) and his colleagues have developed a concept of global commodity chains (GCC) that encompasses not only supplier relations in manufacturing but commodity chains in the service sector.

al. 1990, Nishiguchi 1994, Fujimoto and Takeishi 1994, Helper and Sako 1995). But much of the literature has focused on the nature of contractual relations between final product assemblers and component suppliers (Granovetter 1985, Helper and Sako 1995) and paid little attention to the question of how skill and knowledge transfer actually occurs.[4]

A growing body of literature has recently examined changes in employment practices in manufacturing and, in particular, in the automobile industry. Some studies have speculated on a causal relationship between the adoption of "flexible" or "lean" production systems and such changing employment practices, including skill development, among auto manufacturers (MacDuffie 1996, Kochan et al. 1997, Sargent and Matthews 1998). Other studies have analyzed the changing nature of supplier relations in the automobile industries across different countries in the globalization era (Womack et al. 1990, Fujimoto and Takeishi 1994, Helper and Sako 1995, Humphrey et al. 1998; also see Chapter 2). However, few studies so far have examined how such recent changes in the supplier relations have affected employment practices, particularly those concerning skill development in suppliers, let alone the profile of their workers, in India or elsewhere.

Therefore, this chapter proceeds as follows. Drawing on the results of my questionnaire survey, Section 4.2 first portrays the profile of first-tier automotive suppliers to Maruti and Telco, and, in particular, those of 50 sample suppliers. Given the segmented nature of the Indian labor market, the characteristics of the labor force at suppliers differ significantly from those at vehicle manufacturers such as Maruti and Telco, as described in Chapter 3. Section 4.3 presents the results of the questionnaire survey of the 50 suppliers with respect to their patterns of skill development. Section 4.4 analyzes factors that have motivated the sample firms to develop their workers' skills in recent years. Section 4.5 discusses the roles of inter-firm linkages in facilitating and transferring skills for workers at

[4] Perhaps an important exception is a study by Lall (1985b), which examined the nature of backward linkages that two Indian truck companies, Telco and Ashok Layland, developed.

suppliers and changes in the nature of such linkages in the process of transformations in the industry. Section 4.6 summarizes the findings.

This chapter offers several general findings. First, during the rapid transformations in the automobile industry, the auto component industry has seen a general trend of upskilling of the workforce in the 1990s: the educational level of the workforce as a whole has risen, as has the demand for professionally-trained managerial workers. Second, suppliers, including small firms, considerably increased their investment in in-firm training in the 1990s. Third, the current process of globalization has strengthened the inter-firm linkages between car manufacturers and their suppliers, through the institutionalization of various mechanisms to improve quality both in production processes and products, including frequent monitoring, information dissemination, and training for suppliers. In other words, the inter-firm linkages, i.e., the supply chain, have served as a learning chain: an institutional form that places demands for learning on suppliers in exchange for ensuring long-term contracts. Thus, it has played a critical role in enhancing the skill levels of workers, changing the nature of skills required, and promoting in-firm training at small-scale suppliers.

4.2 The Profile of Suppliers to Maruti and Telco

This section briefly portrays the characteristics of Maruti suppliers and Telco suppliers in general, and of the 50 sample suppliers in particular.

4.2.1 Maruti Suppliers

As of 1997, Maruti had 404 first-tier suppliers.[5] Of them, over 100 are small firms located within an hour of Maruti's main plant in Gurgaon in the state of Haryana. About 10% of them have Japanese involvement; of these one third are in joint ventures, and two-

[5] As discussed in Chapter 1, some smaller first-tier suppliers also serve large first-tier suppliers of Maruti as second-tier suppliers. Thus, the divisions between tiers in the pyramidal structure are not completely straightforward.

thirds in technical collaboration. Several key suppliers are located in Chennai in the southern state of Tamil Nadu. Of the 404 suppliers, 53 rely on Maruti for more than 90% of their sales. Other first-tier suppliers have multiple customers. In fact, because the volume of production is still very small, Maruti encourages its suppliers to have multiple customers so that they can attain economies of scale, with the exception of a handful of key suppliers of which Maruti holds equity shares, as discussed in Chapter 2. Of the 404, about one-third were established after Maruti started operating in 1983. Many suppliers have long-term contractual relations with Maruti; the majority has continuously worked with Maruti since 1983. Challenging the "arm's length" supplier relations which had prevailed in India, Maruti first introduced close relations with its suppliers in India, as discussed in subsequent sections. At the same time, Maruti placed great emphasis on improving suppliers' performance, particularly in terms of product quality and on-time delivery, factors totally new to Indian suppliers before Maruti's entry.

4.2.2 Telco Suppliers

Telco's three plants in Jamshedpur, Pune, and Lucknow have about 900, 1,200, and 700 first-tier suppliers respectively. About 500 of these suppliers cater to all three plants. Many large-scale suppliers serving all three plants are located in Chennai in the state of Tamil Nadu, and some of them also serve Maruti. Many of these Chennai-based suppliers have recently shown an interest in setting up another plant in Pune once the volume of production increases. Although many of the 1,200 first-tier suppliers of the Pune plant are spread all over the country, about 50% of them are actually concentrated in Pune and surrounding cities in Maharashtra, creating a high level of geographical concentration. Of the 1,200, about 700 to 800 are small-scale; most produce basic items, such as sheet metals, and their operation does not rely on high-tech equipment. Many are family-owned enterprises, often one-man operations. Telco has traditionally had an "arm's length" relationship with its suppliers. Until recently, Telco's primary criterion for

selecting suppliers was price; it thus had a relatively small volume of business with high-quality but high-price suppliers such as Denso India. In 1997, however, the firm drastically changed the nature of its supplier relations, focusing on closer relations, with greater interest in the suppliers' overall performance.

4.2.3 Profile of Sample Supplier Firms

Taking into account these geographical and size factors, I selected a sample of 25 Maruti suppliers, mainly located in Faridabad and Gurgaon in the state of Haryana, and in Delhi, and another 25 Telco suppliers mainly located in Pune and Aurangabad in Maharashtra (for a summary of the profile of these suppliers, see Appendix 4.1).[6] It should be noted that labeling the sample firms as "Maruti suppliers" and "Telco suppliers" only reflects how these firms were identified for sampling and does not necessarily mean that they have exclusive supplier relations with Maruti or Telco. In fact, many of the sample firms have more than one customer (see Appendix 4.1), and of the 50 sample firms, 11 cater to both Maruti and Telco (see discussions below).

1) Establishment

Of the 25 sample Maruti suppliers, 18 firms were established long before Maruti was set up. These are mainly located in Faridabad, an old industrial district in Haryana, where the majority of Maruti suppliers are located (see Appendix 4.2 for the geographical distribution of Maruti suppliers). Of these 18, the majority had been suppliers of tractor components for major tractor companies, such as Escort and Eicher Tractor, both located in Faridabad.[7] These suppliers turned to the automobile sector when Maruti started production in 1983. Many firms started as small units simply undertaking "job work,"

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[6] Hereafter, I use the codes employed in Apprendix 4.1 to refer to the suppliers I interviewed, instead of identifying their real names.

[7] The growth of tractor component manufacturers in Faridabad reflects the government's priority on agricultural development in the 1960s and 1970s, which supported the development of agricultural equipment such as tractors, agricultural infrastructure such as irrigation, and inputs such as fertilizer.

processing certain types of components with the raw materials supplied by customers; and then gradually moved to manufacturing. In other words, they had already accumulated basic engineering skills before Maruti entered India, which has made it easier for Maruti to facilitate their development since then. The other 6 firms were established in the mid-1980s, a few years after Maruti's start, in Gurgaon, a new industrial district that grew as Maruti grew.

Of the 25 sample Telco suppliers, 14 firms, mainly located in Pune and Aurangabad, were established before liberalization of the Indian economy started in the mid-1980s. Many small firms in Pune grew as the three auto manufacturers based in the city, Telco, Bajaj Auto and Bajaj Tempo, grew. About 60% of all small-scale industry (SSI) firms in Pune serve one or more of these three customers, forming the country's largest industrial district specializing in auto components.[8]

2) Firm Size

First-tier suppliers are relatively small, largely in the categories of small and medium enterprises. Of the 25 sample Maruti suppliers, 6 have fewer than 100 employees, while 13 firms employ between 100 and 400 employees. On the other hand, of the 25 sample Telco suppliers, 8 firms have fewer than 100 employees, while 9 have between 100 and 400 employees. Reflecting the still small overall production volume in the Indian automobile industry as a whole (see Chapter 2), first-tier suppliers in India are much smaller on average than are Japanese first-tier suppliers (1,198 employees).[9]

Indeed, 19 of the 25 Maruti suppliers and 15 of the 25 Telco suppliers are in the SSI sector, enjoying various benefits of the government support to this sector. This reflects a general tendency in India for an entrepreneur who starts an enterprise as a SSI firm to qualify for subsidies and various support measures provided by the government for this category, which would have been difficult to obtain otherwise. Such measures include

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[8] My interview with a general manager of the District Industrial Center (Pune), in April 1997.

a priority allotment of land, water, electricity connection, telephone connection, access to capital,[10] lower tax rates, reservation of certain items for SSI firms (see Chapter 2), and exemption from various obligations imposed on large firms. This generous government support has resulted in considerable inefficiency in operation among SSI firms, but they have still helped develop a wide industrial base in the country, even though their growth was stagnant in the 1970s.

Interestingly, however, some of these SSI firms are small only in disguise. A closer look reveals that they have actually grown to be more than they appear to be on paper. They create other firms under separate names on the same premises in order to qualify for the privileges and protection the government provides to SSI firms. Indeed, many of the firms I visited have more than two, and as many as seven, firms under different names as "sister concerns" owned by family members, even though they actually share the same production facilities, management, and labor.[11] For example, one SSI firm in Faridabad has six plants under four different names,[12] while another firm in Gurgaon has three plants under two names in different locations.[13] Some firms set up separate plants to cater to each of several different customers. Such arrangements have helped firms overcome the otherwise great difficulty in attaining economies of scale.

Most sample firms, both Maruti and Telco suppliers, have grown remarkably since the mid-1980s, confirming the general trends observed in Chapter 2. For some firms, sales figures grew more than 100 times between 1990 and 1996. Some firms have graduated from their SSI status in the last few years, having reached the point where the benefits of being a medium-scale unit (more business opportunities and greater economies of scale) exceeded the benefits from the various protections and privileges provided to a SSI unit.

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[9] Fujimoto and Takeishi 1994.
[10] For example, the government has required all commercial banks, which had all been nationalized until the recent liberalization of the financial sector, to reserve 20% of lending available for the SSI-sector firms.
[11] Lall (1987) makes a similar observation about SSI firms in India.
[12] Interview with M11, in February 1997.

3) Supplier Relations

Until the mid-1990s, the approaches of Maruti and Telco to their suppliers differed considerably. Maruti developed a long-term close relationship with its suppliers, following the Japanese model of supplier relations, while Telco had a rather "arm's length" relationship with its suppliers, close to the Western model of supplier relations (see Chapter 2).

Among the 25 sample Maruti suppliers, only three firms have exclusive supplier relations with Maruti. Of the 25 sample Telco suppliers, only two have exclusive relations with Telco. Indeed, some suppliers have more than 10 customers. Some still produce components of tractors and other consumer electric goods such as refrigerators. On the surface, therefore, both Maruti and Telco appear to have weak supplier networks. However, detailed interviews with their suppliers revealed that they still maintain such close relationships with these suppliers that it significantly affects their performance, as discussed in subsequent sections.

Large-scale suppliers are often original equipment manufacturers (OEMs) themselves; they have their own brand names, export their products, and have relatively autonomous relations with their customers. Some recently started forming joint ventures with foreign suppliers (see Chapter 2). By contrast, few small-scale firms have their own products or proprietary technologies, producing products "as per the specification and drawings provided by customers," relying on the customers to design products.[14] Few such small suppliers are involved in joint design development with their customers. Customers usually give these suppliers the designs of products, dies and tools. Some small firms are engaged in "job work" or processing of intermediary goods, and depend more on their customers. As they grow, they gradually move to manufacturing activities,

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[13] Interview with M20, in February 1997.
[14] These firms include M2, M3, T10, T16, and T19, to name a few.

and some start developing their own products.[15] Some firms undertake to manufacture components for some customers and remain engaged in "job work" for other customers.[16] Some small firms that depend highly on Maruti have actually developed even their production layouts following the specifications Maruti prescribed in the mid-1980s.[17]

Even without exclusive supplier relationships, many sample suppliers do have some sense of trust in Maruti and Telco, compared to other customers. Some Maruti suppliers maintain that Maruti's remarkable success lies in its developing suppliers and good relationships with them.[18] Many Maruti suppliers stressed their dependence on Maruti as a deliberate business strategy.[19] One loyal supplier with 100% dependence on Maruti said, "since 1983, we never felt a sense of insecurity; Maruti and my firm have a very clean relationship. With Maruti's phenomenal growth, our business also grew, with a large increase in our business volume."[20]

As discussed in Chapter 2, the nature of supplier relations even among domestic car manufacturers began to change dynamically in the 1990s, as many foreign car manufacturers entered the Indian market. The automotive component industry has witnessed a large inflow of FDI in the component sector, a growing division between OEM and "after market" suppliers, and closer supplier relations between car manufacturers and their suppliers (see Chapter 2).

While many of the sample firms are local, several have started joint ventures with foreign firms. Among Maruti's suppliers, one sample firm, the largest and oldest seat maker in India, and located on the same premises as Maruti's main plant, was set up in 1985 as a joint venture among four partners: Maruti, Suzuki, a Suzuki supplier in Japan, and a local entrepreneur. Such key suppliers form rather exclusive relations with Maruti,

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[15] For example, T13 even started developing its own R&D facilities under a different company name at the facility next door (interview with T3 in April, 1997).
[16] For example, M5 undertakes processing for Maruti and PAL, while it does "job work" for Eicher Tractor, Bajaj Auto, and Bajaj Tempo.
[17] For example, M21.
[18] Interviews with M13.
[19] For example, M3.

catering only to Maruti, even though Maruti does not entirely rely on such dedicated suppliers and has alternative sources for each component. On the other hand, Telco, reflecting its traditional "arm's length" supplier relations, never held equity in any of its suppliers until the mid-1990s when it created a supplier base in Tamil Nadu, forming several joint ventures with different foreign firms for different key components (see Chapter 2).

While both Maruti and Telco have adopted some elements of "flexible" and "lean" production as discussed in Chapter 3, the ways they interact with their suppliers still differ considerably. While Maruti suppliers can coordinate their own production schedules following Maruti's monthly production schedules, Telco gives its suppliers its production schedule daily. While Telco has recently introduced just-in-time inventory systems, it often changes its production schedules in an erratic manner, placing a large burden on the local suppliers that then need to adjust their production volumes on a daily basis. Some of these suppliers complain that because of Telco's frequent schedule changes, it is extremely hard for them to plan production: Some have to change up to 50% of their monthly production schedules. This problem stems partly from a lack of coordination concerning suppliers among different Telco departments, such as Purchase, Production Planning, and Supplier Development. Suppliers sometimes dispatch their trucks with their products only to learn that Telco no longer needs them due to changes in its production schedule. Sometimes their trucks and drivers are stranded at Telco's gate for a few days, causing further losses in addition to the wasted excise duty payment. These frequent schedule changes thus seriously increase production costs for local suppliers, particularly smaller ones, sometimes eroding trust between Telco and its suppliers. On the other hand, Maruti suppliers maintain that Maruti's monthly production schedules are stable and reliable, thus helping the firm generate some sense of security and trust among its local suppliers. Thus, the intra-firm

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[20] Interviews with M3. Managers at other firms such as M2 made similar remarks.

division of labor and coordination on the part of customers greatly affects the nature of supplier relations.

4.3 Skill Development at First-tier Suppliers

This section examines the nature of skill development at the sample first-tier suppliers. It first analyzes the characteristics of the internal and external labor markets surrounding the workers at suppliers, including the educational level of employees, and then examines where they obtain skills and how they develop skills of workers within the firm.

4.3.1 Characteristics of Labor Markets at the Supplier Level

Given the highly segmented nature of labor markets in India (see Chapter 1), the characteristics of the labor market segments surrounding the workers at small suppliers obviously differ considerably from those for workers at large vehicle manufacturers such as Maruti and Telco, as described in Chapter 3. To understand the nature of skill development for workers at suppliers, we first need to know what types of workers these suppliers employ, what tasks they actually perform, and under what conditions they work. This subsection therefore analyzes the occupational structures, labor characteristics, and employment practices among the sample 50 suppliers.

1) Occupational Structure

As expected, the occupational structure of firms differs depending on the firm size. Large-scale suppliers have occupational structures similar to those of vehicle manufacturers such as Maruti and Telco. Like vehicle manufacturers, they have well-developed internal labor markets, with clear rules governing recruitment, promotion, salaries, and training. Due to the segmented nature of labor markets, however, the port of entry for recruitment at

large suppliers differs according to the occupational group of employees, requiring different educational levels for entry.

The proportion of trained engineers (those having a degree or diploma in engineering) in the workforce is relatively small among first-tier suppliers. While large- and medium-scale firms employ such trained engineers, smaller firms often employ ITI graduates as "technicians." This is because in many small firms the labor-intensive nature of their operation does not require engineering expertise, and because they often cannot afford to pay the prevailing wages for engineers.

As for production workers, at large suppliers, recently hired production workers are mainly fresh ITI graduates, as at Maruti and Telco (see Chapter 3). However, many older workers have previously worked in other industries, but typically transport-related manufacturing firms, such as Escort, a tractor producer. Through such channels, basic engineering skills had been accumulated in the automotive component firms even before the liberalization policy was introduced in 1991.

Interestingly, despite their shallower hierarchical structures compared to large firms, small firms do have informal ways of classifying their production workers according to skill level, such as unskilled, semi-skilled, skilled, and sometimes, highly skilled, which often determine workers' wage levels. Though the definition for each category of workers varies from one firm to another, these categories implicitly create a *de facto* informal internal occupational hierarchy.

At the bottom of the occupational hierarchy, firms commonly hire unskilled workers often called "helpers," who typically undertake such simple tasks as loading, unloading, packing, and moving materials. Out of the 50 sample suppliers, only one firm had no unskilled workers, as it instead used semi-skilled workers to perform such tasks.

In addition, many firms in India use so-called "casual labor" outside of the formal employment system. Some firms have far more casual workers than formally employed workers; in others, nearly all the production workers are casual. Because casual workers

do not quality for labor welfare measures and legal protection, most "keep coming and going" on a short-term basis. These casual workers are further classified into two types, thus serving two different purposes. The first type, the cheap laborers, receives minimum wages, substituting for regular unskilled workers. They also serve as a buffer to fill in for absent workers, given the high incidence of absenteeism in India, on average 12% for the transport equipment and parts sector as of 1992.[21] The second type, contract workers, receives wages on a piece rate basis depending on their output (hence sometimes receiving higher earnings than regular workers). They serve as a buffer when demand fluctuates. The second type may sometimes work outside the premises of the enterprises; thus they are sometimes called subcontractors or Outside Labor Processors (OLS).[22]

Three factors explain this extensive use of casual workers: First, the rigid nature of labor markets, particularly the difficulty in firing workers due to protective labor legislation (see Chapter 3) makes employers prudent about formally employing workers. Second, the general anti-union attitudes make employers reluctant to hire more permanent employees, which could lead to the creation of unions in their firms. This anti-union attitude is particularly prevalent in the north where most Maruti suppliers are located. Some employers I interviewed have deliberately chosen not to increase their firm size above 100 employees, because they would then have to allow a union within the firm, which they think would harm management. Finally, some small firms are afraid to increase regular workers, who might start their own business once they became skilled and acquired enough knowledge about the nature of the firm's business.

However, transformations in the automobile industry in the 1990s (see Chapter 2) have changed the patterns of labor deployment among suppliers. First, many small suppliers have increasingly turned "from a family-managed enterprise to a professionally managed enterprise."[23] Smaller suppliers traditionally had a shallower occupational

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[21] Government of India 1997.
[22] My interview with M1, in February 1997.
[23] My interview with M1, in February 1997.

structure; many were essentially the owner's one-man operation. Usually a son of the owner, often with a degree in engineering, held the second position in the firm as a technical director overseeing technical aspects. In the 1990s, however, new types of small-scale suppliers have slowly emerged: some educated engineers with experience working at large assemblers have established professionally-managed small firms. Second, an increasing number of firms have started hiring more professional managers, particularly in the areas of quality assurance and maintenance. This has resulted in a marked increase in the proportion of qualified managers even among small firms, while creating a more hierarchical structure within each firm. For instance, holders of MBA are now in high demand. Even smaller firms commonly have professional accountants and one or two college-educated administrative employees. This change in the occupational structure in favor of managerial skills, a trend also observed in developed countries in the 1980s (OECD 1996), seems to have been common among the sample first-tier suppliers in the 1990s. Table 4.1 shows a changing employment growth trend for different occupational groups in the sample first-tier suppliers that have kept employment records since the mid-1980s.

Table 4.1: Average Annual Employment Growth for Different Occupational Groups in 13 Selected First-tier Suppliers

Occupational Category	1985-1990	1990-1996
Managers	7.7%	12.8%
Engineers	2.2%	2.8%
Production Workers	16.9%	5.1%
Helpers (Unskilled workers)	32.5%	5.5%
Casual Workers	24.1%	3.7%

Source : Calculated from the results of my questionnaire survey.

There are several reasons for this change, according to a small supplier in Faridabad. First, many firms became more interested in expanding than in continuing as a SSI firm. Second, the entry of many vehicle manufacturers led even small suppliers to establish various plants in various locations, which in turn made it difficult for one person

to manage and oversee the entire operation. Third, "the exposure to Japanese business culture through Maruti and Hero Honda prompted suppliers to realize the importance of having an efficient business organization."[24] Finally, suppliers needed to transform themselves to obtain ISO 9000, required by customers, particularly Maruti, as discussed in more detail in subsequent sections.

Moreover, increased quality consciousness widened the range of jobs within each firm. Many firms have recently created new positions in the areas of quality assurance, inspection, and maintenance, which are mostly filled by educated employees with college degrees. For example, a small firm in Aurangabad had only four shops until recently: forging, heat treatment shop, tool room, and finishing room.[25] But the firm recently created a new section focusing on inspection, which is now staffed completely by college graduates. In other words, production processes have called for a wider range of tasks requiring higher skills than before, resulting in considerable upskilling among component suppliers.

In contrast with the considerable growth in demand for managers, the employment growth for engineers has been slower than in other categories throughout this period. This slow growth may reflect the extremely limited product development capabilities of these suppliers, which rely mostly on the drawings provided by their customers. It also reflects assemblers' focus on improving suppliers' capabilities in the production process management, particularly for quality control, rather than product development. In fact, many of the small firms I interviewed had recently created a position of quality assurance manager.

In addition, increased quality consciousness has lowered the demand for casual labor, particularly in small firms. Among the firms I interviewed, some have recently decided to stop using casual workers for several reasons. First, the use of casual workers makes it difficult to sustain the quality standard that customers require, since retraining new

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[24] My interview with M1, in February 1997.

workers is particularly costly for resource-constrained small firms. A manager of a small firm noted that, "each time when new ones come, we have to teach them from scratch, which results in wasting a huge amount of time on the part of managers."[26] Second, many suppliers, including small firms, have recently introduced new forms of work organization, which require more worker responsibility and involvement, a quality that cannot be expected in casual workers who "keep coming and going." This stands in marked contrast with earlier recruitment practices: until recently, many firms "recruited basically whoever came to the gate." Therefore, contrary to the popular assertion in the literature that globalization has led to the casualization of labor, the case of the Indian automobile industry suggests otherwise.

On the other hand, second-tier suppliers are very small, often home-based, consisting of only a few workers, many of whom are often family members. They are often in the informal sector, and they often operate and live in slums in the neighborhood. Some of the first-tier suppliers have a separate quarter for their own workers in the same factory premises (but often in a separate building in poor condition). The changes in supplier relations between vehicle manufacturers and first-tier suppliers following "lean" production principles--increased awareness about quality, on-time schedule, and in-time delivery--are not yet seen in the relations between first-tier and second-tier suppliers. Therefore, there is a clear discontinuity between the first-tier and second-tier suppliers in the supply chain in terms of production processes as well as labor markets, which limits the possibility of second-tier workers moving up to a job in a first-tier supplier. In some cases, however, former operators of first-tier suppliers become independent subcontractors (i.e., second-tier suppliers) paid on a piece rate basis, almost exclusively working for their former employers (i.e., first-tier suppliers).

2) Labor Characteristics

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[25] My interview with T22, in March 1997.
[26] My interview with T8, in April 1997.

This subsection analyzes the characteristics of workers at the sample first-tier suppliers, in terms of a) educational background; b) age and gender distribution; and c) regional and social background.

a) Educational Background

Changes in the occupational structure as observed above also coincide with considerable recent changes in the educational level of employees of suppliers. While serious data constraints permit no systematic analysis on the educational trends for the whole industry, Figure 4.1 shows a general upward shift in the educational level for every category of the workforce in the sample first-tier suppliers. Given the rigid nature of the labor market, long-term employees with less education were still working in 1996. During my interviews, however, many firms, including smaller ones, indicated that while they had not previously placed any weight on job seekers' educational backgrounds, they started requiring better-educated workers in the early 1990s. One Maruti supplier with 140 employees explained this shift: since 1993, his firm has recruited ITI graduates as workers instead of those who had completed the fifth grade.

This shift was necessary for at least three reasons. First, workers' tasks increasingly require literacy and numeracy, because of increased automation and computerization: workers have to read and interpret parameters to operate machines. Second, ITI graduates have better basic technical knowledge. While employers commonly acknowledge the importance of on-the-job training, the changed nature of operation now requires more basic knowledge, which workers acquire through ITI training. Finally, supplier firms now increasingly emphasize in-firm training, which requires the readiness to learn new skills, a quality found only in those workers who have basic knowledge through schooling.[27] In other words, even small-scale firms now demand more of the general skills acquired through general vocational training.

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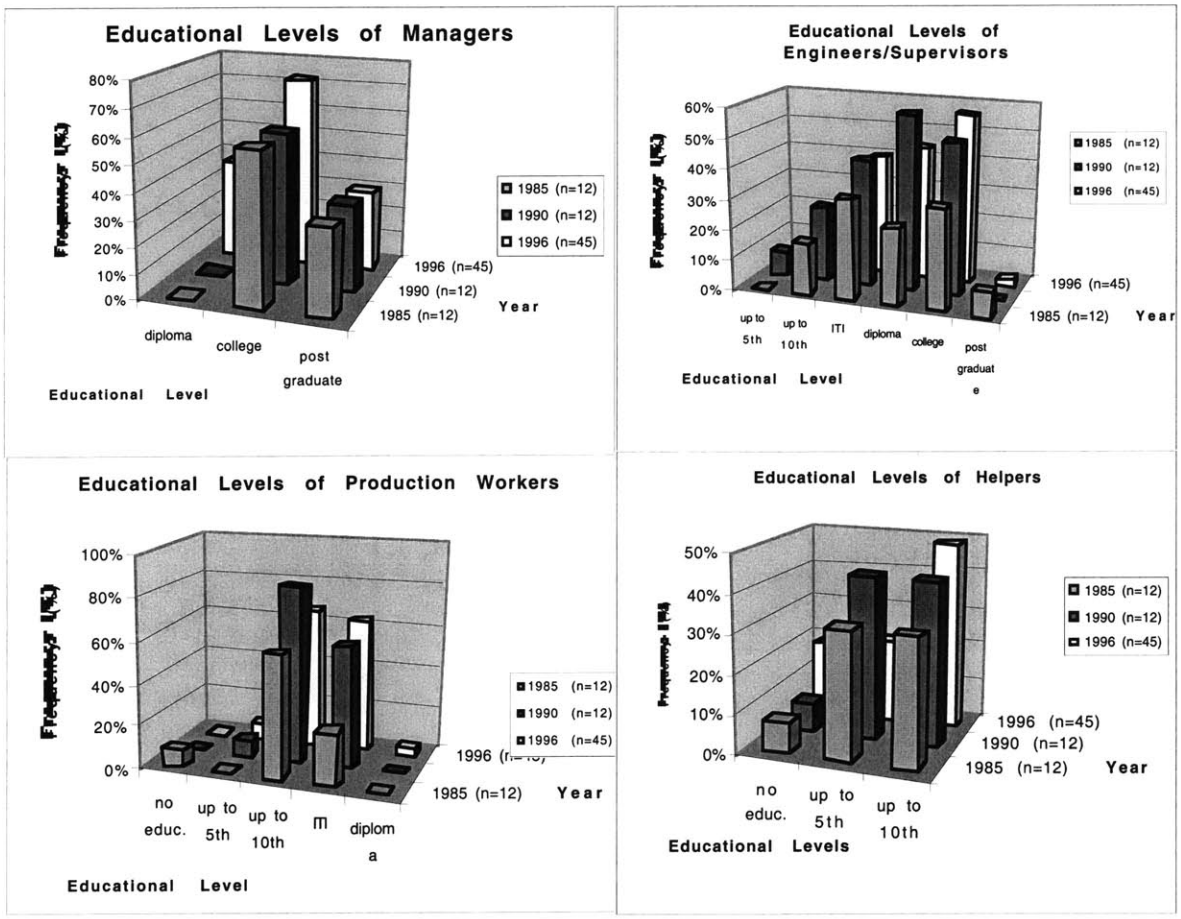
[27] Interview with a firm in Faridabad, in March 1997.

Figure 4.1: Educational Trends of Employees by Occupational Group: Selected Sample Suppliers

(Frequency of responses: %)



Notes: 1) N refers to the number of firms that had valid responses to the question. Thus, the percentage refers to the share of the firms that had employees in each category of the given educational level. This was 12 firms in 1985 and 1990, and 45 firms in 1996. 2) As firms employ different occupational groups of employees with different levels of education, the sum of the percentages for each occupational group is not equal to 100. 3) Firms rarely keep personal records on casual workers; thus few firms knew their educational background.
Source: Constructed from the data obtained through the questionnaire survey conducted by the author.

b) Age and Gender Distribution

Table 4.2 shows the age distribution of the 10,696 employees in the 40 sample firms where data were available. The largest group of employees is in the age group between 25 and 34 years, indicating that the industry relies on relatively young employees.

Table 4.2: Age distribution

14-17	0.7%
18-24	27.2%
25-34	37.6%
35-44	21.3%
45-54	6.7%
55-64	1.5%
Unknown	4.6%
Total	100.0%

Source: Computed from the results of my questionnaire survey.

Suppliers in general employ few women, except for one large joint-venture firm in Delhi producing wiring harnesses, where 80% of production workers are women. However, increased computerization even at small firms has increased employment opportunities for women in the automotive industry, which has traditionally been male-dominant. In most firms I visited, one or two women, usually young college graduates, have been recruited in the last few years for a clerical job involving some computer operation. Employers explain that they prefer women for this type of position because women are more serious and reliable, and concentrate more on their tasks.

c) Regional and Social Background

Workers' characteristics differ considerably across different regions. The majority of employees in Haryana, where many of Maruti's suppliers are located, are from the northern states of Uttar Pradesh (U.P.) and Bihar, the two poorest states in India. This is partly because in the 1970s when new industrial areas emerged in Haryana, many entrepreneurs moved to Haryana from West Bengal, to escape from an anti-industry climate in West Bengal where political power had long rested with the communist state government and militant unions. These employers brought workers from U.P along with them.

Even today, most production workers in Haryana are migrant workers from agricultural areas in U.P. and Bihar. They tend to take leaves during the agricultural season in summer (May through June), thus significantly affecting production outputs as well as productivity at suppliers during the season. Labor turnover is relatively high among recent migrants, as they sometimes do not return to their firms after going home to their villages. Despite such constraints, employers in Haryana generally prefer such migrants to local workers, for two reasons. First, migrants are more likely to accept low wages, as the prevailing rural wages in such poorer states are lower than the prevailing wages in cities surrounding Delhi. Second, they are less likely to become politically organized than local workers; employers are afraid of their workforce unionizing.

In some cases, suppliers in the north employ workers from the southern states (Tamil Nadu, Kerala, and Karnataka), particularly workers in certain skill areas, such as welders and machinists, because the level of education is generally higher in the south, and ITIs and polytechnics in the south have courses in such specific trade skills. Interestingly, the women workers employed at the wiring harness firm mentioned above are almost entirely from Kerala. The firm prefers women from Kerala, having found them well educated, diligent, and hard-working, compared to local women; in the north, women's wage employment in the industrial sector is less socially acceptable than in the south.

On the other hand, workers in Pune are largely from local areas. As the educational level in Maharashtra, the wealthiest state in India (see Chapter 2), is much higher than in other states, the overall educational levels of workers are generally higher than those in northern states, allowing firms to enjoy higher levels of general skills in their workforce. Interestingly, differences in their attitudes regarding the recruitment of workers among small firms in Haryana and Maharashtra lie in the difference in labor legislation in these states: In Maharashtra, by law, even small firms must allow their employees to form a union, and therefore, they do not need to rely on migrants to avoid unionization.

3) Employment Practices

Employment practices vary among suppliers. Some firms, large and small alike, generally have low labor turnover among their production workers reflecting the long-term employment tradition, except for the "helpers" (unskilled workers) who keep "coming and going,"[28] while others report high turnover among their workers. They usually recruit workers through public employment exchanges, or more commonly, through the personal connections of the existing workers, who often bring relatives and friends from their home villages.[29]

A closer observation reveals that suppliers generally use three types of employment practices for production workers, depending on their skill levels. The first type is long-term employment for a small proportion of skilled workers who typically work at the same enterprise for more than 10 years. These skilled workers are relatively well-paid compared to other workers in the same firms; they receive other incentives and training opportunities, partly to discourage them from leaving.[30] Labor turnover among skilled workers is thus very low.[31] However, when such skilled workers do quit jobs, they often start their own business, sometimes to become second-tier suppliers.[32] The second type is short-term employment for a large proportion of workers, mainly unskilled or semi-skilled, who receive minimum wages and "keep coming and going" after working four to six months at a firm. Labor turnover among this type of workers is fairly high, particularly at firms without unions.[33] The third is medium-term employment for those who work at a firm for several years and then move to another firm looking for better opportunities. For this type

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[28] Interviews with M3, M9.

[29] For example, at M18, only 10% of the employees were recruited through the local employment exchanges, while the other 90% were brought through personal connections of the existing workers (Interview with M18, in March 1997).

[30] For example, M18 provides monetary incentives to workers who have completed 5, 10, and 15 years of service, to encourage them to remain in service.

[31] For example, a firm (T17) reported that in the last 10 years, only five workers left the firm. Another firm (T4) noted that the average years of service are 15 to 16 years, as "experienced production workers never leave."

[32] Interviews with T8, in February 1997.

of employment, firms tend to employ workers who have already acquired necessary skills through their previous jobs. Thus, the juxtaposition of these different types of employment practices helps suppliers gain some flexibility, despite the institutional rigidity created in external labor markets as discussed in Chapter 3. This skill-based labor mobility has clear implications for the patterns of skill development, a central theme of discussions in subsequent sections.

Another interesting pattern of labor mobility is that of casual workers in Pune, which has the largest concentration of auto ancillary firms in three adjacent industrial districts, Pimpli, Chichiwad, and Bhosari in a suburb of the city. Three large auto manufacturers in Pune, namely, Telco, Bajaj Auto, and Bajaj Tempo, employ many temporary workers for six months. For example, Telco employs about 10,000 such temporary skilled workers, as they are much less costly to hire them than regular workers (see Chapter 3 for Telco workers' wages). Such temporary workers work in nearby small ancillary suppliers for the remaining six months. This labor sharing has helped facilitate skill transfer between Telco and its suppliers.[34]

Among suppliers, work hours vary from 42 to 72 hours per week including overtime, for six days a week. Many firms in Haryana require several hours of overtime. On the other hand, firms in Maharashtra discourage overtime, as they have to pay double the hourly rate for overtime, which would considerably raise their labor cost.[35] The difference in attitudes toward overtime between the two regions reflects the stronger enforcement of labor policy by the state government of Maharashtra.

Even small firms have some informal mechanisms for internal promotion, though more limited in scope and less structured than large firms. Somewhat surprisingly, many small suppliers generally prefer to promote existing workers rather than recruiting new ones, because of the firm-specific nature of skills even in their relatively labor-intensive

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[33] For example, M4, M9, M13, T7, T9, and T13 noted this point.
[34] Interview with T1, in April 1997.
[35] Interviews with T4, T9, T19, in April 1997.

operations. Helpers (unskilled workers) do become promoted as regular operators (semi-skilled and skilled) after some years of service, only if their performance is good. Workers acquire skills by moving up a job ladder from unskilled to semi-skilled, and further to skilled jobs, and sometimes even to supervisory jobs, while acquiring necessary skills on the job.

Table 4.3 summarizes wage structures and distribution among different occupational categories at the sample suppliers, with and without FDI, where the wage data were available. As anticipated, firms with FDI pay considerably higher wages to workers at every level (except unskilled workers). The automotive component industry sees a wide wage dispersion among different occupational categories: managers in firms with FDI receive 8.2 times more than the lowest level of workers, whereas managers in firms without FDI receive 9 times more than the lowest level of workers. In both FDI-affiliated and non-FDI firms, helpers and casual workers receive minimum wages.

Table 4.3: Average Annual Earnings for Different Occupational Groups at Selected First-tier Suppliers: 1996 (in US dollars)

	Managers	Engineers	Production Workers	Helpers (Unskilled)	Casual Workers
Suppliers with FDI (9 firms)	6,492 (n=256)	2,208 (n=671)	1,440 (n=3183)	648 (n=80)	792 (n=1475)
Suppliers without FDI (31 firms)	5,184 (n=133)	1,488 (n=432)	1,020 (n=2128)	708 (n=618)	576 (n=623)
Total (40 firms)	6,060 (n=389)	1,920 (n=1103)	1,236 (n=5511)	708 (n=698)	720 (n=2173)

Source: Calculated from data obtained through a questionnaire survey conducted by the author.
Notes: 1) Out of the sample firms, only those which have matching data for employment and wages are included in this computation. 2) n refers to the number of employees in the category. 3) The exchange rate was US $1 = Rs. 35.43 in 1996 (IMF 1997).

As discussed in Chapter 3, a large wage gap also exists between assemblers and first-tier suppliers. While the wages for workers at large-scale joint-venture suppliers receive are 80% of Maruti workers' wages, those at small-scale suppliers are only about 20% (see Chapter 3: Table 3.4). These wage differentials between assemblers and

suppliers in India are much greater than in the U.S. and Japan (80% in both countries).[36] Clearly, the high degree of subcontracting by Maruti and Telco (see Chapters 2 and 3) has taken advantage of low wages at suppliers. This huge wage disparity between assemblers and small suppliers also means that workers in assemblers and small suppliers operate in different labor market segments, which makes labor mobility between these different segments very difficult.

However, the recent upward shift in the educational levels of the workforce (see Figure 4.1 above) has had various effects on employment practices among suppliers. First, it imposed some limits on these informal skill formation practices within the firm. As more small firms started demanding ITI graduates for new recruits, opportunities for uneducated and unskilled helpers to become skilled have become extremely limited. In fact, several firms witnessed some conflicts between uneducated but experienced old timers and educated but inexperienced new recruits on the shop floor. In some cases, in-firm training has served as a forum to mediate such conflicts by treating them on the same ground and balancing the types of skills acquired by the two groups of workers. Second, in Maharashtra, where educational levels are generally higher than in other regions, a recent rise in the educational level among production workers has made it increasingly difficult for employers to fill unskilled minimum-wage jobs; high school graduates do not easily accept tasks and work conditions as cheap laborers. Such new constraints due to upskilling trends have led firms to reform their organization of work, as discussed below.

Despite considerable difficulties in examining the nature of external labor markets surrounding the workforce of suppliers due to a serious lack of data, Figure 4.2 presents the responses of the 44 sample suppliers regarding demand for and supply of different occupational categories of workers for their firms. Figure 4.2 shows that employers generally face few supply constraints for most occupational categories. However, nearly 40% of the sample firms, particularly small ones, have had some difficulties in recruiting

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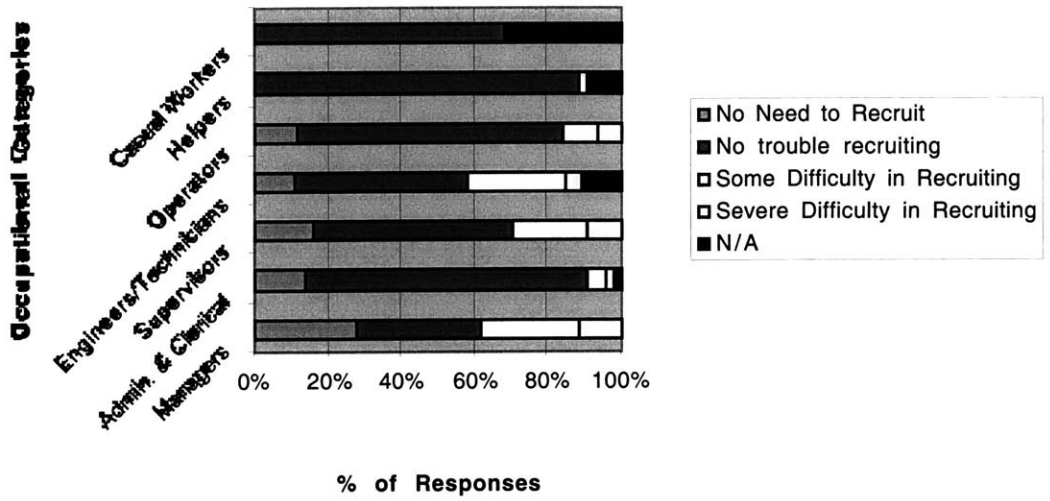
[36] See Nishiguchi 1994.

qualified managers, and about 30% had some difficulties in recruiting qualified supervisors and engineers, indicating an increased demand for and a shortage of qualified employees in these categories.

Figure 4.2: Labor Market Conditions for Different Occupational Groups: Frequency of Responses from 44 Sample Firms



Source: Computed from the results of a questionnaire survey conducted by the author.

Qualifications of supervisors and engineers vary, however, largely depending on the firm size. At large firms, well-educated holders of degrees or diplomas in engineering occupy these jobs, while smaller firms employ few engineers, and their supervisors are more likely to have been promoted from production worker jobs after 15 to 20 years of service at the same firm. Where holders of degree or diploma occupy supervisory positions, production workers have extremely limited promotion opportunities beyond their occupational category.

As shown in Figure 4.2, several factors explain why small firms find it difficult to recruit qualified engineers. First, engineers generally prefer to work at large firms, because

of the higher social status and recognition attached to large firms, let alone better wages large firms pay. Thus, small firms often cannot recruit the best-qualified engineers.[37] Second, at small firms, even educated engineers need to perform odd tasks.[38] Finally, because applicants' skills acquired through previous work are firm-specific, it is hard to match them with the skills other firms require, especially in such areas as the tool room, maintenance, and rubber processing.[39] At the same time, labor turnover is very high among engineers at small firms. Thus, the difficulty in attracting qualified engineers has increasingly led small firms to contract out such engineers' tasks as testing and maintenance, to outside independent testing facilities.

In addition, 16% of the sample firms found it difficult to recruit even skilled workers for various reasons. First, as discussed earlier, as many workers are from agricultural areas, it is difficult to find good workers during the agricultural season as they go back to their villages. Second, skilled workers, especially those with particular trade skills, such as die-makers, tool makers, rubber specialists, fitters, and welders, are in high demand and in short supply, due partly to the recent remarkable growth of the industry (see Chapter 2), as these skills are not easily available in the labor markets.[40] Finally, like engineers, skilled workers also prefer to work at large firms, as they offer better wages and more opportunities.[41]

In sum, labor markets for workers at suppliers are more complex and mixed than for workers at large vehicle manufacturers, with the coexistence of various patterns of employment practices, including those concerning skill development. At supplier firms, the level of skills largely determines the patterns of employment practices. The recent transformations in the industry have resulted in a considerable upward shift in the general skill levels and in increased demand for skilled and managerial workers even among small

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[37] Interviews with T1, T9, T10, T14, T17, T18, T20, in April 1997.
[38] Interview with T9, in April 1997.
[39] Interviews with M18, T13, T15, T16, in March 1997.
[40] Interviews with M2, T10, T12, T13, T14, T19, T23, in March and April 1997.
[41] Interview with T23, in April 1997.

suppliers. At the same time, while on-the-job training remains a dominant method of skill development for workers at small suppliers, general education, particularly post-secondary industrial training at ITIs, has become increasingly important to acquire basic technical knowledge to enter a production job even at small suppliers.

4.3.2 The Changing Patterns of Skill Acquisition and Development

This subsection explores where and how different types of skills are acquired and developed at small suppliers and why the demand for skills has increased among suppliers in the 1990s, as seen in the previous section.

1) Managerial Skills

Traditionally, many suppliers, particularly small firms, are family-owned and managed by the owner who started the enterprise. Many of these small owners used to work at firms producing tractors, such as Eicher, as skilled workers before they established their firms.

As discussed earlier, professional managerial skills have become more important even among small firms in recent years, as indicated by an increased demand for educated and qualified managerial workers, particularly in the areas of production control, quality assurance, and maintenance. Moreover, a growing number of employers, particularly among young well-educated entrepreneurs, started gaining managerial skills through outside industrial associations, particularly the Confederation of Indian Industry (CII) and the Automotive Component Manufacturers' Association (ACMA). These organizations have recently played an important role in disseminating such management techniques among Indian entrepreneurs and managers through their training activities.[42] This industry-wide diffusion of knowledge and values has played an important role in changing

[42] For example, M1, M3, M4, M6, M11, M18, T16, and T18.

the perceptions of entrepreneurs and managers about what changes are required to improve their business.

Moreover, several entrepreneurs have participated in management training courses organized by AOTS in Japan (see Appendix 3.3 in Chapter 3). They paid half of their air tickets, and AOTS bore the rest of the costs, including boarding and lodging. During these courses, they learned the Japanese production systems, particularly such areas as production control, quality control, inventory systems, and other management techniques, and were assigned to Japanese firms that produce similar products to theirs to observe the Japanese shop-floor practices. This experience has helped them change their perception about how to run their business. For example, two young owners (brothers) of a small supplier in Faridabad introduced a training program in their firm upon their return from Japan. Before going to Japan, they had thought that small firms like theirs would not need, and could not afford, to conduct training programs for employees. But in Japan they observed that even small firms with only five employees had regular training programs. This experience literally opened their eyes. A young owner of another firm in Pune also participated in a similar course organized by AOTS in Tokyo. Upon his return, he changed the production process and the layout of his factory. He installed a new floor which was much safer and easier to clean than his earlier floor, placed a yellow line on the floor following the flow of production lines to better organize the flow of materials and workers on the shop floor, and introduced a color-coding scheme to more easily identify each item according to the stage in each process. These changes have significantly improved the efficiency of the operation and reduced the wastage and rework, thus improving productivity.

Young managers, often sons of owners of SSI firms, actively participate in activities organized by AOTS's alumni organizations set up in several cities in India, such as Delhi, Pune, Faridabad, Bangalore, and Madras. They voluntarily organize seminars and workshops for local young managers on new management techniques, such as *kaizen*,

"5S," and quality control, developing a new form of horizontal networks among small firms to facilitate the diffusion of information, knowledge, and management techniques, and thus developing managerial skills among them.[43]

In addition, other region-specific horizontal networks among entrepreneurs and managers, such as the Maratha Chamber of Commerce in Pune and the Faridabad Small-Scale Industry Association (FSSIA), have recently started organizing seminars and training programs for their members in each region, thus serving as an increasingly effective forum for diffusing new knowledge, skills, and values. When asked, many respondents maintained that such organizations were a major source of new knowledge and management practices, particularly those pertaining to quality improvement.[44]

Interestingly, organizational change appears to occur faster among firms whose owners (and their sons) are exposed to production processes in Japan, either in their foreign partnerships or through AOTS training. In fact, these firms whose owners have had some overseas exposure most actively introduced formal training programs for workers in their own firms as well. Indeed, perceptional changes among entrepreneurs and managers have also had a large impact on the patterns of skill development for workers. For example, a managing director of a small supplier in Faridabad attended a training course on ISO 9000, organized by CII, in 1993 for the first time. His increased quality consciousness led him to introduce training programs for workers at his firm, which in turn resulted in a marked increase in sales (more than doubled between 1990-91 and 1995-96) and improvement in product quality and in productivity. Therefore, once again, industrial associations such as CII and ACMA and training intermediaries such as AOTS have played a critical role in diffusing information, knowledge, and ideas throughout the industry, particularly those concerning quality improvement, and creating an organizational environment conducive to industry-wide learning.

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[43] For example, M23.
[44] For example, T5, T11, T12, and T14.

2) Engineering Skills

Table 4.4 is a summary of the responses from the 50 sample suppliers to the question as to where their employees mainly acquired their skills. As Table 4.4 shows, engineers in suppliers mainly acquire their skills through schooling or on the job.

Table 4.4: Where Did Employees Acquire Their Skills?
Responses from 50 Sample First-tier Suppliers
(Number of firms)

	Supervisors	Engineers / Technicians	Production Workers
a. Higher level education (e.g., degree / diploma from engineering college)	10	15	0
b. Technical / vocational schools (ITIs)	7	10	19
c. Apprenticeship	1	1	3
d. In-house off-the-job training	1	0	1
e. In-house on-the-job training (from supervisors/ senior workers/ managers)	20	14	31
f. Informal learning from co-workers	1	1	3
g. From magazines and other publications	0	0	0
h. Through previous work at another firm	14	15	22
i. From friends	0	0	0
j. From family or relatives	0	0	0
k. From vendors of machinery/ tools	0	0	0

Notes: As multiple answers were permitted, the total number of answers does not equal the total number of respondent firms.
Source: The results of my questionnaire survey conducted in 1997.

Reflecting small suppliers' relatively low engineering capabilities, very few have their own R&D facilities. Their product development capabilities are low, as they produce products based on the drawings and samples provided by their customers. While many of the sample firms did have simple testing facilities, they rarely used them until the mid-

1990s. The development of engineering skills among small suppliers still appears to be slow.

Prior to the entry of Maruti in India, reflecting the prevalent "arm's length" supplier relations, Indian vehicle manufacturers rarely deputed their engineers to suppliers. But Maruti started sending its engineers to its key suppliers in joint ventures with Maruti for an extensive period of time. One Maruti engineer I interviewed was sent to a supplier for the initial three years soon after the supplier was established, to provide technical assistance to the firm. The engineer apparently served as an effective interface between Maruti and the key supplier, as he went back and forth daily between the two firms, carrying problems in his hand one way and their solutions on the way back. As the supplier was located in the same premises as Maruti's main plant, this intimate feedback mechanism through the Maruti engineer worked smoothly and quickly, and was thus effective. Maruti does not depute but frequently sends its engineers to other suppliers to provide technical assistance, as discussed in more detail in subsequent sections.

Telco too, despite its traditional "arm's length" supplier relations, had had some close interactions with its suppliers in the area of parts development, even before it drastically changed its supplier relations in 1997: Telco's Ancillary Development Department works closely with suppliers to develop parts, until they can produce such parts on their own on a commercial basis. Then, Telco's Purchase Department deals with such suppliers through its bidding process. Therefore, both Maruti and Telco in effect show that vertical inter-firm linkages have helped suppliers develop their engineering skills.

Overseas training opportunities for engineers at suppliers are limited. Among the 50 sample suppliers, only a few, especially those in joint ventures with Japanese component manufacturers, have sent their engineers to Japan for training.

3) Production Skills

Production skills are mostly acquired through on-the-job training, especially as many production workers do not have technical training at ITIs and other training institutions before they begin their jobs. Employers do welcome those who have already acquired necessary skills through their previous jobs. When they require skills that are not available elsewhere, they mostly rely on in-firm on-the-job training to develop their workers' skills. Interestingly, first-tier suppliers define production skills differently among themselves, reflecting their diverse product range and equally diverse production processes. Even small firms have their own norms regarding what it takes for workers to become skilled, informally defined not by years of schooling but by the experience required to perform certain tasks. For example, in a small firm producing 50 different items, production processes are flexible, as the firm has to change jigs and dies frequently according to the orders from customers. Thus, new workers in its press shop need to become familiar with all 50 items, which usually takes two months. Workers gradually learn when and how they load dies, change them according to the line shift, and make adjustment. They learn in progression how to operate machines and understand the nature of products and of materials.

Typically, however, helpers learn the basic nature of work while performing their simple tasks. Many firms find no need to train helpers, thus leaving them outside the scope of even on-the-job training. Only occasionally, those helpers who perform well are gradually paired up with more experienced workers for on-the-job training to prepare them to become regular production workers.

The recent rapid transformations in the industry have resulted in two concomitant patterns of skill acquisition; an increasing reliance on standardized vocational training, especially at ITIs, to acquire basic skills, and traditional experience-based on-the-job acquisition of craft skills. Until recently, firms generally preferred to recruit those who had already acquired necessary skills through previous work; now, however, more firms prefer

to recruit fresh graduates from ITIs (see Table 4.4).[45] Indeed, the ITI training has increasingly become a minimum qualification for entry into production jobs at these suppliers. This does not undermine the importance of on-the-job training, however; as an owner of a small firm admitted, "those ITI graduates cannot perform our kind of jobs right away"; they still need to acquire firm-specific skills through their jobs.

On the other hand, despite rapid automation in the workplace, craft skills such as die making are still in high demand, as most Indian suppliers have their own tool rooms in their workshops. Because the development of such craft skills requires long years of experience, firms keep such highly skilled workers, who are often not educated and are older than other workers, by paying special skill premiums.

Few small firms conduct their own apprenticeship programs,[46] as it is costly to do so. Even in the cases where supplier firms do accept apprentices, the rate of retention is low. After the apprenticeship, trainees often look for jobs elsewhere. But, they do accept apprentices trained by their customers such as Maruti and Telco, thus saving the costs of training they would have incurred otherwise.

4.3.3 Changes in Work Organization

Not only did Maruti adopt a number of Japanese work organization practices within the firm (see Chapter 3), but it also served as a model for diffusing such practices throughout the industry, and in particular among its suppliers. Table 4.5 compares the degree of introduction of some of the lean production techniques among Maruti suppliers and Telco suppliers. Clearly, the diffusion of new work organizations with emphasis on team work and quality consciousness occurred much faster among Maruti's local suppliers than Telco's local suppliers, except for the practices of rotation and multi-skilling, suggesting the role of vertical inter-firm linkages in the diffusion. The adoption of such

[45] Interviews with M12, M14, M22, T1, T5, T7, T10, to name a few.
[46] For details of the Indian statutory apprenticeship scheme, see Chapter 3.

new techniques and practices was also common among those firms which supply both Maruti and Telco; these are mainly large firms, some of which are themselves FDI-related.

On the other hand, large FDI-related suppliers, such as Denso India, which is a key member firm in the Toyota group in Japan and one of the largest component suppliers in the world, are more influenced by their parent company than by local customers in shaping production processes. In fact, Denso is the only firm in India which has introduced Hourly Outputs Control Panels, a management tool to improve per-hour productivity for each line; even in Japan, this technique is used only by Toyota group firms.[47]

Table 4.5: Adoption of New Management Techniques and Practices: Maruti and Telco First-tier Suppliers

	QC circle	Suggestion Scheme	Multi-skilling/ Rotation	ISO 9000 Certification
Suppliers with FDI (n= 11)	5	4	7	7
Suppliers without FDI (n=36)	6	7	17	15
Suppliers to Maruti (n=18)	5	5	9	9
Suppliers to Telco (n=18)	0	1	11	4
Suppliers to both Maruti and Telco (n=11)	6	6	4	9
Total (n=47)	11	12	24	22

Source: Calculated from the results of my questionnaire survey.

However, a closer examination reveals that in the process of diffusion, because of such prevailing social institutions as the caste system and labor relations, such practices have been modified into something different from what was originally intended. For instance, many suppliers have introduced QC circles, originally designed to promote workers' participation in quality and productivity improvement efforts, only for managers and staff (indirect workers), without involving the production workers on the shop floor. Therefore, unlike the Japanese model, these organizational changes have not really led to decentralization of decision-making on the shop floor at first-tier suppliers.

4.3.4 Growing Formalization of Training Programs at Suppliers

In recent years, many Indian suppliers have increasingly adopted formal training programs. Of the 50 suppliers I interviewed, 31 now have regular training programs for their employees; many have introduced them only since 1993, as a totally new activity.[48] Some firms have even developed an annual training plan for each employee, based on the individual's training needs defined by the individual, his supervisor, and the manager of the department. Many firms have also introduced induction training for new entrants in recent years. This move toward formalizing the in-firm training among suppliers is a new phenomenon in India. For example, even a large firm with a total of nearly 1,800 employees set up its human resources development (HRD) department and started formal training programs for production workers only in 1996, after more than fifty years of operation. However, many firms' training programs cover only managers, indirect workers and supervisors, and often exclude production workers.

Like Maruti (see Chapter 3), some firms with FDI use direct interactions and exchanges with their foreign partners, including visits to their foreign plants to provide their employees with instant exposure to foreign practices. One such firm sent its new workers to Japan for training at the initial stage of operation. Another firm sends its HRD manager to the U.S. and supervisors to its Japanese joint-venture partner for training. An FDI-affiliated wiring harness manufacturer sends 50 employees a year, including 35 female workers, several supervisors and engineers, to its Japanese joint-venture partner, for three-month on-the-job training. Trainees commonly learn foreign technologies, production systems, teamwork, and problem-solving techniques, and inventory systems in foreign plants. As at Maruti, workers bank their salaries during their overseas training, while they also receive stipends from the firm's Japanese partner. While such overseas training occurs more commonly among FDI-affiliated firms, the ownership does not necessarily

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[47] My interviews with a joint managing director of Maruti and managers of Denso India, in May 1997.

determine the amount of in-firm training. Some FDI-affiliated firms, such as Denso, conduct little training except for the introduction of QC circles.

Table 4.6 summarizes the frequency of responses regarding the subjects covered by in-firm training among three groups of suppliers: those supplying both Maruti and Telco, those supplying Maruti, and those supplying Telco. Although the sample size is small, Table 4.6 still indicates some interesting trends. First, the firms supplying both Maruti and Telco, which are mostly large, generally conduct training in various subjects, particularly those concerning health and safety, quality improvement, and problem-solving techniques. Second, Maruti suppliers conduct more training in most areas than Telco suppliers, except for training in new technologies. In particular, the difference in interests between the two groups is most apparent in such subject areas as statistical process control, quality improvement, communication and personal skills, team building, problem-solving techniques, and QC circle activities. Interestingly, these trends reflect the different focus of training between Maruti and Telco; Maruti mainly focuses on quality improvement, problem-solving, and interpersonal skills for improving production capabilities, while Telco focuses more on improving technical skills and learning about new technology (see Chapter 3). This suggests the considerable influence of their customers' orientation toward strategic areas over learning at their suppliers. Also, there is a clear shift in the focus of in-firm training toward the improvement of product and process quality and greater efficiency, suggesting considerable changes in the nature of skills required by suppliers.

[48] These firms include M5, T1, T3, T5, T16, T19, T20, to name a few.

Table 4.6: Subjects Covered by In-firm Training: Selected Suppliers (By Group): 1997
(Frequency of Responses)

	Suppliers to both Maruti and Telco (n = 11)		Suppliers to Maruti (n = 17)		Suppliers to Telco (n = 18)	
Subjects	On-the-job training	Off-the-job training	On-the-job training	Off-the-job training	On-the-job training	Off-the-job training
1. Safety and health	91%	45%	53%	47%	33%	28%
2. Technical skills upgradation or refreshing	64%	45%	71%	35%	61%	28%
3. Knowledge about new technology	36%	9%	24%	29%	33%	11%
4. Statistical process control	55%	73%	35%	18%	17%	11%
5. Basic mathematics	0%	0%	0%	6%	6%	6%
6. Quality improvement	82%	82%	65%	53%	39%	28%
7. Communication & interpersonal skills	18%	18%	29%	29%	6%	17%
8. Time management	27%	27%	24%	6%	6%	6%
9. Information management	36%	36%	6%	6%	0%	0%
10. Team building	55%	27%	35%	35%	17%	17%
11. Problem solving techniques	64%	55%	29%	6%	17%	17%
12. QC circle activities	45%	55%	29%	18%	0%	0%
13. ISO 9000	18%	36%	12%	6%	17%	0%
14. About company policy/ goals	0%	0%	0%	12%	0%	6%
15. Cleanliness/ housekeeping	9%	9%	24%	18%	0%	0%

Source: My questionnaire survey conducted in 1997.

4.4 What Motivates Firms to Foster Skill Development? : Creating Demand-Driven Learning Chains

Why have supplier firms started requiring better-educated workers and introducing more in-firm training in recent years? Many factors explain this upward trend toward skill development among suppliers. Table 4.7 summarizes the responses of the sample suppliers.

Table 4.7: Reasons for the Introduction of and Increases in In-firm Training: Frequency of Responses from the Sample Suppliers (1997)

	Suppliers to both Maruti and Telco (n= 11)	Suppliers to Maruti (n= 17)	Suppliers to Telco (n= 18)
a. A need to improve productivity	4	9	8
b. An increase in exports	1	2	2
c. Suggested by export agents	0	0	
d. An interest in improving quality/ increased quality consciousness	8	13	11
e. Guidance from government/ government agencies	0	0	1
f. Guidance from foreign collaborators	3	2	1
g. Guidance from business associations	3	8	4
h. Guidance /demand from customers *	6	14	9
i. Workers' interests in training	4	8	3
j. Pressures from unions	0	0	0
k. Interests in creating better work culture **	0	2	1
l. Reduce costs **	1	3	2
m. Increased computerization **	0	0	3
n. Technological change /upgradation **	1	2	4

Notes: Multiple answers were permitted, so that the total number of answers does not equal the total number of firms in each category. However, some firms did not reply, as they did not introduce or upgrade their training activities (3 Maruti suppliers, 5 Telco suppliers); * includes variants of answers such as customer satisfaction; to gain confidence of customers; interested in becoming core suppliers. ** respondents raised these as reasons other than those covered in A through J. Thus, the number of answers might be higher if these items were pre-given.

Clearly, for all three groups, two linked factors most clearly motivated supplier firms to promote skill development: their interest in improving quality, and pressure from their customers. As a Maruti supplier put it, "complaints from Maruti were a main motivation to improve quality."[49]

Many firms explain the reasons for their increased quality consciousness. Since the introduction of the liberalization policy in 1991, competition in the industry became intense, which forced firms to reduce costs and improve productivity.[50] Because of this intensified competition and technological change, "firms today require better workers, and therefore need to improve the quality of workers."[51] Others put it, "If we want to survive, we have

[49] Interviews with Maruti suppliers (M10), in March 1997.
[50] Interviews with M5, T12, in March 1997.
[51] Interviews with M6, T6, and T11, in March 1997.

to do training."[52] The rapid recent transformations within vehicle manufacturers have clearly been translated into suppliers' strategies for organizational change. Another firm noted, "As our customers' awareness has improved, they now want us to upgrade our training. We now require better machines, better procedures, new layout, new testing equipment, more housekeeping, and improved quality."[53]

In addition, many suppliers became motivated to accelerate in-firm training to reduce costs and improve productivity (see Table 4.6). Indeed, some firms attributed their recent productivity increase to the introduction of in-firm training and its resulting improvement in attendance and/or reduction in waste and defects.[54] Other firms, however, indicated no interest in improving productivity, as the delivery schedules set by their customers determines their productivity in terms of output per hour.

Behind all these factors, one strong driving force for the recent introduction of training programs among supplier firms was their interest in obtaining ISO9000/ ISO9002 certificates, required by both Maruti and Telco. This requirement has actually forced suppliers to implement training programs, one on a long list of items that firms needed to comply with for obtaining the ISO certification. As one supplier put it, "ISO is the most important determinant for our introduction of training."[55] Clearly, pressures from their customers have induced an unusually high momentum for introducing organizational innovation, including training among suppliers.

Indeed, many firms I interviewed have conducted special training programs specifically designed for ISO certification, often hiring a special consultant as a trainer, since the mid-1990s.[56] While most firms have allocated 0.5% to 1% of sales turnover to training activities in recent years, some report a phenomenal rise in their training costs, ranging from Rs.400, 000 to Rs.5 million in 1996, 10 times more than they spent in

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[52] Interviews with T3, T12, in March 1997.
[53] Interview with T15 in April 1997.
[54] For example, M5, M23, T23.
[55] Interview with M18, in March 1997.
[56] For example, these firms include T5, T16, T19.

1995.[57] In fact, many firms noted that a large portion of training costs are spent on paying those consultants specially hired to introduce Statistical Process Control (SPC), TQM, and ISO. Many firms are concerned about whether it is worth spending so much on training, but they do so, because it is what "everyone is doing." Thus, new ideas, techniques, and practices are being rapidly diffused throughout the automobile industry, even among small firms. Suppliers' decisions to introduce such new ideas and practices are not necessarily based on their profit-maximizing interests. Rather, they are motivated by the industry-wide dissemination of new norms and values through increasingly standardized training programs conducted by their customers and independent consultants.[58]

As the process of ISO certification entails a detailed sequence of standardized organizational reforms involving virtually every aspect of their production activities, the requirement of obtaining ISO certificates has effectively forced suppliers to adopt these procedures as an institutional form. Suppliers' adherence to the principles of ISO has in turn become institutionalized as a norm. This new norm has rapidly been diffused throughout the industry in response to a rapidly changing institutional environment.[59] Because the ISO certificates also serve as a status symbol of good quality and as a ticket for gaining credibility from customers, this process of institutionalization was also legitimized among supplier firms fairly quickly. This process of diffusion among suppliers has also helped change their perception of production management from *ex-post* "inspection" to *ex-ante* "prevention" with greater focus on quality improvement embedded in the production processes, as discussed in the next section.

While neither Maruti nor Telco directly requires their suppliers to undergo organizational reforms in the areas of work organization and training, their indirect influences are still strong. Even though many suppliers have multiple customers, only Maruti and Telco, among many vehicle manufacturers, impose strict quality standards on

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[57] For example, these firms include M2, T5, T16.
[58] For the theoretical constructs of such institutional isomorphism, see Powell and DiMaggio (1990).
[59] See Powell and DiMaggio (1990) for theoretical constructs of institutional isomorphism.

them. For example, several Telco suppliers noted that although Telco never conducted training for suppliers until recently, its auditing focuses on various areas for improvement, and the feedback from Telco they received through the auditing prompted them to introduce training activities.[60] Many firms admitted that Maruti and Telco had implicitly threatened to terminate business unless they improved their quality standards.[61]

Not only "threats" but also "rewards" motivate suppliers to improve their performance; Maruti gives annual performance awards to the best performing suppliers each year at an annual convention, inviting all its suppliers. The criteria for award selection include 1) delivery schedules; 2) quality; 3) prices; 4) loyalty; 5) maintenance; and 6) rejection rates. While some suppliers also recognize the importance of the ISO certification for the firms' international recognition and global market access in the long run, their main motive still is to satisfy their customers' demands. Clearly, an increased demand for quality improvement from the customers has induced the current acceleration of skill development among suppliers.

With respect to the relationship between technological change and skill development at suppliers, their responses were mixed. Some firms cited the increased use of computers in the workplace, such as the introduction of CAD, and thus the growing need to familiarize workers with computers, as an important factor in increasing training activities.[62] One firm noted that 60% of its employees, including production workers, are now computer literate.[63] Some firms even sent their employees to outside training institutes or brought in specialized trainers to conduct computer training. The increased computerization has improved the performance of suppliers in such areas as inspection and quality control, thus allowing them to attain higher process control, in adherence to the principles underlying the QS certification.[64] In other words, the recent accelerated

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[60] For example, T19.
[61] For example, M13, T16.
[62] For example, T4.
[63] Interview with T20, in March 1997.
[64] Interviews with T5, T20.

computerization is also part of suppliers' efforts to obtain the certificate required by their customers.

Unions played a very small role, if any, in promoting skill development at suppliers, as their interests largely remained in the issues of compensation and working conditions. Many firms noted, however, that while workers were initially not interested in ongoing organizational changes within the firm, including the introduction of training, they gradually started showing an interest, as they started seeing the positive effects on them, in terms of wage increases because of sales growth.

Further, as discussed earlier, some firms, particularly small ones, noted that the management's exposure to Japanese production practices had an eye-opening effect, leading them to introduce in-firm training upon their return from Japan. As discussed in Chapter 3, intermediary training organizations such as AOTS played an important role in disseminating knowledge, ideas, and managerial techniques that value quality. Several owners of small firms without foreign collaboration noted that their own "learning" in the form of direct exposure to the Japanese production systems during their visits to Japanese suppliers as part of AOTS training programs had a tremendous effect on their perceptions of running business.

4.5 The Role of Inter-firm Linkages

The previous sections pointed to the important role that the demand, pressures, and guidance from customers have played in changing the attitudes of suppliers toward skill development. This section analyzes the nature of interactions between Maruti and Telco and their respective suppliers, to reveal the role of inter-firm linkages in shaping the patterns of skill development at suppliers.

Building on Lall's work (1985b) on backward linkages in the Indian commercial vehicle industry, this section analyzes the nature of linkages between Maruti and Telco,

and their respective suppliers, as they relate most directly to skill development at supplier firms.[65] Such linkages may take four different but interconnected forms: 1) direct interaction between employees of customers and suppliers; 2) activities for information sharing with suppliers; 3) the enforcement of quality standards that require suppliers' efforts to promote organizational innovation and improvement; and 4) spillovers, when customers' employees move to suppliers. In what follows, I examine each of these forms of inter-firm linkages that Maruti and Telco forged with their respective suppliers.

4.5.1 Direct Interaction

Maruti has seven Vendor Development Departments in its Materials I and Materials II Divisions. Four Departments in the Materials I Division, staffed by 90 engineers and technicians, are responsible for supplier development, while three departments in the Materials II Division deal with the purchase of raw materials, consumables, and tools, and handles matters related to excise, shipping, transportation, and inventory of components. Each department is responsible for a fixed group of suppliers according to their product line. The Vendor Development I Department, the largest of the four departments in Materials I, looks after Maruti's dedicated suppliers, particularly those in joint venture with Maruti, such as Asahi Glass India, Bharat Seats, and Sona Steering. The Vendor Development II Department looks after suppliers of transmission components, while the Vendor Development III and IV Departments are responsible for suppliers producing engine and other components respectively. As in the case of Japanese auto assemblers

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[65] A study by Lall (1985b), comparing the nature of backward linkages of Telco and Ashok Layland in the 1970s, identified ten kinds of backward linkages: 1) establishment; 2) locational; 3) informational; 4) technical; 5) financial; 6) raw material procurement; 7) managerial; 8) pricing; 9) distributional; and 10) diversification. Of these, I focus here on 3) informational; 4) technical; and 7) managerial linkages, as these are perhaps most directly related to inter-firm skill development and transfer. Informational linkage refers to placing orders for specified periods to facilitate current production planning, and communication of long-term plans to facilitate investment planning. Technical linkage refers to the provision of technical assistance or exchange of technical information, to ensure the precise matching of needs with supplies, to provide for adequate quality, and to facilitate innovation. Managerial linkage refers to providing training and other help with management and organization, to improve the supplier's performance (Lall 1985b: 269-270).

(Nishiguchi 1994, Fujimoto 1997), these departments work closely with their assigned suppliers, providing them with technical assistance, evaluating their products and performance, and jointly solving problems that suppliers encounter. Most suppliers receive the drawings from Maruti, indicating the generally low levels of supplier involvement in their own product design development. As noted earlier, engineers from these departments frequently interact with the suppliers.[66] Many Maruti suppliers note that engineers come from Maruti much more frequently than from other customers. As most suppliers are located in proximity to Maruti, the costs of such frequent monitoring are kept relatively low.

Such technical guidance by Maruti engineers occurs in various forms (see Table 4.7 below) and covers a wide range of areas, from product quality to plant layouts, procedures, and housekeeping, with great emphasis on improving quality and reducing rejections, waste, and costs. Some suppliers note that they have received detailed technical guidance on tooling, assembly processes, and welding techniques. For example, one Maruti supplier explained, "Our rejection rate was very high. Maruti taught us how to curtail the rejection, by improving housekeeping and changing the layout of both office and factory spaces."[67] Another firm noted that Maruti found its die-casting workshop very stuffy and thus suggested how to improve the layout. Table 4.8 summarizes responses of the sample suppliers about what forms of guidance and/or pressures they have received from their customers.

Moreover, a group of Japanese engineers sent from Suzuki visit Maruti suppliers periodically; they make extremely detailed suggestions on specific areas for improvement. For example, a Suzuki engineer, during his visit to a small supplier in Faridabad, suggested that the firm should replace wooden storage cartons with plastic ones, which are more durable, easy to handle and clean, thus reducing wastes and time spent on reworking.

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[66] This frequent face-to-face interaction with suppliers is also considered a characteristic of the Japanese model of supplier relations (Fujimoto 1997).

[67] Interview with M5, in April 1997.

Clearly, Maruti's supplier relations follow the model of lean production (Womack et al. 1990: 146-153) with great emphasis on "inter-firm collaborative problem-solving" (Nishiguchi 1994).

Table 4.8: What forms of guidance and/or pressures do you receive from your customers?: Frequency of Responses from the Sample Suppliers

(No. of firms)

	Suppliers to both Maruti and Telco (n= 10)	Suppliers to Maruti (n= 17)	Suppliers to Telco (n= 18)
A. Guidelines	2	11	9
B. Distribution of training manuals/modules/ materials	3	9	5
C. Providing trainers	4	7	6
D. Verbal discussions	5	12	9
E. Threats to terminate business	0	8	5
F. Performance/quality evaluation ranking	7	13	9
G. Awards/prizes	2 **	5**	0
H. Financial assistance for training activities	0	1*	1

Notes: As multiple answers were permitted, the total number of responses is not equal to the total number of firms that answered. Some firms (1 Maruti supplier and 3 Telco suppliers; 1 firm supplying both Maruti and Telco) did not introduce or upgrade their training activities; their responses were "not applicable," and thus not included here. * not Maruti but TEF and Escort. ** Three firms note that while there are no awards for promoting training, Maruti provides performance awards (M16).
Sources: Questionnaire survey conducted by the author.

In addition to technical support, Maruti also provides its suppliers with financial support in the form of on-time payment. Suppliers receive payment from Maruti within 15 days after the delivery of goods, which helps them, particularly the small firms, to gain some financial stability, as they are often short of working capital and lack access to credit.[68] In return for the on-time payment, however, Maruti takes 1% as a commission. This new financial stability due to Maruti's on-time payment has in turn helped develop confidence among suppliers. This "trust" relationship between Maruti and its suppliers did not exist at the earlier stage, however: many suppliers were skeptical about working with Maruti, then a state-owned enterprise, because of the deeply-rooted stigma among Indians

against state enterprises as inefficient and corrupt. Thus, contrary to the embeddedness argument (Granovetter 1985) that such inter-firm relationships are embedded in the prevailing social relations, Maruti actually has worked hard to win trust among its suppliers, by instituting clear, transparent "rules of the game" in its business with its suppliers, and thus building a reciprocal relationship with them.

Telco, on the other hand, despite its traditional "arm's length" contractual relationship with its suppliers, has developed various forms of linkages with them. Its different departments were involved in supplier development, without much overall coordination among them. Telco's Ancillary Development Department has been responsible for locating and developing new suppliers up to the stage of placing orders (Lall 1985b: 279). Its Quality Control Departments monitor the quality of purchases and evaluate the performance of suppliers, while the Purchase Department actually places orders based on competitive bidding and controls delivery schedules. Meanwhile, the Product Development Departments worked with Telco suppliers in developing new components, by working out the precise specifications for each supplier and advising on tooling-up for production (Lall 1985b: 280).

Until recently, however, Telco's supplier management had largely been confined only to inspection and instruction regarding the use of gauges, other than earlier joint prototype development of certain components before their commercial production. As a Telco manager described, "Telco gives drawings to suppliers, and they in turn give components to Telco. If products are not satisfactory, we simply go to another supplier. We were meeting as a stranger with our suppliers. Our relationship has been businesslike, not like family or relatives on both sides."[69] Thus, as in the Fordist model of supplier

[68] This arrangement is rather unusual, as large firms in india typically pay their subcontractors four to six weeks, and sometimes even six months after the delivery, causing serious shortages in working capital (Hesp 1996).

[69] Interview with a Telco manager in Material Division, in March 1997.

relations,[70] Telco offered little help to its suppliers in solving their problems, either technical or financial.

In 1997, Telco drastically changed its supplier relations, however, from "arm's length" to longer-term, closer ones, as part of Telco's strategic move to enter the passenger car market amidst ever-intensifying competition in the Indian car market with the entry of many global players (see Chapter 2). The new competitive environment has posed Telco a set of new challenges: global quality, attractive price, after services, available spare parts, and cost competitiveness. Such new challenges made Telco acutely aware that to compete in the global market without its global "brand name," it would need to achieve the same quality standard as those of the global players. This meant an enormous need to improve the performance of suppliers, forcing Telco to drastically change its supplier relations. This change has in turn involved a considerable internal restructuring, altering the division of labor among its departments concerning supplier development. Under the new arrangement, when Telco develops a new product, its Planning Department and Ancillary Development Department jointly decide whether to "make or buy" each component. Based on the bought-out component list, the Ancillary Development Department supports suppliers in the areas of quality, costs, and delivery requirements. The department also works with suppliers on the drawings and specifications of components. If suppliers have any difficulty in proceeding independently with the production of parts based on the drawings, Telco sends its engineers to work on the production process, machine engineering, and quality control, to guide suppliers. Suppliers in turn must strictly meet its quality, volume, and schedule requirements. Telco now evaluates its suppliers on the basis of their meeting and reducing the lead time and meeting target costs.

Moreover, in 1997, the process of mutual learning between Telco and its suppliers intensified further, as Telco started a new practice. The firm started visiting its suppliers to

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[70] On the comparison between the Fordist model of supplier relations and the "lean" production model of supplier relations, see Womack et al. 1990.

assess their production processes, training needs, and types of knowledge required, through three new schemes: a supplier assessment and orientation, supplier self-evaluation questionnaires, and a quality system survey. Based on the assessment, Telco selected its best commercial vehicle suppliers to work for its new small car project.

Further, in 1997, Telco also set up a new special unit, the Supplier Quality Improvement Program (SQIP) unit, to strengthen the capability of its suppliers and improve the quality of their products. The SQIP comprises 32 young and motivated engineers gathered from various departments. The manager of the SQIP first trained these engineers on the method for supplier assessment and how to conduct the quality system survey. Then, the 16 paired engineers were assigned to 4 suppliers selected for Telco's small car project, to train them in specific areas such as the statistical process control (SPC) and the use of gauges and calibrators. Some of them are deputed to their assigned suppliers on a short-term basis to accelerate the process of knowledge and skill transfer. As discussed in Chapter 2, Telco (Pune) also plans to reduce the number of its first-tier suppliers from 1,200 to 500 in the next few years, and to consolidate its supplier base by adopting a policy of double sourcing per item (from the previous three or four sources per item).

Taken together, Telco has responded to a new institutional environment in terms of the rapid transformations in the industry, by redefining not only the division of labor but also the quality of the relationship with its suppliers, with a considerable shift in focus from the inspection of *products* to the control of *process*.[71] This in turn induced a great deal of learning on the part of suppliers; one Telco supplier noted that this new relationship with Telco forced the firm to work on redesigning and reengineering, including die designs to

[71] Interestingly, Telco's model for change was not Maruti or other foreign newcomers in India but its sister company, Tata Cummins (a joint venture between the Tata Industries and Cummins in the U.S.), which also started changing its supplier relations in recent years, following the practice of Cummins. A senior manager in charge of Telco's SQIP was trained at Cummins in the U.S., which provided a basis for his initiatives in reforming Telco's supplier relations.

conform to Telco's new quality standards. The firm's manager commented, "what was accepted two years ago is no longer acceptable today."[72]

Like Maruti, Telco provides detailed drawings to most of its suppliers. But Telco's Engineering Research Center, an R&D facility (see Chapter 3), recently started developing its products through "simultaneous engineering" jointly with its suppliers, especially for prototype and design development.[73] Where Telco's own technological base is sound, however, it usually does not involve its suppliers in developing technological capabilities. Telco does not charge its suppliers for its technological support, except for the costs of tools that Telco develops for suppliers' use, as the firm considers it to be "creating assets which will be useful to Telco in the future."[74]

4.5.2 Information Sharing

Apart from direct interactions with individual suppliers, Maruti has developed various ways of sharing information with its suppliers. To speed up information dissemination between the firm and its suppliers, Maruti has connected its suppliers on-line to ensure accurate information from them as to inventory and delivery schedules; it also plans to communicate with them through the internet for more comprehensive supplier management.

Maruti also organizes various kinds of training for managers from supplier firms to diffuse knowledge among them, particularly in the areas of quality control, particularly ISO 9000, statistical process control, and process auditing systems. In addition, Maruti has also encouraged its suppliers to participate in training seminars organized by industrial associations such as CII and ACMA, and management training programs organized by AOTS, though suppliers have to bear the costs of these activities.

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[72] Interview with T15, in March 1997.

[73] When Telco engages its suppliers in joint product development, there is an implicit agreement that suppliers cannot sell products to other auto makers (Interview with a senior manager, Telco's Materials Division, in August 1998).

[74] Interview with a senior manager, Telco's Material Division (Pune), in August 1998.

Telco, on the other hand, reflecting its "arm's length" relationship with suppliers, has not been active in organizing activities for suppliers. Telco started conducting training for suppliers only in 1997, though still on a limited scale.

Both Maruti and Telco distribute some manuals on quality improvement, specification, and cleanliness, thus diffusing knowledge and standardizing expected procedures and performance among suppliers. Such manuals focus on 1) the improvement of quality; 2) in-time delivery; 3) on-time schedules; 4) right materials; 5) right timing; and 6) proper dispatch and packing. The formalization of training for suppliers serves as an effective way to communicate with them and diffuse new knowledge, norms, and values among suppliers. These efforts have helped not only to improve the performance of suppliers but also to strengthen the supplier relations.

Moreover, as discussed earlier, Maruti involves selected suppliers, particularly those in joint ventures with Maruti, for joint product development, often considered a characteristic of the Japanese supplier relations. However, the majority of small suppliers receive the detailed drawings from Maruti and are not involved in joint product development. In this sense, Maruti's supplier relations are not as decentralized as the Japanese model, with limited autonomy on the part of suppliers.

4.5.3 Setting and Enforcing Quality Standards

Maruti has taken various measures to improve the quality standard of its suppliers. First, it participates in the equity of its key suppliers, many of which are located in the same premises as Maruti's main plant, to strengthen its influence and control over them, and thereby to ensure their quality and efficient operation. Second, as discussed earlier, along with Suzuki, it has actively sought a match-making arrangement between over 40 Maruti suppliers and Suzuki suppliers in Japan, thus facilitating knowledge transfer to and improving quality standards at Indian suppliers. Third, in addition to requiring suppliers to obtain ISO certificates, Maruti instituted its own system of self-certification, a common

practice among Japanese auto assemblers: only certified suppliers can remain in business with Maruti, and their products can be directly placed on the assembly line without on-site inspection at Maruti.[75] Fourth, the firm developed a system of vendor rating and auditing, which constantly reminds its suppliers of the need to improve their performance. Each year, Maruti organizes several conventions inviting all suppliers, where it awards the best suppliers a prize to further motivate suppliers to improve their performance and provides training on quality control and ISO certification. Finally, Maruti provides its suppliers with gauges and calibrators for setting and enforcing Maruti's quality standards on their products. With these measures, as in the case of Japanese automobile assemblers (Nishiguchi 1994), Maruti has developed an institutionalized mechanism to achieve the goal of continuous improvement within its supply chain.

Along with other dynamic changes that occurred in Telco's supplier relations, in 1997, like Maruti, Telco also introduced a system of self-certification, which means an automatic acceptance of parts delivered by certified suppliers to be directly placed on the assembly line without on-site inspection at Telco.[76] This is Telco's own certification system, though it follows a similar format to the ISO certification. It requires suppliers to install certain standardized procedures, including in-firm training, while strengthening the ties between Telco and its suppliers as they share more and more common codified knowledge. Of 1,200 Telco (Pune) suppliers, 225 were self-certified by 1997. This institutionalized mechanism for improving quality created in the supply chain has led suppliers to undertake various organizational reforms, including the promotion of quality-enhancing training activities, as discussed earlier.[77]

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[75] Fujimoto (1997) notes that this is a key feature of the Japanese supplier relations linking suppliers closely to the production systems, including quality control, at assemblers. This practice is an extension of a lean production practice focusing more on quality control within the production processes than on inspection.

[76] Interview with T11, in April 1997.

[77] For example, T3, T8, T10, T14, T15, T19, T20 instituted a new training program to become eligible for self-certified suppliers.

Moreover, as at U.S. auto firms, Telco has recently started requiring its suppliers, particularly those which cater to all three plants, to acquire the QS9000, to achieve two goals: 1) to improve supplier quality to enhance the quality of components to the global standard; and 2) to reduce wastes and thus reduce production costs. A Telco manager found that while many Telco suppliers had already acquired ISO9000, it brought about little real change in the area of production control. But QS9000 requires firms to make a full commitment to production control. A Telco supplier noted, "previously, we had our own system of quality control, but this changed a few years ago. We now have to conform to QS9000."[78] Other firms noted: "The acceptable rejection rate used to be 1% at the customer (Telco) end. But, Telco now wants 0%,"[79] and "We were basically given two choices: either to meet the customers' standards or close down."[80] Again, the introduction of such a certification scheme has served as an effective institutional mechanism to enforce quality improvement, which has in turn induced organizational changes at suppliers.

In addition, like Maruti, Telco conducts a quality audit once a year, to check all aspects of operations at suppliers. The results of this audit become one basis of "vendor rating," which determines their decisions on long-term contractual relations. In fact, these quality improvement efforts resulted in a significant reduction in rejection rates (e.g., down to 99.55 ppm in the case of Telco), thus improving productivity at assembly firms.

Indeed, it is this acute sense of pressure to improve the quality of their products and production processes that has motivated supplier firms to upgrade the skills of their workers. In this process of institutionalization the code of behavior expected of suppliers through such certification schemes and other procedures, behavioral and cognitive skills have become more important even at the level of suppliers. At the same time, the shift in focus of the supplier management on the part of customers from inspection of products to

[78] Interview with T4.
[79] Interview with T15.
[80] Interview with T16.

the control of production processes has made it critical for suppliers to acquire managerial skills, as we have seen in the previous sections.

As illustrated above, with these quality enforcement mechanisms in place, the supply chains of Maruti and Telco are no longer just contractual relationships but actually involve the diffusion of norms, standards, and values, as well as the transfer of technical knowledge and skills, in addition to what they are transacting. Organizational learning at suppliers induced through such institutionalized enforcement mechanisms differs considerably from the "opportunistic behaviors" of firms predicted by the transaction cost theorists (Williamson 1975).

The nature of inter-firm linkages that Maruti and Telco have developed with their suppliers also differs from the embeddedness argument (Granovetter 1985) that the patterns of firms' behaviors are embedded in the prevailing structures of social relations between firms. Indeed, neither the embeddedness argument nor the cultural argument (Dore 1973) can successfully explain the close supplier relations that Maruti has created and the dramatic changes that have occurred in Telco's supplier relations, both fairly unconventional within the prevailing social relations. Rather, various forms of institutional arrangements, particularly for quality improvement, built into the supply chains have led the firms to develop reciprocal relationships with their suppliers: Trust was *acquired* through the latter's adherence to a set of strict standards and requirements, rather than *embedded* in existing networks of personal relations.

4.5.4 Spillover

Inter-firm spillover of embodied knowledge and skills may take various forms, including 1) former employees of vehicle manufacturers becoming independent suppliers; 2) vehicle manufacturers and suppliers sharing employees between them; and 3) workers formerly trained at vehicle manufacturers moving to supplier firms. I consider each aspect in the cases of Maruti and Telco.

Maruti observes relatively few cases where former Maruti employees became independent suppliers; more often, former employees become directors (senior managers) of Maruti suppliers, though either situation leads to no preferential treatment from Maruti. However, Maruti more often deputizes employees to its key suppliers. In addition, as discussed in Chapter 3, Maruti suppliers and authorized service stations often absorb apprentices trained at Maruti.

Likewise, few Telco employees became independent suppliers. Reflecting the traditional "arm's length" supplier relations, Telco has not provided any assistance or preferences to such suppliers run by its former employees. Like Maruti, Telco chooses its suppliers based only on its evaluation of their performance. Only in 1997 did Telco start sending its engineers to those suppliers specially selected for its small car project.

In sum, various forms of inter-firm linkages that Maruti and Telco have forged with their suppliers have clearly facilitated the transfer of knowledge and skills. Such linkages have been strengthened in the 1990s, as they have developed much closer ties with their suppliers. The role of inter-firm linkages has therefore become even more important in developing and transferring knowledge and skills to smaller supplier firms in the process of transformation in the automobile industry. These linkages have not only increased the amount of interaction between vehicle manufacturers but also instituted various forms of quality control mechanisms that have demanded different kinds of knowledge and skills, and made suppliers realize the need to transform themselves.

A quick observation of second-tier suppliers reveals, however, that they have a very different type of interactions with their customers, the first-tier suppliers. Even though many owners of second-tier suppliers previously worked at their customer firms and thus acquired their skills there, these first-tier suppliers provide little technical assistance to develop skills at second-tier suppliers. Clearly, the reciprocal relationship that has emerged between vehicle manufacturers such as Maruti and Telco and their respective suppliers has not been adopted at the lower level of supply chains. Thus, the unusually high momentum

created among first-tier suppliers to enact organizational reforms with a focus on quality has not reached the second level. Unlike those in the Japanese automobile industry, therefore, production networks among different tiers of firms in India seem not only shallower but also weaker as a decentralized learning mechanism. In order to fully understand the changes that have occurred in the entire spectrum of segmented labor markets like India's, a detailed study of the nature of production and the patterns of inter-firm coordination at lower levels is necessary, a topic that future research should address.

4.6 Conclusion

This chapter examined changes in the labor market at the level of automotive component suppliers in the face of dramatic transformations in the Indian automobile industry, with particular focus on changes in the patterns of skill development for their workers.

Drawing on a questionnaire survey conducted with 50 first-tier suppliers of Maruti and Telco, this study found a considerable recent change in labor markets toward upskilling. Even smaller suppliers have witnessed a general upward shift in the educational levels attained by workers in different occupational groups and an increased demand for professional managerial workers. As at vehicle manufacturers, the nature of skills at first-tier suppliers has changed considerably. While traditional craft skills such as die making still receive high skill premiums because of their increasing scarcity, even smaller firms have recently placed greater emphasis on cognitive, particularly problem-solving, skills, behavioral traits for quality improvement, and computer-related skills. Such changes reflect increased quality consciousness among suppliers, which in turn reflects a greater demand from their customers for improved product quality. Suppliers have dramatically increased their training activities in recent years; many have even hired professional consultants to conduct training in such areas as quality control and statistical process control. Contrary to the assumption by the neo-classical human capital theory that firms

invest in human capital based on their maximization calculation, small suppliers make their decisions on investing in human capital, motivated instead by informal institutional constraints embedded in their inter-firm relations with customers. Indeed, significant organizational changes conducive to skill development have recently occurred at suppliers of Maruti and Telco, largely induced by pressures and demands from their customers.

Both Maruti and Telco have created various forms of backward linkages that have facilitated skill development at and transfer to their suppliers. Maruti has developed long-term stable supplier relations, introducing the Japanese model of supplier relations in India. Telco, too, recently changed its traditional "arm's length" supplier relations to close stable ones, due to changes in the institutional environment with intensified competition in the Indian market. Various forms of institutional arrangements between the vehicle manufacturers and their suppliers have forced the latter to take up drastic organizational reforms to improve quality and operational efficiency in the workplace, including a change in the organization of work. In particular, institutionalized mechanisms created to set and enforce quality standards have turned the supply chain into a learning chain, based on a collaborative reciprocal relationship between them. At the same time, frequent interactions between customers and suppliers through various channels have helped ensure rapid information flow, thus allowing a fast diffusion of knowledge, skills, and norms among suppliers. Clearly, inter-firm linkages have played a critical role in facilitating skill development at suppliers.

While the literature asserts that knowledge and skills in today's production activities are becoming more and more tacit and firm-specific, this study finds the processes and modes of skill diffusion becoming increasingly explicit, standardized, and codified, through various forms of on-going monitoring and evaluations of suppliers' performance. The institutionalized procedures of quality certification required by the vehicle manufacturers, such as self-certification, ISO9000, and QS9000, have forced suppliers to adopt similar patterns of organizational changes covering virtually every aspect of their

production activities, thus resulting in considerable homogenization in the patterns of skill development among suppliers.

Appendices

Appendix 4.1: Profile of Sample Suppliers

	Type of products	FDI	Year of Establish.	Size of Emp. 1996	Sales 96 (Rs. millions)	Capacity Utilization	SSI Status	# of Customers
Maruti Suppliers								
M1	Sheet metal	no (trying)	1963	320	110	70-90%	SSI	6(M=20%)
M2	Fuel hoses/Fuel injections	no	1963	301	90	50-70%	medium	10(M=40%)
M3	Sheet metal parts	no	1965	142	38.88	above 90%	SSI	1(M=100%)
M4	Precision machining	no	1967	200	60	92%	SSI	10(M=20%)
M5	Cylinder head/die-casting	no (G initially)	1967	469	131.7	70-90%	medium	8+(M=55%)
M6	Precision machining/hydraulic cylinders	JV (J)	1968	120	18	50-70%	SSI	4(M=60%)
M7	Harness Grommets/Suspension Bushes	no	1969	40	16	70-90%	SSI	8(M=10%)
M8	Tubes	JV (J)	1969	400	355	70-90%	SSI (two names)	9(M=15%)
M9	Sheet metal components	no	1970	275	550	above90%	SSI	30(M=80%)
M10	Clutch	JV(1990-93)	1971	692	522	70-90%	large	9(M=30%)
M11	Door locking sys./Window glass regulator	no (trying)	1972	253	175	above 90%	SSI	10(M=50%)
M12	Sheet metal components	no	1974	142	70	50-70%	SSI	3(M=60%)
M13	Oil chambers/Body components	no	1975	90	n/a	above 90%	SSI	1(M=100%)
M14	Machined cast components	no	1978	646	32.5	above 90%	SSI (7 firms)	5(M=25%)
M15	Switch and lock aseemblies/Lamp	TC (4)	1979	183	n/a	below 30%	SSI (2 firms)	6 (M=60%)
M16	Sheet metal	no	1980	50	9.5	50-70%	SSI	5(M=70%)
M17	Sheet metal components	no	1980	200	70	45-50%	SSI	9(M= 50%)
M18	Sheet metal/Fuel pipes	no (trying)	1981	113	75	80-85%	SSI	5(M=23%)
M19	Integrated wiring harness	JV (J)	1986	1500	95.6	n/a	n/a	n/a
M20	Sheet metal/Plastic components	no	1985	75	90	70%	SSI	10(M=65%)
M21	Fiber glass products	no	1985	175	420	70-90%	SSI	4(M=98%)
M22	Precision machining	no	1986	86	160	75%	SSI	4(M=60%)
M23	Car seats	JV(J)	1986	363	n/a	30-50%	large	1(M=100%)
M24	Plastic moulds	no	1992	14	15	50-70%	SSI	3(M=60%)
M25	Starters/Alternator/Cooling fan motor	JV	1984	800	1350	n/a	n/a	13(M=65%)

Telco Suppliers								
T1	Lighting eqpt./air filtration sys.	JV5(JJS UK)	1945	1845	686.5	above 90%	large	10(T=30%)
T2	Oil seals/rubber components	no	1966	129	33.2	80%	SSI	3(T=50%)
T3	Aluminum die-casting	JV (J)	1967	983	610	50-70%	large	14(T=15%)
T4	Forging	JV (G)	1968	452	3500	65%	large	80(T=?)
T5	Sheet metal components	no	1969	78	171.9	70%	SSI	3(T=98%)
T6	Clutch disc assemblies	JV(J)	1973	423	n/a	50%	medium	6(T=?)
T7	Gear box components	no	1974	30	6	80%	SSI	1(T=100%)
T8	Industrial rubber products	no	1976	57	13.1	70-75%	SSI	5(T=50%)
T9	Plastic moulding	no	1979	24	9.9	70%	SSI	5(T=60%)
T10	Sheet metal	no	1979	53	20	70%	SSI	3(T=99%)
T11	Sheet metal press parts	no	1980	200	160	70-90%	SSI(till 1996)	5(T=75%)
T12	Suspension/subassemblies	no	1982	479	155	70-90%	large	4(T=85%)
T13	Rubber components	no	1982	127	42	65%	SSI	15(T=20%)
T14	Oil seals/rubber components	no	1982	132	42	85%	SSI	7(T=15%)
T15	Rubber components	no	1984	113	72	80%	SSI	10(T=5%)
T16	Sheet metal press parts	no	1985	393	n/a	66-70%	SSI	2(T=80%)
T17	Aluminum die-casting	no	1985	315	3825	40		6(T=10%)
T18	Integrated wiring harness	JV2 (JJ)	1986	1500	95.6	70-90%	large	11(T=10%)
T19	Aluminum die-casting	no	1987	34	25	60%	SSI	6(T=70%)
T20	Springs/Fuel injection	JV (J)	1987	137	117.6	88%		20(T=14%)
T21	Sheet metal components	no	1988	22	20	60%	SSI	2(T=80%)
T22	Ferrous steel forging	no	1989	164	70	70-80%	SSI	6(T=60%)
T23	Sheet metal press parts	no	1993	17	15	50-70%	SSI	1(T=100%)
T24	Accelerator Pedal	no	1972	145	54.8	70-90%	SSI	5(T=5%)
T25	Precision machine components	no	1983	17	4.5	70-90%	SSI	15(T=30%)

Source: The questionaire survey conducted by the author.

Appendix 4.2: Geographic Distribution of Maruti's First-tier Suppliers

Geographical Distribution:		# of Firms	% Dist'n	Firm Size:		
City	State			Large	Medium	Small
Faridabad *	Haryana	77	19.1	12	36	29
New Delhi *	Delhi	71	17.6	29	22	20
Gurgaon *	Haryana	63	15.6	17	19	27
Chennai	Tamil Nadu	28	6.9	17	4	7
Mumbai	Maharashtra	23	5.7	11	4	8
NOIDA *	U.P.	16	4.0	5	2	9
Pune	Maharashtra	16	4.0	10	6	0
Bangalore	Karnataka	15	3.7	7	7	1
Coimbatore	Tamil Nadu	8	2.0	4	3	1
Old Delhi *	Delhi	7	1.7	3	2	2
Ludhiana	Punjab	6	1.5	2	4	0
Ghaziabad *	U.P.	6	1.5	1	2	3
Calcutta	West Bengal	5	1.2	4	1	0
Jaipur	Rajasthan	4	1.0	3	1	0
Pondicherry		4	1.0	2	0	2
Rohtak *	Haryana	4	1.0	0	2	2
Chandigarh	Punjab/Haryana	3	0.7	2	0	1
Madurai	Tamil Nadu	3	0.7	3	0	0
Mohali	Punjab	3	0.7	1	1	1
Secunderbad	A.P.	3	0.7	1	2	0
Ahmedabad	Gujarat	2	0.5	1	1	0
Goraya	Punjab	2	0.5	2	0	0
Nasik	Maharashtra	2	0.5	1	1	0
Thane	Maharashtra	2	0.5	1	1	0
Kolhapur	Maharashtra	2	0.5	2	0	0
Vadodara	Gujarat	2	0.5	1	1	0
Other Locations		27	6.7	12	13	2
Total		404	100.0	154	135	115

Source: Maruti Udyog Ltd.

Note: The data are based on Maruti's supplier database as of January 1997.
* refers to firms located in an hour distance from Maruti.
Large: firms with annual sales of more than Rs. 100 million (US$2.82 million).
Medium: firms with annual sales of more than Rs. 20 million (US$ 0.56 million) but less than Rs. 100 million (US$2.82 million)
Small: firms with annual sales of less than Rs. 20 million (US$ 0.56 million)

Chapter 5

Conclusion

This study examined the conditions under which firms promote skill development for workers in the face of a rapid integration of developing countries into the global economy. The case study of the Indian automobile industry presented in the preceding chapters has shown that in the process of globalization, firms--both foreign-affiliated and local, and both assemblers and suppliers--, have considerably increased their investment in developing their workers' skills. At the same time, the patterns of skill development at both assemblers and suppliers have changed significantly. I argue that even as the Indian economy has become more globalized under the increasing liberalization of the trade and industrial regime, paradoxically, an interacting set of local institutional factors still crucially shapes the patterns of skill development at firms. In particular, inter-firm linkages are critical in promoting skill development among smaller firms, thus spreading workers' learning across different segments of the economy. In this study I found that the Indian government has played an important role in creating the institutional conditions that promote skill development, and thereby helping the industry grow. This final chapter recasts the findings of this study to develop a theoretical framework for understanding the conditions that foster workers' skills in the context of emerging economies, and ends with some policy implications.

This chapter is organized into three sections. Section 5.1 summarizes the findings of the study. Section 5.2 places the findings into a theoretical framework. Section 5.3 discusses policy implications for developing countries that aim to promote skill development in a changing economy.

5.1 Workers' Learning under Globalization: Lessons from the Indian Automobile Industry

Since the liberalization policy was introduced in India in the mid-1980s, and more intensely implemented in 1991, the Indian automobile industry has experienced remarkable growth and dynamic transformations with a growing inflow of foreign capital, resulting in intensified competition within the domestic market. What made it possible for the industry to achieve such dramatic growth? This study found that both Maruti, a joint venture between the Indian government and Suzuki, and Telco, a leading local commercial vehicle manufacturer, significantly contributed to the growth of the industry, and improved export performance, even before the large inflow of FDI started in the 1990s. In particular, Maruti, with its remarkable growth in production, sales, and productivity, literally became the driving force of the growth spurt in the passenger car segment in the 1980s. On the other hand, unlike many local vehicle manufacturers in developing countries that have typically weakened their relative market positions in the face of growing dominance by FDI-related firms, Telco strengthened its market position by diversifying its product range, and even entered into the passenger car segment in the 1990s.

The rapid process of transformations has also led to a dynamic restructuring of the industry with the gradual formation of tiers within the industry. As the component industry grew much faster than the vehicle industry in the 1990s, a growing number of local component suppliers started forming alliances with foreign component manufacturers. At the same time, vehicle manufacturers started setting up joint ventures with global suppliers to strengthen their supplier base. Moreover, Maruti played an important role not only in developing backward linkages through its own supplier development efforts, but also in helping change the dominant model of supplier relations in the country, from short-term "arm's length" relationships to more long-term, close ones, involving reciprocal interactions with suppliers.

The detailed case study of these two leading Indian car manufacturers revealed one key factor which has led them to perform so well: their massive investment in skill development not only for their own workers but also for their suppliers. Both Maruti and Telco built elaborate skill development systems into their internal incentive structures, involving various aspects of internal labor markets, such as recruitment, wages, promotion, and formal training. Both firms recruit well-educated workers for permanent, long-term, stable employment. Both firms use high wages and generous benefits, not only to attract well-educated and highly motivated workers to begin with, but also to keep motivating them by rewarding their efforts to improve their skills and thereby their performance. Thus, both firms experience very low labor turnover among production workers. Indeed, both firms have their own systems of rewarding workers' skills, either collectively or individually, by linking them with remuneration and promotion structures (though promotion opportunities are limited for production workers). Maruti, in particular, developed a productivity-linked incentive scheme to reflect a productivity increase in workers' pay, leading Maruti production workers to receive the highest wages in the industry. Also, at Maruti, small wage differentials between production workers and indirect employees, as well as egalitarian and participatory practices on the shop floor, have resulted in a high level of employee identification with the company and created incentives for workers to develop and use their skills to produce more cars and improve their processes. In addition, both firms have systematic in-firm formal training programs to foster firm-specific skills in areas carefully linked with each firm's respective strategic focus. These internal incentive structures have kept motivating workers to learn new skills.

Moreover, both firms have extensively used apprenticeship schemes beyond what the government legislation required, as mechanisms for recruiting reliable and competent workers, efficiently deploying workers trained in ready-to-use firm-specific skills, promoting their organizational learning, and lowering labor costs by paying apprentices stipends which are only a tiny fraction of regular salaries.

Further, Maruti has actively promoted overseas training for its employees--production workers as well as engineers and managers--on a massive scale for an extensive period. Such overseas training, involving direct exchange between Maruti and Suzuki employees across all levels, has provided Maruti workers with an opportunity to gain "hands-on" experience on the Japanese shop floor and learn about new technologies and production processes. Such training has enabled workers to understand the importance of ensuring full quality proofing in the production processes, particularly in the areas of process control, a critical element to improve the quality of products, and thus to acquire diagnostic and problem-solving skills. Overseas training opportunities have not only upgraded the skills of Maruti workers but have also served as an incentive to motivate them to perform well, as only good performers are selected for overseas training.

In addition, Maruti introduced a Japanese-style human resources management policy, with more participatory and egalitarian gestures, which created a sense of confidence and trust among workers. Both management and labor have been clear that Maruti is totally unconventional among existing Indian firms, and have seen Maruti as a "model for change," not only in the automobile industry but also in Indian industry as a whole. This in turn has generated great pride and momentum for learning new skills among Maruti employees. Maruti's remarkable success, in not only achieving soaring growth but also adopting the new models of work organization, management, and production processes, has brought it much attention at the national level, inducing industry-wide and, in fact, economy-wide learning.

What has motivated these firms to create such internal incentive structures to promote their workers' learning? This study revealed that the interplay of a set of local institutional factors both inside and outside the firms has played a critical role in motivating firms to develop their workers' skills. First, the legal obligation to train apprentices has greatly influenced the patterns of in-firm skill development, while effectively setting the educational level of entry-level production workers at one year of in-firm apprenticeship

training plus two years of post-secondary vocational education. The apprenticeship program has effectively linked government-sponsored industrial training with in-firm on-the-job training, which in turn helps supply a high quality workforce for long-term employment. At both Maruti and Telco, the apprenticeship scheme has also served as a buffer as the firms adjusted to changes in demand for production labor; as a screening device to recruit the best-performing workers for long-term employment; and as a source of knowledge and skill spillover to their suppliers and service stations. This scheme also helped both firms to lower the costs of searching for labor with the right kind of skills and knowledge and to develop firm-specific skills at relatively low costs. Thus, both firms have actually taken advantage of the institutional constraints created by the apprenticeship policy.

Second, the Indian labor market is very rigid: the labor policy makes it difficult for employers to fire workers, which has made firms very prudent about hiring. This rigidity in the external labor market has actually motivated firms to conduct long periods of initial in-firm training for new entrants so as to recruit the best-performing workers for long-term employment from a large pool. This has in turn made stable employment practices viable, while in effect reducing the cost of retraining.

Third, as the Indian labor market is highly segmented, an extensive use of subcontracting by the vehicle manufacturers, due partly to the government's local content requirement, has actually enabled them to pay high wages to their production workers, while taking advantage of low wages among their subcontractors. Fourth, Maruti's productivity-linked high wage policy emerged partly because the firm was a state-owned enterprise until 1992 and its wage setting was governed by the government salary rules for Indian civil servants, which prevented the firm from increasing wages to attract better-qualified workers.

Fifth, Maruti has actively promoted overseas training for its workers in Suzuki, Japan, institutionalizing a tripartite institutional arrangement among Maruti, Suzuki, and

intermediary training organizations in Japan to facilitate knowledge and skill transfer between the two firms. A carefully organized cost sharing among the three institutions has made such overseas training affordable and greatly benefited all the parties involved: Maruti, Maruti workers, and Suzuki. Finally, the Indian government ensured the inclusion of such overseas training as part of the initial technological transfer agreements between Maruti and Suzuki, when the Maruti project started. All these factors suggest the existence of robust local and cross-country institutional conditions under which practices related to skill development have evolved in these firms.

However, this study also found considerable differences in the patterns of skill development between Maruti and Telco, which require further explanation beyond the existence of local institutional frameworks. First, they have made different kinds of institutional arrangements for skill development. At Maruti, various measures link workers' *collective* performance with its reward system and on-the-job training systems, whereas Telco's internal labor markets focus on upgrading workers' *individual* trade skills to promote multi-skilling. Second, they have different occupational mix: Maruti has a higher proportion of production workers than Telco, resulting in a flatter occupational structure, reflecting its focus on improving its production capabilities. By contrast, Telco has a higher proportion of engineers, reflecting its focus on technological deepening, particularly in terms of developing design capabilities. Indeed, Telco's innovative skill development schemes for enhancing individual trade skills have enabled the firm to develop the dedicated workforce it needed to continue its tradition of "self-learning" technological development, while integrated into a closely linked feedback system among R&D, engineering, production, and training.

Third, with respect to the content of training, Maruti's training is concerned with the standardization of procedures related to line management, and has focused on diffusing values and norms about operational and quality standards, while Telco, more concerned with design specifications and protocols, has focused on enhancing individual skills.

Indeed, at Maruti, in-firm training stresses the diffusion and penetration of both technical standards and behavioral norms involving a considerable degree of standardization and formalization of rules and procedures with respect to parameters, temperatures, speed, and quality, for each line.

Finally, the two firms' learning reflects their very different amounts of exposure to foreign practices. Unlike Telco, Maruti's in-firm learning involves a direct inter-firm transfer of knowledge and skills through individual exposure, concrete instruction, and on-the-job training at the work site among employees at various levels, allowing Maruti employees to quickly disseminate their knowledge and skills. Overseas training on a massive scale, along with its flatter hierarchical structure and more participatory management, has facilitated fast information flows within the firm and between Maruti and Suzuki.

These findings suggest that Maruti and Telco follow different models of skill development: one is exposure-based, and the other experience-based. These different models of skill development also reflect a very different mechanism of intra-firm diffusion and transfer of knowledge and skills in these firms: Maruti focuses on *externalizing* its internal labor markets beyond the firm's boundary, while Telco focuses on *internalizing* its bought-out foreign technologies, reflecting its long tradition of self-learning. At Telco, intra-firm diffusion requires the indirect transmission of the experience of a limited number of senior managers and engineers, which necessarily involves the codification of their knowledge and skills.

Like many other auto manufacturers across different countries, both Maruti and Telco introduced and incorporated some elements of the "lean" production techniques such as TQM, QC circles and *kaizen* into their training activities in the early 1990s. Such adoption has led the firms to change some aspects of their work organization, and then to change some of the training content from technical toward more behavioral and attitudinal, and to considerably increase the amount of training, particularly at Telco. Thus, the focus

of in-firm training has shifted in recent years, from diffusing knowledge and skills to infusing norms and values to be shared across different parts of the organization.

Also, the direction of diffusion of knowledge and skills within each firm differs: in Maruti it is horizontal, and in Telco vertical. These differences, in turn, reflect their orientations in technological development: Maruti focuses on production capabilities and Telco on innovation capabilities, hence requiring different types of skills and developing different modes of training. In other words, each firm's distinctive strategy for technological development also influences its patterns of skill development.

The rapid growth of the Indian automobile industry since the mid-1980s has brought about dynamic transformations in the auto component sector, which has grown even faster than the vehicle sector; increasing alliances with foreign component manufacturers; a growing emergence of pyramidal structures (though shallower than those in the U.S. and Japan); and closer supplier relations. Maruti has played an important role in transforming the component industry by forging much closer supplier relations.

In this process of restructuring, the component industry has witnessed considerable changes in the characteristics of workers in supplier firms, with a general trend of upskilling. The patterns of skill acquisition and development have also changed considerably among suppliers: higher educational qualifications demanded from job entrants for production jobs; greater demand for well-educated managerial workers; an increasing tendency toward longer-term employment and a decrease in casual workers; and the increasing introduction of formal training programs at suppliers. Moreover, many suppliers have transformed themselves by adopting some elements of the "lean" production techniques, with emphasis on quality improvement. All these suggest that Indian auto component suppliers have increasingly strengthened their efforts to promote skill development for their workers.

What has made auto component suppliers so eager to develop their workers' skills in the 1990s? This study found that for suppliers to both Maruti and Telco, pressures and

guidance from their customers have been the largest motivating factors. In fact, the results of my questionnaire survey revealed that even the content of training closely reflects their respective customers' orientation in skill development, considerably influencing the way training takes place at suppliers: For Maruti, emphasis is on developing production capabilities, and for Telco, on developing innovation capabilities. Moreover, many suppliers have increasingly set up measures to improve quality in their plants.

Indeed, Maruti has instituted a variety of mechanisms to foster skills in its suppliers. First, Maruti's four Vendor Development Departments frequently send engineers to its suppliers, and regularly invite suppliers to its own plant. Second, Maruti disseminates various types of information among its suppliers through its close interactions with and training for suppliers, in such areas as product quality, plant layouts, and housekeeping, with great emphasis on improving quality and reducing rejections. Third, it enforces strict quality standards through various measures such as vendor rating and auditing to which suppliers must adhere to retain their business with Maruti. Such influence is particularly strong over Maruti's key suppliers, some of which are dedicated to and in joint venture with Maruti, and located in the same complex as Maruti's main plant. Telco also started these practices in 1997, when it changed its supplier relations drastically, from the traditional "arm's length" into much closer ones, and created a new unit specially designed to develop selected suppliers through intensive interactions to transfer knowledge and skills to them. All these have led to unusually high momentum in the Indian automobile industry for intra-firm as well as inter-firm learning, resulting in industry-wide learning. This study found that in the 1990s, with the intensification of domestic competition due to the entry of many FDI firms, inter-firm linkages became strengthened as a mechanism for developing and transferring knowledge and skills to suppliers.

What has shaped the patterns of skill development at these firms? This study finds that the interplay of various institutional forces, such as historical imperatives, national labor and training policies, and institutional alliances with the government, foreign firms,

and training institutions, shapes the patterns. First, the peculiar historical conditions under which firms have to operate necessarily shape the patterns of skill development at the firm level. Under the inward-looking trade regime from the mid-1960s through the 1980s, which restricted the import of raw material, equipment, and components, and the purchase of foreign technologies, Telco needed to develop specific strategies regarding product development, production, and organizational capability development. These, in turn, determined the patterns of skill development. Telco had to internally develop its capabilities in design, R&D, manufacturing of engineering equipment and tools, and large tool rooms. Even amidst recent rapid changes in the institutional environment, the pattern of skill development in Telco has remained largely unchanged, with only incremental changes such as recent additions to the subjects in training.

Second, the government has played a critical role in shaping the pattern of skill development in both Maruti and Telco, by creating national institutional frameworks in terms of setting labor policy and training policy, and by getting more directly involved in the management of Maruti. The protective labor policy, which prevented large firms from firing workers, constrained the firms in recruiting and deploying labor, and created rigidities in the external labor markets. However, as discussed earlier, the firms actually turned these institutional constraints into an advantage to develop their own internal incentive structures, including those to motivate and reward workers' skill development. The government also directly intervened in the governance and management of Maruti, by insisting on including training as part of its joint-venture agreement with Suzuki. Maruti's governance structure, which maintains a fine balance between the government and Suzuki, has enabled the government to promote organizational change on its own terms.

Finally, the cases of Maruti and Telco show that they not only made good use of national institutional frameworks, but also positively built institutional alliances with other organizations, such as local industrial training institutes, intermediary training organizations, joint-venture partners, and the supply chain and service networks. For

instance, Maruti's skill development system is largely shaped by its institutional alliances with its joint venture partner and training intermediaries, thus externalizing its internal labor markets beyond the boundary of the firm through its extensive overseas training.

I argue that a series of government policies, particularly those concerning local content, foreign investment, and reservation of many components to be produced by the small-scale industries (SSI) sector, have effectively created conditions under which car assemblers, such as Maruti and Telco, were motivated to promote skill development at suppliers. Moreover, the government played a critical role in developing Maruti itself, which has not only led the growth of the Indian automobile industry but also served as a catalyst for promoting industry-wide learning.

5.2 Skill Development in the Context of Emerging Economies: A Conceptual Framework

The experiences of Maruti and Telco have demonstrated the critical role of training in knowledge transfer and skill development. The findings of this study offer a conceptual framework for understanding the conditions that promote skill development and transfer in emerging economies undergoing industrialization.

As national economies integrate into a global economy that is increasingly becoming "knowledge-based," with ever-accelerating technological change and innovations, it has become more important than ever for firms, and nations, to acquire, accumulate, and diffuse knowledge and skills, in order to become and remain competitive. At the same time, firms, both foreign and local, need to cut production costs, including labor costs, to compete in the global market. Faced with such paradoxical challenges, firms need to promote skill development while reducing production costs.

As the process of industrialization in developing countries largely involves *learning* in terms of borrowing technology from industrially advanced countries (Amsden 1989), developing countries need to develop ways to induce and facilitate learning at various

levels: in-firm, industry-wide, and economy-wide. As technological change forces firms to move into more complex products, the nature of skills required in production processes also changes. As the knowledge and skills required for today's production activities are becoming more and more tacit, hard to obtain, and costly to transfer between firms, and thus more industry-specific, or even firm-specific, the firm's role as a *de facto* institution for skill development becomes more important than ever to improve productivity and gain competitiveness. Thus, to compete in the global market, firms in emerging economies need to develop mechanisms inside the firm while involving other outside institutions in order to learn specific types of new knowledge and skills from more advanced countries and diffuse them quickly enough within the organization.

Training, whether on-the-job or off-the-job, is an institutionalized form of knowledge and skill transfer. In particular, in-firm training is a means of acquiring and enhancing firm-level learning, through the intra-firm diffusion of knowledge and skills; what the organization has learned translates into *learning* by members of the organization, and they share acquired knowledge in different parts of the organization. This also involves the process of socialization (Adler 1993), through which certain norms and values are infused within the organization. Training changes the very way workers do their jobs, by changing values and behavioral norms, standardizing procedures, thoroughly diffusing quality awareness, and instilling "forward-looking visions." Thus, training is an integral part of the process innovation that firms promote in creating "competitive assets" (Amsden 1995).

In-firm training thus has three distinctive but interrelated components: 1) the transfer and diffusion of knowledge and skills within the organization; 2) the embodiment of knowledge by individuals; and 3) the institutionalization of learning mechanisms. Hence, strengthening each of these components would accelerate workers' individual learning as well as the firm's organizational learning. As a large part of in-firm learning occurs through on-the-job training, these three components involve not only formal training

programs but also much larger spheres of organizational structures, including internal labor markets and the organization of work. Thus, firms in emerging economies that want to foster their workers' skills need to find ways to strengthen these three components.

However, in general, firms and workers in emerging economies face various institutional constraints that influence the mode, contents, and extent of in-firm training. First, as the patterns of skill development are shaped over a long period of time involving various parts of organizational structures, they are greatly influenced by historical imperatives, i.e., peculiar historical conditions under which the firm needed to operate and promote its technological development. Second, the patterns of skill development are embedded in the national institutional framework, including the nature of local labor market institutions and conditions of the external labor markets that are generally characterized by abundant surplus labor and are largely segmented.

Third, as the contents of knowledge and skills that local firms want to bring from abroad tend to be based on more advanced technologies than those available locally, they may not be an extension of existing bodies of knowledge and skills that have already been accumulated in the firms. Thus, knowledge and skill transfer would simultaneously require the intra-firm infusion of norms and values that would facilitate the transfer, as it would help the firm bring about attitudinal and behavioral changes among employees and enhance their commitment to improving performance, and thereby productivity. Until workers know clearly what the acquisition of such new knowledge and skills entails and how they benefit the firm and/or workers, they may not be motivated to learn. In that event, the diffusion of new knowledge and skills may require more drastic acceptance and adaptation on the part of workers, which would in turn require changes in their norms and values.

Fourth, as locally produced products are commonly of poor quality in developing countries, in-firm training at local firms inevitably must focus on quality control and improvement, particularly through production line management. But changes in product

quality actually involve every aspect of production activities, as well as changes in values and attitudes on the part of employees. As the nature of the required skills shifts from simple repetitive work to work involving more of workers' problem-solving capabilities, they must make judgments regarding problems they encounter and detect any irregularities. Firms then must shift their mode of skill development, toward a more organized and more knowledge-imparting one, to make their workers attentive to such problems.

Finally, to compete in the global market, firms, both foreign and local, need to reduce production costs, often by increasing local contents because relying on imported components is too costly. However, in developing countries, smaller local supplier firms generally have much more limited financial, technological, and managerial capabilities than large firms do. For example, as few local suppliers have their own design capabilities, they must rely on drawings provided by their customers. Thus, to promote localization through the development of backward linkages, large firms must improve the skills of smaller component suppliers. On the other hand, the latter need to meet their customers' quality standards, to retain business with their customers.

Thus, the structural constraints discussed above greatly determine the nature of in-firm skill development, as they influence firms' decisions regarding their investment in skill development--not only the amount of investment, but also the mode, extent, and content of training. This view is contrary to the assumption of the dominant neo-classical human capital theory that firms make decisions essentially by calculating the price of labor in the external labor markets, expected productivity increases, and the likelihood of turnover of trained workers (Becker 1993[1964]). Such structural constraints are also more complex and contextual than the explanations provided by the market failure theorists that the markets, for both labor and products, are imperfect in developing countries. On the other hand, it also considerably departs from the model of skill development developed by the internal labor market theorists which focuses on internal rule-bound mechanisms regarding the allocation and pricing of labor, i.e., the internal labor markets, as a determinant of

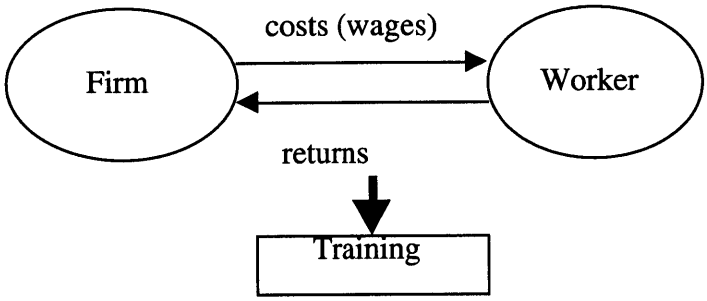
training (Doeringer and Piore 1971, Koike and Inoki 1990). The structural constraints discussed above concern factors that exist largely beyond the firm's organizational hierarchies.

Indeed, the experiences of Maruti and Telco as well as their suppliers presented in this study suggest an alternative model of in-firm skill development, one that is based on "inter-firm linkages," rather than "markets" (of labor) as in the human capital model, or "hierarchies" as in the internal labor market model. This alternative model postulates that firms make decisions on training for workers, largely determined by institutional conditions, particularly through inter-firm linkages, under which firms can overcome structural constraints discussed above.

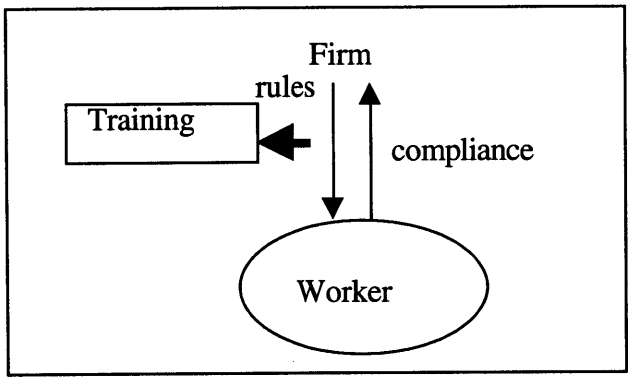
Analytically, this model significantly differs from the human capital model of skill development in three ways. First, while the human capital model focuses almost exclusively on the supply side of skills (e.g., the price and availability of labor trained in skills, either general or specific, in external labor markets and the likelihood of turnover) in its theoretical framework (Becker 1993[1964]), the alternative model looks into factors that are on the demand side of skill development. Second, while the human capital theory model of skill development focuses mainly on a single firm's calculations of costs and returns as a determinant of the extent of training, the alternative "linkage" model regards both the costs and the returns of training as capable of being shared among a group of networked firms. Finally, while the human capital theory almost entirely disconnects a firm's decisions on training from those on production, the "linkage" model sees it as part of the firm's strategic decisions on its production activities, including technological development (see Figure 5.1 for schematic illustrations of difference between these models).

igure 5.1 Schematic Illustrations of Three Models of Skill Development

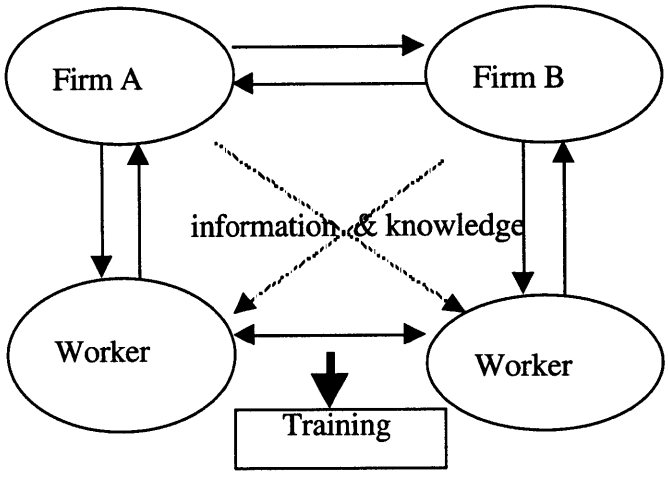
1) Human Capital Model:



2) Internal Labor Markets Model:



3) Inter-firm Linkage Model:



The alternative model also analytically differs from the internal labor market model. First, as in the human capital model, the internal labor markets model also focuses largely on the supply side of skills, overlooking the demand side conditions for skill formation. Second, as in the human capital model, the internal labor markets model also looks at a single firm as a unit of skill development. As in the internal labor markets model, firms in the "linkage" model proposed here need to create internal incentive structures by rewarding workers for acquiring new knowledge and skills. But, the "linkage" model considers that internal incentive structures can actually be externalized beyond the boundary of a single firm to a group of firms that form institutional alliances, which makes it easier to institutionalize cross-country training and facilitate this direct exchange of employees. Finally, while the internal labor markets model is mainly applicable to large firms with well-established bureaucratic structures, the model's utility is limited in analyzing conditions for skill development in small firms. The "inter-firm linkage" model allows us to see how the nature of inter-firm relations affects the pattern of skill development for workers in small firms by creating demand for particular types of skills (see Figure 5.1).

Inter-country (horizontal) inter-firm linkages facilitate the transfer and diffusion of knowledge and skills acquired from abroad through two mechanisms: direct interactions between firms and between workers and the institutionalization of learning mechanisms inside the firm. In this model of skill development, training serves as a means to expose workers to more advanced production processes and procedures, thus allowing quick diffusion of knowledge and skills through direct interactions between workers in local and foreign firms and between workers across different parts of the organization. Constant exposure to foreign practices on the shop floor by all levels of employees would speed up the process of diffusing new ideas, knowledge, and skills across all levels of organizational hierarchies. Actual observations and experiences would effectively make workers understand the nature of advanced technologies and how they work, and the new standards expected of them. In this model, two other factors facilitate the rapid transfer and diffusion

of knowledge and skills: 1) a relatively flat organizational structure; and 2) standardization of production procedures and training contents. These factors help the transfer of knowledge and skills to occur *horizontally* between and within the firms.

Clearly, as this study demonstrates, the development of institutional alliances, either local or foreign, greatly facilitates the process of knowledge and skill transfer. In the process of globalization, FDI is widely believed to facilitate knowledge and skill transfer to and accumulation in developing countries (Lall 1985a, Koike and Inoki 1990, de Mello 1997, OECD 1998). As this study showed, however, it is not the mere presence of FDI that promotes skill development at local firms in emerging economies. Rather, certain institutional conditions are necessary to forge such institutional alliances and make foreign firms commit to transferring knowledge and skills to local firms. Such conditions include: the imposition of skill transfer as part of technology transfer agreements; institutional arrangements to reduce the costs incurred in transferring knowledge and skills, including cross-country training; and the willingness by both local management and workers to adopt new forms of skill development. As this study found, intermediary training organizations can play a very important role in facilitating the development of such cross-border institutional alliances, by instituting inter-firm arrangements to promote such knowledge and skill transfer. These institutional alliances make the direct exchange of employees between two firms easier, less costly, safer in terms of information leakage, and administratively less cumbersome. As I discuss in the next section, the governments of emerging economies can play an important role in building such institutional alliances.

Moreover, organizational innovations such as participatory management and flatter organizational structures--flat occupational hierarchies as well as flat reward structures--facilitate fast diffusion of knowledge and skills across different parts of the organizations in various ways. First, they accelerate information flows between managers and workers, thus speeding up the processes of transfer and diffusion of knowledge and skills, which in turn expedites the process of collective learning throughout the organization. Indeed, the

less time a firm spends on diffusing information and knowledge, the more it can improve its productivity. Second, the flatter organizational structure helps motivate workers to learn new skills by closely linking the interests of individual workers with those of management, and by enhancing workers' receptivity about the knowledge and skills to be learned. Third, the flat structure makes it easier to organize formal training programs for employees across different occupational categories, thus leading to a greater stock of accumulated knowledge and skills within the firm.

Further, training also serves as a mechanism for knowledge dissemination. Although the knowledge required on the contemporary shop floor is becoming more and more *tacit*, paradoxically, in-firm training actually requires a more and more *codified* method, involving considerable standardization of rules and procedures, to enable workers to share the tacit knowledge they have accumulated within the firm. Thus, in-firm training involves the internalization of knowledge throughout the organization. The standardization of production processes and procedures helps codify the knowledge and skills required in the production processes and facilitate their thorough diffusion across different corners of the organization. It would thus help attain the expected quality required of workers as well as develop diagnostic and problem-solving skills to handle substandard parts. Also, as I argue below, such standardization also greatly facilitates the inter-firm transfer of knowledge and skills through the supply chain.

Another important element of this "linkage" model of skill development, particularly relevant for emerging economies, is its focus on vertical inter-firm linkages as a mechanism to extend the learning processes to a group of vertically networked firms through the supply chain. I argue that the creation of backward linkages by leading firms plays a critical role in developing such institutional mechanisms as learning chains to foster skill development, even for workers at small firms, and thus promote the accumulation of knowledge and skills in the economy at large. Such vertical inter-firm linkages effectively promote skill development at supplier firms in at least four ways: 1) as employees in

various occupational categories interact directly between leading firms and small firms; 2) as information is disseminated through manuals, conventions, and training programs for employees of suppliers; 3) as quality certification and auditing set and enforce quality standards, which creates demand for skill training at suppliers; and 4) as suppliers absorb engineers, workers, and apprentices with ready-to-use knowledge and skills, creating learning spillovers.

In-firm training that extends beyond the employees of a firm to promote the sharing of knowledge and skills with its suppliers and service dealers and spillovers to them greatly benefits large firms that invest in in-firm training. Although the human capital theorists assume that firms would have no incentive to invest in training if trainees cannot be retained afterwards, the firms can actually benefit from such training, if their supply chains absorb the trainees. Once again, the externalization of internal labor markets to the level of a group of vertically networked firms in the supply chain helps institutionalize the learning mechanism. Thus, the creation of such inter-firm linkages is effective for promoting skill development in emerging economies.

5.3 Policy Implications: The Role of Governments in Fostering Skill Development

The findings of this study, and the conceptual framework developed above, offer some important implications for public policy in fostering skill development for workers in emerging economies. In this final section I explore a set of policies that can promote in-firm skill development. Challenging the currently popular policy prescriptions, particularly those advocated by the World Bank (Middleton et al., 1993, World Bank 1995), that labor markets should be liberalized to increase wage flexibility and labor mobility, I argue that to promote skill development in emerging economies, it is important to internalize labor markets, and create institutional incentive mechanisms both inside and outside the firm.

Contrary to the claim by the human capital theorists that government intervention in labor markets distorts the operation of labor markets and negatively affects incentives for individuals and enterprises to invest in skill development (Becker 1993[1964], Psacharopoulos and Woodhall 1985, Middleton et al. 1993), I argue that the government can actually play a very important role in setting various institutional conditions to develop and stimulate incentive mechanisms for firms to invest in in-firm training. The case of the Indian automobile industry has shown that precisely because of various institutional constraints, firms were motivated to promote training not only for their own workers but also for workers at their suppliers. The evidence presented in this study, that the Indian government has played a positive role in promoting skill development, is somewhat surprising, given its generally negative reputation in the literature as corrupt, inefficient, and bureaucratic (Krueger 1974, Lal 1985, Kohli 1987, Lall 1987).

While a large body of recent literature regards FDI as a driver of economic growth and an important instrument for upgrading local skills, FDI does not automatically induce the process of fostering skill development at local firms. Certain institutional conditions must be established through various policy measures in order to involve foreign partners as well as foreign training institutions in local skill development and transfer.

The findings of this study suggest several ways in which governments in emerging economies can foster skill development, directly or indirectly, other than the conventional model of government-run vocational schools. Indeed, the conventional policy measures for promoting skill development, based on the dominant human capital theory, have almost entirely focused on the supply side of skill formation, i.e., the development of skilled labor through vocational training, without considering how to generate demands for skills and how to link training with emerging skill demands (see Middleton et. al. 1993 for review). Thus, policy debates have so far centered on whether training should be provided before or after employment and who should finance such training.

But this study has found that, as in-firm training involves large spheres of production processes and organizational structures, a wide range of public policy measures can help foster skill development, including those that enhance demands for skills and thereby for skill development. First, the government, through its training policy, can strengthen institutional alliances between firms and industrial training institutions in developing firm-based training such as apprenticeship schemes to be implemented at large firms, which would help the firms train potential workers in firm-specific skills. Such alliances with close interactions between firms and industrial training institutions would make in-firm training more flexible, more responsive to changes in skill demand, and less costly than vocational schools. They would also make the deployment of labor more efficient, more stable, and less costly. Moreover, the enforcement of mandatory apprenticeship schemes in effect sets the educational standard of industrial labor at a high level, thus ensuring the deployment of high general skills, which would in turn enhance workers' readiness to learn new firm-specific skills through in-firm training.

Second, through its labor policy, it can create institutional environments in which firms reward workers for acquiring new knowledge and skills. While India's exit policy that prevents employers from firing labor may be extreme, some policy measures to encourage long-term employment, discourage labor turnover, and support firms' high wage policy, would help strengthen firms' internal labor markets and thereby create internal incentive structures that promote in-firm skill development. While recent literature argues for more fluid external labor markets, the micro-level evidence in this study shows that on the contrary, long-term stable employment practices, high wages, and internal mechanisms to reward workers' skill improvement, by internalizing labor markets, are a key to motivating workers to learn new skills and improve their performance.

Third, the government can, through its foreign investment policy, promote the transfer of knowledge and skills, by forcing foreign firms to do so as a condition for approving FDI. Explicit agreements between the government and foreign firms on the

terms of technology transfer involving a direct exchange of many employees in various categories—not only engineers but also managers and production workers—would clearly facilitate the transfer of knowledge and skills between firms. Fourth, the government can promote institutional arrangements with overseas training intermediaries such as AOTS,[1] to institutionalize overseas training to allow local workers to gain some instant exposure to knowledge and skills required in more advanced production processes abroad. Similarly, it can support local industrial associations, such as CII and ACMA, in disseminating information and knowledge; this would accelerate the diffusion not only of knowledge itself but also of norms and values which would help create an institutional environment that encourages industry-wide learning.

Fifth, through industrial policies such as localization and reservation, it can promote the development of backward linkages between large firms and local small firms, which would force the former to promote skill transfer to the latter and create the demand for skill development at the latter. The imposition of a high level of local content on both foreign and domestic firms would effectively force them to develop ways to upgrade the skills of their local suppliers' employees. Reserving certain items to be produced by small firms would keep large firms from being vertically integrated and force them to use local small firms as their suppliers. Taken together, these policies would encourage large firms to improve local suppliers' capabilities and turn their supply chains into a learning chain.

Finally, the government can become more directly involved in creating key firms that could lead the industry and serve as a "model for change" by introducing new practices and management styles that are more conducive to the development of workers' skills; this was the case with Maruti. The successful performance of such key firms can help legitimate the new practices and enhance their acceptance by other firms, and thereby help induce industry-wide, and even economy-wide, learning.

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[1] See Appendix 3.3 in Chapter 3 for a brief description of AOTS activities.

A question arises, then, as to why some of these policies that the Indian government had implemented for decades have only recently had significant positive effects on skill development, and more broadly, on economic development. This study found that the development of institutions for skill development takes time, and that some policy measures that may not produce short-term results will still have long-term effects. But, when a set of institutional conditions are in place as a consequence of these policies, they allow firms to respond to changes in institutional environments such as the economy's rapid integration into the global economy and intensifying competition within the industry. Moreover, a single policy measure alone may not produce desired outcomes. The interplay of various policy measures creates complementary effects. While the issue of training has conventionally been approached within the narrowly defined domain of training policy, with focus on the direct provision and financing of public vocational education, this study proposes a new way for government to be involved in skill development, with a more comprehensive and integrated approach to skill development, involving other policy areas such as labor, foreign investment, and industrial policies.

Drawing on the micro-level evidence of successful experiences of two leading firms in the Indian automobile industry in developing workers' skills, this study examined the conditions under which firms foster skill development. In so doing, it showed alternative models of skill development in the context of emerging economies. For further generalization of the findings of this study, the experiences of other industries in India as well as those of the automobile industries in other emerging economies need to be examined. These are topics for future research.

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