The Politics of Skill Building in a Global Age

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ABSTRACT

National skills systems have historically imposed significant constraints on production strategies. This dissertation investigates the impact of the home economy skill base on firms’ off-shoring and out-sourcing decisions, asking: how are globalization pressures mediated and shaped by politically constructed institutions?

Chapters One and Two review the literatures on ‘varieties of capitalism’ and national skill profiles, examining the relationship between skills and production strategies in the US (general skills and Fordism), Germany (industry-specific skills and diversified quality production) and Italy (tacit skills and industrial district production). Despite considerable differences, politicians and business leaders in all three countries have embraced remarkably similar skill-building rhetoric.

The dissertation then examines globalization as a de-stabilizing agent for skill-building systems, focusing on the textiles and apparel industries. Chapter Three argues that domestic education and training institutions in the United States facilitated off-shoring, and that upgrades in management skills were rarely accompanied by more robustly skilled workers on the production floor. Chapter Four argues that recent changes in Italian industry structure attempted to ensure a steady supply of a vital input—workers with lots of tacit skill—but an over-reliance on tacit knowledge could ultimately undermine competitiveness in the industry. Chapter Five finds that Germany's edge in production, rooted on strong, industry-based skills institutions, gave firms a clear advantage in the period of intense globalization. But given recent transfer of skills from German firms to Central European suppliers, how enduring Germany's skills advantage will be remains unclear.

Chapter Six examines the impact of new, global technologies on national skill-building systems, looking at the advent of information technology skill certifications. Despite important national variations in adoption, IT skill certificates came to define skill sets at the international level, underscoring the importance of a new set of global, often for-profit actors in previously domestic arena of training and education.

Chapter Seven concludes with a discussion of the skills workers and employers need to be competitive in the global economy, arguing that reform of formal education institutions may be necessary but insufficient. Policy makers and employers would do well to focus more attention on fostering tacit skills.
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Chapter One
Globalization and Skills: An Introduction

When lowered trade barriers and better communication technology allow managers to search the world for production locations, are any jobs safe? Through much of the 1980s and 1990s, workers and governments assumed that high technology production, with its billions of dollars in capital equipment and demands for public infrastructure, would remain in advanced economies. Semiconductor factories in China and Costa Rica proved them wrong. The next assumption, that highly skilled jobs and high-skill production strategies required advanced economy hosts, has been thrown into question by Bangalore software houses and pharmaceutical R&D in China. Indeed, the choice today may not be between “High Skills or Low Wages”, as an influential US government report put it almost twenty years ago: workers in advanced economies may be forced to struggle for both (National Center on Education and the Economy, 1990).

While some workers, and the firms that employ them, have clearly benefited from globalization, new patterns of production and trade have hit other groups hard. Initially, lower-skilled and manufacturing workers bore the brunt of adjustment to increased trade. Next, call centers, software development, and in a highly publicized case, radiology analysis, were outsourced. People put out of jobs in this round of relocation were not manufacturing workers, but service sector employees and highly skilled
professionals. The most recent wave of outsourcing, which has seen the relocation of some core business functions like research and development, may be as frightening for American and European biologists and computer scientists as it is exciting for employees and investors in India and China (Rai, 2005a, Rai, 2005b). Even mainstream macro-economists have begun to question whether increased trade always results in a net benefit for both economies (Samuelson, 2004). Politicians across the ideological spectrum have begun to emphasize the costs of adjustment that come bundled with globalization’s promises of prosperity.

Politicians also seem to agree on the remedy: rich countries must rely on more productive, highly skilled workers to maintain an edge. Markets are increasingly international. The supply of skilled workers in an economy, however, remains dependent on the nation-state, and rich nations seem to have a natural advantage in producing highly skilled workers. But just as finding workers to exploit new markets and technologies demands ever more attention from firms, equipping workers with the skills to thrive in a global economy presents an escalating challenge to governments. This dissertation investigates the impact of the home economy skill base on firms’ off-shoring and out-sourcing decisions. National skills systems have historically imposed significant constraints on production strategies. I ask: how are globalization pressures mediated and shaped by politically constructed institutions? And,
how have new international actors, public and private, impacted domestic skill-building arrangements?

**Globalization: a Win/Lose Proposition?**

By most accounts, globalization raises productivity in rich and poor countries alike (Bailey, Neil, and Solow, 2001). However, gains from increased productivity have not been distributed evenly: some industries, categories of workers, and regions within rich countries have suffered under the new order of prosperity. As Aldonas et al indicate, about 25,000 jobs are destroyed, and slightly more than that created, every hour in the US (Aldonas, 2007:11).

Though globalization has been a boon for certain workers – highly skilled, mobile professionals who have increased income and autonomy under the new production order – more workers are relatively worse off than they were before 1985 (Osterman, 2001; Levy and Murnane, 2004).

One study finds that for displaced manufacturing workers, about two-thirds found new full-time jobs, but were forced to take an average pay cut of 13% (Kletzer and Jensen, 2005). Older and less-educated workers were hit the hardest. Perceptions of economic insecurity have also spread beyond the manufacturing sector: a 2007 study of workers in tradable services reported greater insecurity (Anderson and Gascon, 2007). Jensen and Kletzer report that, for the period of 2001-2003, the annual job-loss rate for displaced workers in tradable services was 12.8%, compared to a rate of 7.3% for
employees in non-tradable services (2005). Worker insecurity is not isolated to liberal economies, either. Though much research focuses on recent increases in income inequality in US and the UK, Williamson points out that even Germany and Italy, where income gaps for full-time workers did not increase post-1985, vulnerable workers were more at risk: “The fact that labor earnings became more unequal in most OECD countries, when full-time labor earnings did not, suggests that many countries took their inequality in the form of more unemployment and hours reduction, rather than in wage rates” (Williamson, 2006:11).

In the early to mid 1990s, economists parsing the reasons for job dislocation laid most of the blame on technological change rather than globalization (see Katz and Murphy 1992, also Levy and Murnane 1992). Such evidence would suggest that a protectionist policy response would not only be destructive for overall growth, but futile. Since 2000, more evidence has emerged that trade and cross-border production have also had serious impacts on production systems and employment in advanced economies (Berger, 2006; Krugman, 2007). In addition, the arrival of Indian and Chinese competitors in industries previously considered safe from low-wage outsourcing, like software and biotech research, has pushed job insecurity higher up the skill ladder. According to government reports, India produces 250,000 new engineers per year, and China 600,000 (Overby, 2007). Some researchers argue that these figures rely on a lose definition, not comparable to
a western-educated engineer, and that the vast majority of new Indian and Chinese graduates are unemployable in western MNCs (Gereffi et al, 2008). Fuller, however, warns that China’s share of the world’s PhDs in science and technology have risen from zero in 1975 to 11% in 2005; arguments that downplay the competitive threat from Asia have “led to false reassurance that the U.S. lead in science and technology is not under threat from China. It would be a grave mistake to drop our concerns about China’s competitive challenge” (Fuller, 2006).

As debates on the opportunities and threats of globalization continue among academics, politicians have attempted to respond to the era of global engagement and technological change in various ways. Many politicians, particularly on the left, have tentatively embraced protectionist rhetoric. The demands by many of globalizations ‘losers’ to restrict trade and roll back internationalization have been echoed by progressive politicians on the left and nativist politicians on the right. During the 2008 presidential election in the US, Tom Tancredo, the far-right anti-immigration Republican senator, garnered little electoral support but managed to set the agenda in many of the early primaries. Barack Obama, the Democratic frontrunner, backed away from NAFTA, calling for enhanced environmental and social protections. In Italy, two of the parties that form Silvio Berlusconi’s recently elected coalition are protectionist. Around the same time, European Commission President Jose Manuel Barroso noted a general rise in protectionist sentiment: “Political forces
in Europe that were traditionally pro-market are today – let’s put it elegantly – more prudent. Some of the center-right parties are now more conservative in that regard” (Barber and Barber, 2008).

As Barroso noted, post-2000 electoral pressure seems to have put the breaks on further trade liberalization. But the cost of pulling out of existing agreements, including the WTO, Nafta, and the EU, seems to be too high for politicians to contemplate seriously. Consumers have come to expect inexpensive goods from China. In addition, closing borders would subject domestic industry to retaliatory tariffs, creating a new set of losers: exporters who now depend on access to foreign markets. No mainstream politicians in advanced economies have proposed a large-scale withdrawal from the international trading system. Krugman reports: “... even trade skeptics tend to shy away from a return to outright protectionism. ... All-out protectionism isn’t acceptable” (Krugman, 2007).

**Policy Alternatives to Protectionism / Focus on Skills**

Instead of vigorous protectionism, mainstream politicians in advanced economies are looking to ‘soft’ competition strategies. First, progressive and left politicians argue for the inclusion and enforcement of labor and environment standards in existing trade agreements. In old labor states like

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1 The US, for example, has balked at increasing free trade in the hemisphere, as evidenced by the recently stalled free trade agreement with Colombia. In the EU, Ireland and the UK pulled back from opening their labor markets in 2007, when they restricted entrance from new EU member countries Romania and Bulgaria.
Pennsylvania, the Democratic presidential contenders argue that they don’t want to abandon NAFTA, but fix it, by implementing side agreements that would protect worker rights and the environment. Of course, to do so would raise the cost of business in low-wage, lower-regulation countries, with protectionist effect. Though enacting and enforcing such provisions is widely viewed a victory for labor in rich countries, evidence that higher labor and environments standards for developing countries suppliers will boost domestic employment in advanced countries is scant (Krugman, 2007).

Protectionism is a defensive strategy for managing globalization. A second strategy, promoting innovation via public support for basic research and for corporate R&D, aims for advanced economies to retake the trade offensive through increased productivity and new products. In recent years, regional and national policy makers in advanced economies have targeted specific high-tech industries, like biotechnology, nanotechnology, and green technology, for support via direct research subsidies and tax credits. For example, in 2004, citizens of California voted to support the issue of $3 billion in bonds to fund stem cell research. Though the race to cure diseases, including Alzheimer’s and juvenile diabetes were important in the campaign to pass the measure, proponents also argued that new research could spawn new firm in a growing, lucrative industry (Broder and Pollack, 2004). In Germany in 2006, the government designated three ‘elite’ universities, passing along $100 million for research along with the title of distinction. One university,
Karlsruhe, was rewarded for its promising program in nanotechnology. The awards were a radical departure from traditional even-handed federalism, and in designating winners based on excellence in science and technology, attempted to reorient the German university toward the needs of the globally competitive market (Landler, 2006). Innovation policy is certainly an important response to the challenge of low-wage competition. However, free-market liberals and other analysts charge that governments don’t have good records at picking winners (see Baldwin et al, 2002 and Dick, 1995). More to the point, though, is that innovation policy by definition seeks to pick winners. At least in the medium term, does little to help globalization’s losers, including low skilled workers and professionals in globalizing industries.

A third policy strategy for responding to globalization without closing borders to goods involves opening borders to immigrants. Proponents of immigration reform argue that in order to compete economically, advanced economies need to open their borders to highly skilled workers, particularly engineers and entrepreneurs. In the US, the number of visas available for skilled workers (called H1Bs) fell after the dotcom implosion in the early 2000s; corporate executives, particularly in the high-tech sector, have argued that the failure of the US to allow companies to recruit workers special skills is hampering competitiveness and pushing firms to off-shore certain activities (Preston, 2007). These firms have lobbied hard that the number of visas should be increased.
In Germany, a similar debate on the need to liberalize regulation on highly-skilled immigration resulted in a German ‘green card’ program, allowing firms to bring in skilled labor from low-wage countries. As with innovation policy, an open immigration policy for highly skilled workers could boost the performance of domestic firms, but does not necessarily increase the security of domestic workers. In fact, as more H-1B visas in the US were sought by Indian software services firms to send Indian consultants to the US for short periods, critics charged that skilled immigration was actually accelerating outsourcing, and American IT professionals complained of being forced to train their own replacements (Preston, 2007).

Though left and right politicians differ in principle on the value of innovation and immigration policy to respond to globalization, another policy goal draws remarkable agreement: workforce skills. Managers and politicians alike have argued that advanced countries have a natural advantage in highly skilled workers, and to meet the challenge of competition from low wage, increasingly educated countries will require a step up in investment in training and education. To economists, education and training are widely viewed to be central to growth (see Romer, 1989, and Acemoglu and Pischke, 1999). International organizations, including the OECD, the World Bank, the IMF, and ASEAN, have adopted skill building as the main legitimate strategy for a state to gain advantage in the international economy (Martens and Leibfried, 2007; Martens and Weymann, 2007).
Skill building is one of few policy goals embraced by both unions and employers, and across the ideological spectrum. Neo-liberals view skill building as ‘human capital investment’, a legitimate state response to a natural market failure. Left politicians argue that government oversight and funding of education and training of the entire workforce is both economically necessary and socially responsible. As Wolf writes, “Indeed, the view that expanding education contributes directly and powerfully to economic prosperity is so pervasive that people barely notice or remark on it” (Wolf, 2003:316).

But beyond broad promises of support for training, politicians’ proposals to raise skills often seem vague: campaign speeches rarely detail concrete paths to increasing skills that would lead to greater productivity for businesses and more security for workers. Proponents of skill-building seem to assume that leaders of training institutions know which skills global businesses require, and that all workers can be trained or retrained, quickly and cost-effectively, for ‘new’ jobs in a global economy.

Unfortunately, much research has suggested that government-directed training for at-risk youth and disadvantaged workers results in limited or no benefit for the individuals receiving training, at a high financial cost for governments (see Bloom, 1997 on the US; Busemeyer, 2007 and on Germany, Keep and Mayhew, 1999 on the UK, Caroleo and Pastore, 2001 on Italy). Even market-oriented and well-funded training programs for experienced workers tend to miss their marks: in a study of displaced ICT manufacturing
workers in Massachusetts, Lazonick and Quimby found that participation
government-funded training was correlated *negatively* with re-employment
(2006:14). In addition, of the 1172 downsized workers tracked by Lazonick
and Quimby who received training, only 24% found new employment within
three to four years. Of those re-employed, only 62% began new jobs for which
their recent training was clearly relevant, a rate the authors describe as a
“substantial improvement over earlier results” (15).

Training by firms, which would be expected to be more directly relevant
to production, has dropped significantly in the US, and *higher* skilled workers
are more likely to receive training (Lynch, 2005). In Germany, a country where
employers’ long commitment to initial training has fueled high value added
manufacturing, provision of further training lags (Gatter, 1999: 253). Crouch
et al warn that even if training is successful, high value-added markets remain
unlikely to be a major source of new jobs in advanced economies (1999: 227).
Moreover, they write, “it should not be pretended that, if they only showed
adequate initiative and responded to the education opportunities available,
most people would be able to gain high-quality places in the labor market”
(239).

Clearly, skill creation is not the simple answer to globalization that many
wish it to be. Nonetheless, improving skills is certainly part of the answer.

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2 Other research suggests that retraining raises earnings capacity if it is voluntary and technical or academic in content,
but costs may outweigh benefits for older workers (Jacobson et al, 2005).
Before questioning how firms and workers could benefit from increasing skills, and which actors are most likely to benefit, we need to take another step back and ask: What are skills? How are they related to formal education? How are skills related to economic competitiveness? Are skills the same in different systems of production? Are they acquired in the same way in all countries?

**Why Train? What are Skills?**

If skills increase efficiency, and are widely known to do so, what accounts for skills shortages? Economists have long looked at the problem of insufficient investments in skills as a market failure.\(^3\) Workers, who in theory earn wages equal to their marginal productivity, have much to gain from investing in training. But many individuals lack access to capital (either financial capital to pay tuition, or physical capital, including tools and machines, with which to train), as well as information (which types of skills will be best rewarded on the labor market? Which modes of training are most effective at increasing skills and which are best recognized by firms?). Firms may also find training to be an expensive and risky investment, particularly if trained workers are free and apt to leave the firm after acquiring valuable skills. Non-training firms, which do not bear the cost of skill building, can hire skilled workers at a better wage than training firms. All firms are better off with a ready supply of skilled workers, but since workers trained by one firm

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\(^3\) This summary draws in part from an excellent summary of the literature in Thelen (2004:9-17).
are then free to move to a competitor, they may deny the original employer a return on its investment. This threat of 'poaching' in the labor market gives individual firms a disincentive to invest in training, despite the general gains to society of training.

Pigou, who identified the problem of poaching and thought it central to the problem of sub-optimal investment in training, prescribed public subsidies for training as a remedy (Pigou, 1912). However, government subsidies for in-firm training can be expensive politically difficult: programs redirect public money to profitable firms and employed workers. State sponsored training via public institutions often suffers from weak leaks to industry, teaching technologies that are outdated or skills that are not valued by employers. Even basic education can be vulnerable to this charge: business leaders worldwide have argued that schools are not preparing children for the workplace.4

Gary Becker’s 1964 *Human Capital* changed the debate on skills and state subsidies. Becker argued that firms do have a disincentive to invest in general skills, as generally-skilled employees are attractive targets for poaching firms (Becker, 1993). But individual workers have a strong incentive to invest in their own skills: they will be more attractive on the labor market and receive a higher wage. The threat of poaching does not discourage training in specific skills—that is, skills valued by a specific firm. Since other competitors will not value the specifically-trained worker enough to pay a poacher’s premium, firms

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4 These charges will be discussed in depth in the sections below on the US, Germany, and Italy.
will invest in these skills, paying workers a share of the gain. However, Becker did concede that failures in credit markets could lead to an under-investment in skills. Though workers would be willing to invest in their own general skills, they may lack access to credit, particularly early in their careers. Becker advocated public spending to provide credit to trainees.

More recently, economists have questioned the assumptions of Becker's model. Though theoretically, firms should never invest in general skills, empirically, many firms do bear significant costs for general education and training (see Streeck, 1987, Katz and Ziderman, 1986, Bishop, 1994; Bishop, 1994; Lynch, 2005). Acemoglu and Pischke discuss how labor market imperfections could reduce the threat of poaching, including monopsony power in a local labor market. In Japan, for example, lead firms could pay trained workers above the local rate, but still below their marginal value (1999).

**How Political Economists Look at Skill**

In addition to pointing out data that contradict Becker's argument, political economists have also challenged the logic of his dichotomy of skills. For Stevens and Estevez-Abe et al, Becker's differentiation between general and specific skills was too stark; many skills could be valuable to several employers (Stevens, 1999, and Estevez-Abe, 2001). These authors introduced intermediate categories (transferable skills and industry-specific skills, respectively) that are valuable to a subset of firms. Such skills are a riskier
investment for workers than general skills, because they will only be valuable to some firms, but also riskier for firms, because workers with transferable or industry skills are targets for competitors who would prefer to avoid training costs. With poaching again the predominant market failure discouraging skill-building, political economists emphasized the role of institutions – national institutions in particular – in mitigating the problem (Thelen, 2004:16).

Germany emerged as the ideal case of a society with institutions that protected firms against poaching and encouraged training (Streeck, 1992, Finegold and Soskice, 1988). German-style vocational training systems got around the poaching impasse via a network of institutions. In Germany, apprenticeship programs are highly regulated, with input from firms, unions, and state agencies. Firms spend substantial sums on training, and agree to a union- and industry-approved curriculum that results in a recognized, state-regulated certification. However, firms' costs and risks are lessened by low training wages, and by the incentive for trainees to stay with the program until the end (even though, during the last stage of their traineeship, they earn less than their value to the firm) in order to earn certification. Sponsoring apprentices also provides firms with a low cost way to screen for the best young workers, who are often hired as regular employees after they earn their certifications. The end result of this system, a highly-skilled and well paid industrial workforce, allowed employers to react quickly to changing market
demands and produce special products for the high end of the market – a system Streeck called ‘diversified quality production’.

In countries that lacked institutions for structuring and certifying industrial skills, the US for example, workers chose instead to invest (if they could) in general skills, and firms tailored their strategies to generally-skilled workers. In practice, Fordist production – a system of mass production of standardized goods that relied on educated managers and engineers along with unskilled or semi-skilled workers – was the result. As Thelen writes, employers chose business strategies that would free them from intensive training and reduce the risk of poaching by reducing their needs for skilled workers: “the goal was above all to rationalize production and reduce dependence on skilled labor altogether through technological change, work reorganization, and product standardization” (Thelen, 2004: 281, emphasis in the original).

According to these political economists, once a national skills profile becomes established, it becomes self-reinforcing (Estevez-Abe, 1002). Employers choose production strategies based on the skills in the local workforce, then support other policies that will sustain their access to the skills they now rely on. Thus, skill-building institutions become interconnected with other key political economic institutions, and tend to be stable over long periods of time (Hall and Soskice, 2001, and Mares, 2003). Estevez-Abe et al argue, in fact, that social welfare protections are put in place not only to buffer individuals from the whims of the market, but rather to
structure individual’s incentives in line with national production strategies.

More recent research (Thelen, 2004, and Culpepper, 2007) demonstrates how national skills profiles have actually evolved over time as new market realities and new political actors shape existing institutions toward new ends.

**Sociologists and Skills**

If economists looked at skill building as a problem of markets, and divided general from specific skills, sociologists investigated training as a lived experience. Aiming to explain persistent within-industry wage differentials in Germany, France, and the UK, Maurice et al (1980) found that organization on the factory floors mirrored the structure of state-sponsored education and training in each country. Even though the factories they studied were producing parts to identical ISO standards, status and wages differentials reflected the previous experience of managers and workers. If political economists see skill in functionalist terms, arising in response to market demand and incentives for individuals, sociologists focus on the social nature of skill acquisition. Individual skill building is embedded in societal norms, relationships, and institutions.

Following from this social understanding of skills, many sociologists distinguished skills by the means they were acquired. *Codified knowledge* could be learned autonomously, as from books, while *tacit skills* were embodied in individuals and transferred via social networks and relationships. The
pioneer of this line of thinking is Michael Polanyi, who explained tacit knowledge with the phrase “we know more than we can tell” (Polanyi, 1966).

Polanyi uses the example of riding a bicycle:

If I know how to ride a bicycle . . . , this does not mean that I can tell how I manage to keep my balance on a bicycle . . . I may not have the slightest idea of how I do this, or even an entirely wrong or grossly imperfect idea of it, and yet go on cycling ... merrily. Nor can it be said that I know how to bicycle... and yet do not know how to co-ordinate the complex pattern of muscular acts by which I do my cycling... I both know how to carry out (this performance) as a whole and also know how to carry out the elementary acts which constitute (it), although I cannot tell what these acts are (quoted in Hedesstrom and Whitley, 2000:3).

Advances in technology have made it possible to codify some knowledge that has long been presumed tacit. Talented engineers, for example, could build a robot capable of riding a bicycle. In addition, the computer and communication revolutions have radically dropped the costs and increased the benefits of codification. Levy and Murnane cite the example of a car company’s frequently updated, easy to access database of common problems as a major advance for mechanics (Levy and Murnane, 2004). But codification is not universally cost effective or even feasible. Riding a bicycle in traffic, or, in the example used by Levy and Murnane, driving a bakery truck through a crowded intersection, requires a level of societal knowledge that makes these tasks dangerous for the non-initiated bicycle riders and truck drivers; these tasks would be much more difficult indeed to break down into a set of codifiable instructions. Non mechanical skills, especially those requiring non-routine,
expert thinking and complex communication may be impossible to explicate in writing, and are certainly much more efficiently transmitted via, in part, interpersonal interaction. As Lam explains:

Explicit knowledge can be aggregated at a single location, stored in objective forms and appropriated without the participation of the knowing subject. Tacit knowledge, in contrast, is personal and contextual. It is distributive, and cannot be easily aggregated. The realization of its full potential requires the close involvement and cooperation of the knowing subject (Lam, 2000:490).

Just as it can be difficult to distinguish 'general' from 'specific' skills, many tasks seem to involve aspects of codified and tacit knowledge. That said, distinguishing tacit-heavy from highly codified knowledge systems and production processes does give us insight on the strategies available to managers. Large reservoirs of shared tacit knowledge lower transaction costs and thus increase efficiency (Lam, 2000, and Belussi, 1999), and to seem to foster innovation (Nonaka and Takeuchi, 1995, and Cole, 2004). Heavy reliance on codified knowledge enables disaggregated production (Berger, 2006, Sturgeon, 2003, Sturgeon, 2002, Baldwin and Clark, 1999 and Brusoni, 2001).

Rather than identify a national skills profile, the tacit knowledge literature takes the organization or (in areas of high interaction between firms) the local region as the unit of analysis. For some economies, the tacit/codified understanding of skills seems more appropriate than the political economists’ framing. In Italian districts, for example, small and medium sized firms were deeply embedded in local communities where employers and laborers lived and
worked together; in fact, as Becattini wrote, “community and firms tend to merge” (quoted in de Blasio and di Addario, 2005:12; see also Tappi, 2001:8). Deep social relations between economic agents promote long term cooperation among firms, facilitating disaggregated production and encouraging entrepreneurship (Pyke et al, 1990 and Brusco and Righi, 1989). Though national institutions helped support local skill building systems, relationships within industrial districts had greater impact.

Skills Across Borders?

Both the political, economic, and the sociological understanding of skills offer insight into how skills are developed, and how they have traditionally been connected with production strategies. But on the whole, these literatures don’t aim to address how skills are developed and deployed in a world of increased trade and global production. The recent wave of globalization differs from past increases in international trade: producers’ ability to disaggregate production between firms and across borders is a radical change (Berger, 2006). This new reality is potentially destabilizing to all the skill-building systems discussed above, which are rooted in national or local communities. How can poorly-trained American factory workers and generally trained professionals compete against Vietnamese workers who earn $1 per day and Indian engineers who work for 40% of the salary of similar professionals in the US? How can the

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5 Italian laws that exempted firms with fewer than 50 employees from collective bargaining and other labor regulations discouraged firm expansion and encouraged small firm cooperation, for example.
German training system, which excels training young manufacturing workers, adapt to a global economy with growing service sector and the need to retrain older workers? And how will Italian firms leverage the advantages of industrial districts in a global economy – where the transfer of tacit skills requires co-location of producers, suppliers, and customers (or marketers), and often a common culture as well – and still to take advantage of non-local technology and the opportunities of disaggregated production? Though skill pressures are constant throughout the developed world, skill-building institutions have varying abilities to respond to them (Carnoy, 1997, Regini, 1997).

**Varying institutions, common skills reform?**

As traditional skill-building institutions are challenged, business leaders in advanced economies claimed that workers with higher skills were needed to compete in the global economy. Perhaps more surprisingly, they also called for governments to take an expanded role in skill creation. This call for help is highly unusual: when it comes to issues ranging from labor regulations to environmental practices, executive pay to capital standards, outsourcing to immigration, business leaders have continued to demand greater freedom from government interference. Indeed, many politicians and business managers seem to believe that globalization permanently tied the hands of the state (see Strange, 1995, Evans, 1997, Hay and Watson, 1998). According to business
lobbies, tax increases could be economic suicide, new environmental regulations would drive industry over borders, protection and subsidies risked the wrath of the WTO.

But skill-building was a major exception. On the right and on the left, in countries strong in industry skills and countries with general skills profiles, education and training has been embraced as the primary policy response to globalization. In fact, countries with traditionally different skill-building institutions and different industrial structures have responded to globalization with remarkably similar rhetoric about the need for higher skills. The SCANS report in the US (“High Skills or Low Wages?”) and the Siena study in Europe (in which Germany and Italy ranked low on academic achievement) pushed education and workforce training into the forefront of national agendas. How did policy makers respond?

**Different systems, Similar debates**

Despite the fact that the US, Germany, and Italy represent the three different ‘ideal types’ of national skill profiles, the skill-system debates and reforms in the past twenty years have been remarkably similar. Each country, after a debate on international competitiveness, has enacted a major reform of skill building institutions. I discuss each one below.

In the United States, education emerged as a major electoral issue. Since the late 1980s, a series of major skill-building initiatives have aimed to
make American workers competitive in the global economy. Skill building in the US evolved to complement a Fordist system of mass production of standardized goods that relied on educated managers and engineers along with unskilled or semi-skilled workers (see Chapter Two). Skills crises in the US are not new. During turn of the century globalization and again after Sputnik, debates on education and training reform jumped into the mainstream. In the 1950s and 1960s, critics worried that the American system would fail to produce the world's best rocket scientists. The current debate, however, focuses not only on the need for training the best and the brightest, but also the new need to train lower-skilled Americans to compete against more highly-skilled, but lower paid workers in developing countries.

The US education and training system is highly decentralized, with bifurcated outcomes: American universities consistently top world rankings in resources and in output, while public schools in inner cities fail to provide even a basic education for large numbers children (Kozol, 1992). Once in the workforce, employees with lower levels of skills were actually less likely than more highly skilled workers to benefit from employer-sponsored training (Lynch, 2005).

Education and training controversies have been a recurrent theme in the US, but the most recent debate on skills reform was sparked by the Reagan administration. President Reagan had campaigned with the promise of disbanding the Department of Education. Reagan's secretary of education
appointed a blue-ribbon commission, apparently to produce a report arguing for less of a federal role in US education, but the commission was ‘hijacked’ at the eleventh hour (Guthrie and Springer, 2004). Instead of a call for devolution, the report was a call to arms:

The time is long past when America's destiny was assured simply by an abundance of natural resources and inexhaustible human enthusiasm, and by our relative isolation from the malignant problems of older civilizations. The world is indeed one global village. We live among determined, well educated, and strongly motivated competitors. We compete with them for international standing and markets, not only with products but also with the ideas of our laboratories and neighborhood workshops. America's position in the world may once have been reasonably secure with only a few exceptionally well-trained men and women. It is no longer (United States National Commission on Excellence in Education, 1984).

Though the report’s methodology was suspect and its findings proved to be flawed – Nation at Risk predicted that the US was becoming less competitive in technology a mere decade before the Silicon Valley IT boom – the media and public seized on it: more than six million copies were printed in the first year of its release (Guthrie and Springer, 2004). Reagan reacted to the widespread public interest in the 'skills crisis'. However, his long-held antipathy for a federal role in education limited his response to calls for curricular reform at the state and local levels.

But the popular response to Nation at Risk influenced the next president, George H. Bush, who adopted education reform as high priority campaign issue and declared his intention to be the “Education President”. After his election, Bush called an unprecedented 'education summit', bringing together all fifty
governors. Bush, after asserting that only half of American high school juniors could manage fractions, decimals, and percentages, argued that raising skills was a national emergency:

No modern nation can long afford to allow so many of its sons and daughters to emerge into adulthood ignorant and unskilled. The status quo is a guarantee of mediocrity, social decay, and national decline (Bush, 1989).

In addition to calling for national standards and accountability in schools, Bush brought new actors into the education policy sector. Business involvement was central to Bush's plan: he extracted from the Business Roundtable and the Chamber of Commerce major commitments of time and lobbying power in service of education and training reform (Martin, 2000: 194-5). Bush also targeted adult education and worker training in addition to traditional schools, citing that 85% of workers in 2000 were already beyond their school years in 1989.

Rather than repudiate Bush's Goals 2000, Clinton adopted his Republican predecessor's agenda to set national skills standards. In addition, he championed the "School-to-Work Act" of 1994. At a time when the German economy seemed ascendant and German manufacturers far more resilient to international competition than American producers, this small new program aimed to implement some aspects of the famed German apprenticeship system in the US. Clinton's policy gains, like those of his predecessor, were ultimately limited. Moreover, in this period, business leaders invested large amounts of
time and considerable lobby power to reform education and training (Sipple et al, 1997).6

However, education continued to grow in importance to politicians, and to voters: by January, 2001, a Roper poll of voters reported that education supplanted the economy as the most important issue facing the country (27% chose education, 92% more than the #2 issue)(Guthrie and Springer, 2004). According to one researcher, the rise in education and training’s salience resulted in a major change in the terms of the debate, and in the key debaters:

The terms of the national discourse shifted from educational opportunity and equity to educational excellence. Along with this move came an expansion in the range of interests actively focused on education, with groups representing business and elected state officials displacing traditional education interests as the primary framers of policy (McDonnell, 2005: 25).

By the election of George W. Bush, the traditional Republican antipathy to federal intervention in education had waned, and broad-based skills issues were increasingly framed as central to economic competitiveness. Bush’s plan became the No Child Left Behind law in 2002. In exchange for a large increase (on average, 49%) in federal funding for education, NCLB mandated that states set educational standards, test all students in grades 3 through 8 on their attainment of those standards, publish the results of assessments, and implement ‘evidenced-based’ curricula (for example, phonics-based reading

6 The support from business for education and training was genuine, but not unlimited. Some employer groups opposed initiatives that would subsidize training on the grounds that they were too expensive and would require tax increases. (Personal interviews with business associations and DC offices of large firms, March 2003. See also Martin, 2000, Chapter five.)
programs) (McGuinn, 2005). Though opponents charge that the reform accomplished little for anyone save the testing companies, some analysts see NCLB as a radical break with the past: “NCLB represents a transformative shift in federal education policy – not merely a new policy but a new policy regime as it embodies a different set of ideas, interests, and institutions for federal education policy” (ibid, 27). In April, 2008, Secretary of Education Margaret Spellings mandated a single national formula for calculating high school dropout rates. This rule change pushes federal authority more deeply into state education policy than ever: “This is a huge deal, in terms of its impact, because it will basically affect every high school in the country,” said one former assistant secretary of education (Dillon, 2008). Despite difficulties implementing and reauthorizing NCLB, proponents in government and business have begun to advocate extending the model to pre-school and tertiary education (McGuinn, 2005: 64).

**Germany**

While a language of ‘crisis in education’ took hold of American politicians in the mid 1980s, many Germans and their elected officials viewed their country’s skill building system as world class. In fact, in the 1980s and 1990s, researchers identified Germany as the ideal typical case of a ‘high skills equilibrium’, with a human capital system that fostered high investment in –
and returns to — skills, for employers and workers alike (Streeck, 1987, Finegold and Soskice, 1988).

That the German system resulted in such favorable outcomes for workers was surprising. Students were separated into three learning tracks (which correlated highly with social class) at age ten, an unusually young age even for national systems that feature stratified learning. Left politicians in Germany had long worried that Germany’s school system entrenched class stratification: traditionally, only graduates of the elite gymnasium have been admitted to university study. However, German employers’ long commitment to dual system training (where secondary school students combined school-based learning with an in-firm apprenticeship), together with the strength of the institutions that certified the quality of dual system training ensured that, in Germany, the vocational education route was not a dead end. Rather, a large number of dual system graduates fueled Germany’s manufacturing export machine as skilled workers who were often promoted to management.

As long as employers were active participants in the system, and apprenticeships led not only to good, skilled jobs but the opportunity for advancement off the factory floor, dual system training was an attractive option, and drew many talented students. Unlike in other European countries where state-run vocational schools were detached from firms and viewed as repositories for the less talented, the German dual system was seen as an alternative path to advancement in a career. Since apprenticeship drew
talented young workers, firms had a strong incentive to invest in the training programs (in order to gain access to the best labor market entrants), and to orient training to high-level, industry-specific skills (in order to maximize returns to their investment in training). The willingness of so many workers to invest in higher-level industrial skills fueled a German production system hallmarked by quality and differentiated products (Finegold and Soskice, 1988, Hall and Soskice, 2001, Culpepper, 1999). As we have seen, the ‘high skill equilibrium’ outcomes – high skills, high wages, and high equality – drew the attention, and served as a model for, training policy reforms around the world.

Employers were less thrilled with Germany’s tertiary education system, which was geared toward academia, required six plus years of study before awarding degrees, and emphasized theory over practice. Many students dropped out before completing their degrees, and Germany’s pool of university grads, in percentage terms, was lower in 2004 than all but three other EU countries (Jacobs and Van der Ploeg, 2006). German universities did not charge tuition, and suffered from under-investment. Despite the country’s size and economic strength, only one German university ranked in the world’s top 50 in 2005; by 2006 the number was zero (Van der Ploeg and Veugelers, undated:13).

By the end of the 1990s, worry about Germany’s skill building system at all levels grew. Some worries were internal to the system: Analysts fretted that the dual system was becoming more expensive – and thus less attractive – to
employers, whose participation was vital (Wagner, 1999). Moreover, the skill building system did a poor job of integrating East German students: as Jacoby shows, the lack of a strong economic base in the region meant that placements for in-firm apprenticeships were scarce (Jacoby, 2000). As a result, students seeking vocational skills were pushed into government-run trade schools. Though they tried to mimic work experience, these placements lacked the key elements that made the West German dual system formidable: up to date technology, market knowledge, and job market access. In addition, even in the West, Germany’s tracked system did a poor job of integrating the children of foreigners (Wagner, 1999).

Other challenges were posed by outside economic factors. The dual system’s strength – producing skilled manufacturing workers – seemed less able to meet increasing demands from a service sector growing in size and economic importance (Culpepper, 1999). A secular growth in preference for higher education (albeit a slower growth than in other EU countries) threatened to remove the best students from the dual system, which would disillusion employers and destroy the dual system’s reputation as an avenue for talented young people to valuable skills and good jobs. These secular social trends are reinforced by economic demands that seem to favor in-school, formal education: “New technologies and new production requirements demand ongoing upgrading of training, mostly in the direction of more general skills and more theoretical training” (Thelen, 2004:274).
In the late 1990s, the IT boom lead politicians to begin to face the previously unthinkable possibility of a German skills shortage. Germany’s conservative parties, long opponents of increased immigration, changed their position to be in favor special visas for tech workers in cases where no Germans qualified workers were available. Stoiber, the leader of the Center-Right, explained the new position as a competitive necessity: “We live in a globalized world. In all countries there is a competition for the best minds. America is our competitor”(Adler, 2001). The ruling Center-Left, while more worried than the right about the distribution effects of globalization, also linked economic viability to skills. As Schroeder said in 1999, “How can we keep all people involved in knowledge and education and training? Prosperity depends on this,”(Jessup, 1999).

Agreement on the basic soundness of the German human capital system disintegrated with the 2001 announcement of the PISA study. According to the OECD, Germany’s 15 year olds ranked 21st of 31 countries in reading, in Europe ahead only of Hungary, Poland, Latvia, Greece, and Portugal, and 20th in math and science (see Chart 1.1). Germany also scored lowest social mobility, which came as another unwelcome surprise: as a coordinator of the study said, “We knew before PISA that there is a relationship between social background and performance in all countries. But that that this relationship [between social background and performance] is strongest in Germany was astonishing,” (De Pommereau, 2002).
### Chart 1.1: OECD Pisa Study Results

*(15 year olds tested in 2000)*

<table>
<thead>
<tr>
<th>Reading Literacy Average Country</th>
<th>Math Literacy Average Country</th>
<th>Scientific Literacy Average Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Finland 456</td>
<td>Japan 557</td>
<td>Korea 552</td>
</tr>
<tr>
<td>2. Canada 534</td>
<td>Korea 547</td>
<td>Japan 550</td>
</tr>
<tr>
<td>3. New Zealand 529</td>
<td>New Zealand 537</td>
<td>Finland 538</td>
</tr>
<tr>
<td>4. Australia 528</td>
<td>Finland 536</td>
<td>UK 532</td>
</tr>
<tr>
<td>5. Ireland 527</td>
<td>Australia 533</td>
<td>Canada 529</td>
</tr>
<tr>
<td>6. Korea 525</td>
<td>Canada 533</td>
<td>New Zealand 528</td>
</tr>
<tr>
<td>7. UK 523</td>
<td>Switzerland 529</td>
<td>Australia 528</td>
</tr>
<tr>
<td>8. Japan 522</td>
<td>UK 529</td>
<td>Austria 519</td>
</tr>
<tr>
<td>9. Sweden 516</td>
<td>Belgium 520</td>
<td>Ireland 513</td>
</tr>
<tr>
<td>10. Austria 507</td>
<td>France 517</td>
<td>Sweden 512</td>
</tr>
<tr>
<td>11. Belgium 507</td>
<td>Austria 515</td>
<td>Czech Republic 511</td>
</tr>
<tr>
<td>12. Iceland 507</td>
<td>Denmark 514</td>
<td>France 500</td>
</tr>
<tr>
<td>13. Norway 505</td>
<td>Iceland 514</td>
<td>Norway 500</td>
</tr>
<tr>
<td>14. France 505</td>
<td>Liechtenstein 514</td>
<td>United States 499</td>
</tr>
<tr>
<td>15. United States 504</td>
<td>Sweden 510</td>
<td>Hungary 496</td>
</tr>
<tr>
<td>16. Denmark 497</td>
<td>Ireland 503</td>
<td>Iceland 96</td>
</tr>
<tr>
<td>17. Switzerland 494</td>
<td>Norway 499</td>
<td>Belgium 496</td>
</tr>
<tr>
<td>18. Spain 493</td>
<td>Czech Republic 498</td>
<td>Switzerland 496</td>
</tr>
<tr>
<td>19. Czech Republic 492</td>
<td>United States 493</td>
<td>Spain 491</td>
</tr>
<tr>
<td>20. Italy 487</td>
<td>Germany 490</td>
<td>Germany 487</td>
</tr>
<tr>
<td><strong>21. Germany 484</strong></td>
<td>Hungary 488</td>
<td>Poland 483</td>
</tr>
<tr>
<td>22. Liechtenstein 483</td>
<td>Russian Fed. 478</td>
<td>Denmark 481</td>
</tr>
<tr>
<td>23. Hungary 480</td>
<td>Spain 476</td>
<td>Italy 478</td>
</tr>
<tr>
<td>24. Poland 479</td>
<td>Poland 470</td>
<td>Liechtenstein 476</td>
</tr>
<tr>
<td>25. Greece 474</td>
<td>Latvia 463</td>
<td>Greece 461</td>
</tr>
<tr>
<td>26. Portugal 470</td>
<td>Italy 457</td>
<td>Russian Fed. 460</td>
</tr>
<tr>
<td>27. Russian Fed. 462</td>
<td>Portugal 545</td>
<td>Latvia 460</td>
</tr>
<tr>
<td>28. Latvia 458</td>
<td>Luxembourg 446</td>
<td>Luxembourg 443</td>
</tr>
<tr>
<td>29. Mexico 422</td>
<td>Mexico 387</td>
<td>Mexico 422</td>
</tr>
<tr>
<td>30. Brazil 396</td>
<td>Brazil 334</td>
<td>Brazil 375</td>
</tr>
</tbody>
</table>

Statistically Above average
Statistically average
Statistically below average

Source: Moore, 2002: 296–299
The PISA results became a sensation for Germany’s press, and a scandal for politicians and educational authorities (Lingens, 2005). Germans responded with a “stunned sense of disillusion” (Schmid, 2007), and began a profound and unsettling self-investigation:

In December 2001, the first PISA report hit Germany like a bomb. . . . Whilst we had always seen ourselves as the leading nation in education, an international organization showed us that, in an international comparison, we just about made the (lower) medium level. And this in the era of “knowledge-based society”, green cards for qualified employees, and economic service globalization. What was going to become of the country? (Martens and Liebfried, 2007).

An obsession with the OECD test results grew so pervasive that the German Language Society named “PISA-Shock” as one of the top ten German words of 2002; a second round of bad test results led to “Pisa-gebeutelte Nation” (or “Pisa-shaken nation”) making the list in 2004 (Schmid, 2007). Schroeder admitted that Germany’s education and training system, previously a source of national pride, was on “shaky ground” (Lingens, 2005). The low marks were salt in the wounds of a people already feeling the battered by international economic competition. “The PISA effect would never have gripped us in the absence of economic crisis,” said Dieter Lenzen, president of the Free University of Berlin (Dougherty, 2005).

After the 2001 PISA results were released, education joined the economy as the central issues in the upcoming national election. Schroeder’s education minister pledged to put Germany in the top five of rankings on international student performance within ten years, improve school quality, and increase the
number of graduates. These proposals were introduced as crucial to national survival: “A good education is for our country as important as the air we breathe,” said Education Minister Eleftherios Buhlm (DW-World.com, 2002). “Anyone who wants to get on in Germany must realize it can only be through education,” Schroeder said, arguing that only innovation and skills could allow Germany to attain a standard of living sufficient to maintain a high level of social equality and security (Agence Press France, 2004). The government announced an E4 billion campaign in response to the PISA results, featuring an increased number of full-day schools and creating national education standards (Williamson, 2003). In addition, the government proposed to foster innovation by creating elite universities (Van der Ploeg and Veugelers, undated), and advocated a reform of the degree structure along the Anglo-American bachelor’s/masters model to cut the drop out rate (Weiler, 2005).

Meanwhile, opposition parties blamed Germany’s failure on the SPD-Green coalition government, arguing that Lander controlled by the CDU performed better on the tests (Roberts, 2003). Rather than centralize standards, right politicians argued for more local control of schools and universities. Angela Merkel addressed skills policy in her inaugural address:

Even the best of reforms on the labor market will not help much if we do not focus on what has made us strong: education and innovation. More than ever before, they are Germany’s raw materials. We have to be better than the others, to the extent that we are more expensive. We cannot and will not compete for the lowest wages. That is why we have to be better. . . . I say in all sincerity that there has never been a coalition
agreement which has prized innovation and state-of-the-art technology so much. . . . More than ever before, we need well-trained and highly motivated young people. What they learn and try out today will determine Germany's performance and prosperity in 20, 30 years' time (Merkel, 2005).

German industry leaders, who long had major input into industrial training in the dual system, began to demand more say in school curricula. In Baden, local business leaders began to volunteer in schools, and educators grudgingly admitted their efforts were altruistic: "What's new is that the companies don't want something back immediately," [one school director said]. "They want the education system to work" (Dougherty, 2005). National employer associations have also upped their interest and commitment to education reform. "We're never going to be able to add more value without better education," said Heinrich Hofer, an education specialist with BDI, the main industry lobby group in the country. "Germans can still turn screwdrivers in the future, but only if they are using automated, computerized machines that we have designed here" (ibid).

Despite the central role of skill building issues in German politics in the last decade, the basic structure of the secondary education and training system has not yet changed, and structural reforms in the tertiary system remain tentative. However, the discourse on globalization and skills remains one of crisis and change. According to Black and William, "Education in Germany is undergoing its most radical upheaval in the last fifty years" (2005:256).
Italy

In Italy, where schooling has traditionally been divorced from the economy and the institutional environment has historically fostered investment in firm-specific skills, improving human capital has been less salient as an electoral issue than in the US and Germany. However, over the past twenty years a consensus emerged among mainstream political actors that education and training institutions were crucial raw ingredients in cooking up a response to the pressures of globalization. Though preferred recipes for human capital success varied by party affiliation, both Left and Right governments pushed through major structural reforms of Italy’s education and training systems.

As we will see in detail in Chapter 2, after the founding of Italy as a nation in 1860, the country’s public education system became highly centralized, aiming to promote nation-building at lower levels and to train the state bureaucracy at higher levels. Unlike in Germany (where the dual system encouraged large scale in-company training under state oversight) or the US (where the need to secure private funding encouraged ties between university researchers and firms), skill building institutions in Italy had long been insulated from industry. The non-economic focus of the formal education system helps explain and helped to reinforce the emergence of Italy’s in-firm model of training. For the most part, industrial workers in Italy acquired skills informally, on the job. As a result, skills tended to be firm-specific, and
pressure from firms on the formal education and training systems was lower than in other advanced industrial economies.

Italy's human capital system had long been viewed as a laggard: secondary school and university completion remained low, and spending on education (particularly universities) hovered at or below the EU average (see Charts 1.2–1.4). In addition, critics charged that the resources dedicated to human capital in Italy were often wasted: despite one of the lowest teacher/student ratios for primary and secondary schools in the OECD, Italian students fared poorly in international comparisons (see Chart 1.1 above with PISA results).

For much of the postwar era, a disproportionate number of university graduates struggled with unemployment (Barbagli, 1982), and in wealthy regions with low unemployment, like the wool and cashmere district in Biella, students were more likely to leave school for the workforce at an early age (interview notes, 2002). The curricula in Italian schools and universities were determined by the central ministry and tended to be academic and traditional. Even technical high schools had little freedom to adapt their programs to local labor markets. In fact, despite the student uprisings of the late 1960s opened universities to middle and working class students, Italian education and training institutions were structurally the same since the 1923 Gentile reforms (Polesol, 2006).
Chart 1.2: Population with at Least Upper Secondary Education
(%, by age group, 2002)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>EU 15</th>
<th>OECD</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-34</td>
<td>62</td>
<td>65</td>
</tr>
<tr>
<td>35-44</td>
<td>72</td>
<td>75</td>
</tr>
<tr>
<td>45-54</td>
<td>66</td>
<td>69</td>
</tr>
<tr>
<td>55-64</td>
<td>58</td>
<td>61</td>
</tr>
</tbody>
</table>

Source: (OECD, 2005)

Graph 1.3: Trends in Tertiary Education
Percentage of the Population Aged 24 to 35 with Tertiary Education

Source: (OECD, 2005).
### Chart 1.4: Public Expenditure on Educational Institutions

<table>
<thead>
<tr>
<th>Country</th>
<th>2001</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary, secondary, and post-secondary non-tertiary education</td>
<td>Tertiary education</td>
</tr>
<tr>
<td>Italy</td>
<td>7.6</td>
<td>1.7</td>
</tr>
<tr>
<td>EU-15</td>
<td>8.0</td>
<td>2.8</td>
</tr>
<tr>
<td>OECD average</td>
<td>8.9</td>
<td>2.8</td>
</tr>
</tbody>
</table>

**As a percentage of total public spending**

<table>
<thead>
<tr>
<th>Country</th>
<th>2001</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>3.7</td>
<td>0.8</td>
</tr>
<tr>
<td>EU-15</td>
<td>3.6</td>
<td>1.3</td>
</tr>
<tr>
<td>OECD average</td>
<td>3.6</td>
<td>1.3</td>
</tr>
</tbody>
</table>

**As a percentage of GDP**

<table>
<thead>
<tr>
<th>Country</th>
<th>2001</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>3.7</td>
<td>0.8</td>
</tr>
<tr>
<td>EU-15</td>
<td>3.6</td>
<td>1.3</td>
</tr>
<tr>
<td>OECD average</td>
<td>3.6</td>
<td>1.3</td>
</tr>
</tbody>
</table>

1. Including government subsidies to households, including subsistence allowances, and to other private entities.

Source: (OECD, 2005)
Italy’s training and education institutions came under attack: critics of the right and left complained the system was inefficient and ineffective. By the late 1980s, however, combined pressure from the OECD, the EU, and Confindustria, the employer organization, began to tilt toward consensus on the need to reform Italy’s skill building system, and to better align formal education and training institutions with the economy (Vaira, 2003). Attempts at reform were initially stymied by a highly centralized, powerful bureaucracy, together with entrenched and highly politicized faculty unions (Moscati, 1998, Vaira, 2003). But as Italy’s integration into the global economy and, more specifically, the European Union, deepened in the 1990s, domestic reformers of skill-building institutions were able to tie their agendas to a broader perception that Italy’s political economic institutions had to be made ready to compete on the global stage.

Italy’s deepening engagement with the global economy gave a shot in the arm to would-be reformers. Comparisons with other advanced industrial countries highlighted Italy’s education and training deficiencies: “We will enter Europe with a backward scholastic system, like haughty ragamuffins, fatuously proud of the past but incapable of preparing for the future,” said one political commentator (Haberman, 1990). Would-be reformers used excitement over Italy’s planned entrance into euro zone to push for a restructuring of the university system, along the lines of an Anglo-American three degree structure, with the first university degree awarded after three years (instead of the 1990
average of 7.9 years) (see McCaffrey, 1999, Moscati, 1998). Berlusconi’s first
government made particular efforts to align university investment and research
with industry (Biggin, 2005). This reform was cheered by Confindustria, which
had long bemoaned a tertiary systems that left employers with workers who
were old and worn out before they even entered the labor market.

Professors, fearing a loss of status and an increase in teaching loads, and
the far left, wary of an increasing influence of industry on academia and
implementation of a low level degree that would hurt social mobility, resisted
the short-cycle degree. As a result, the reform was implemented haphazardly.
A 1993 devolution of financial responsibility to university rectors, rather than
budget allocation from Rome, gave universities autonomy and the ability to
respond to their local clients and labor markets and proved a more successful
reform.

By 1995, the economic motive for education and training found
champions on Italy’s political left. Romano Prodi, campaigning for the center-
left, claimed that improvements in research and in education would be his first
priority, and that a high standard of education is “the condition of survival in
this modern world. Mass education is the great public responsibility” (Lewis,
1995). Though Prodi, and subsequent center-left leaders, remained committed
to the left goals of social mobility through education, their rationale for reforms
also relied on the need for a better-skilled workforce to maintain Italy’s
economic competitiveness. At a conference exploring ‘third way’ alternatives to
neo-liberal policy, Prime Minister D’Alema argued that “skills are the highest form of social protection” (Jessup, 1999). In 2000, Parliament passed the Berlinger Reform, which raised Italy’s mandatory schooling age from 12 to 15 and merged the technical and academic streams.

Italy’s right politicians also embraced education and training as an answer to the challenges of globalization. Berlusconi’s center-right government, after taking office in 2001, began immediately implementing their skills program based on “Le Tre I” – inglese, informatica, and impresa (English, information technology, and business). In this clear attempt to orient education and training institutions toward the economy, Berlusconi disputed the value of extended study of the humanities, like ancient Greek: “Greek in high school? Two years is enough, as mental gymnastics, then it’s better to study more [modern] languages and computers. . . . We should take 900,000 school workers and train them to use computers” (Mas, 2002). Berlusconi’s education minister pushed through a reform raising the school age to 18, re-institating the divisions between technical and academic secondary education, and pushing the broad implementation of three year initial degrees at universities.

Though at the tertiary level, these reforms echoed Center-left reforms, some major differences remained between the two political wings: the right coalition’s Moratti reform retained the divisions between academic, technical, and vocational schools. Left unions opposed the changes, saying the reform
implementing a path of school/work alternance training lacked oversight and funding, at the risk of “pushing young people towards an anticipated entrance into the labor market” which could “contribute to increased social differences” in Italy (Paparella, 2005).

During Italy’s 2006 election campaign, both the incumbent (Prime Minister Berlusconi) and the challenger (eventual victor, center-left coalition leader Romano Prodi) argued for the need for education reform, but without the prominence and urgency heard in similar debates in the US and Germany. Skill and productivity issues have generally taken a back seat to fights over fixing the pension system and the need to increase market competition, including liberalizing the labor market. However, Luca Cordero di Montezemolo, the Fiat executive who led Confindustria from 2004 to 2008, argued to put skills issues front and center: “I’m looking for a country much more concentrated on the future than on the past,” he said in 2004. “We say: ’O.K., give us the possibility to make investments in infrastructure, not only roads and bridges, but also intellectual infrastructure’” (Paparella, 2005). Despite problems with implementation, which were exacerbated by alternating and unstable governments, Italian politicians have moved to respond to Italian business demand for reformed skill building institutions.

*Skills and Globalization: a micro-level Investigation*
As we have seen above, globalization spurred major debates on education and training in the US, Italy, and Germany. The rhetoric of skill building politics is remarkably similar across borders. But the skill-producing institutions are not at all the same, nor, traditionally, have been the production systems in each of the three economies. As the ‘varieties of capitalism’ research showed, skills have been conceived, created, and employed differently according to the national institutions that organize the economy in each country (Hall and Soskice, 2001, Regini, 1997, Carnoy, 1997). However, as we have just seen in the sections above on the US, Germany, and Italy, recent debates on reforming skill-building institutions to better serve domestic firms in a global economy have largely overlooked these national differences. Reform based on unproven assumptions about globalization, while perhaps good politics, may be pernicious: as Wolf writes, “The current political consensus concerning education’s contribution to economic performance has generated simplistic policies with substantial deleterious effects” (Wolf, 2003:330).

In order to assess the politics and policies of skill building reform, I suggest reframing the debate, looking at skill needs from the point of view of individual employers and trainers. Studies give us some indications of increased demands for skill under globalization, but large-N studies of national economies and local labor markets cannot explain the interaction of production strategies and skill institutions. As the Varieties of Capitalism scholars have shown (Thelen, 2004, Hall and Soskice, 2001, Estevez-Ave et al, 2001, Mares,
production strategies are deeply linked to workforce skills, and to the institutions that foster them. A close look at how firms decide on strategies will shed light on the continued impact or the waning influence of these institutions for competing in the era of global production.

In this dissertation, I examine two industrial sectors in three different countries. Textiles/apparel and information technology, the two industry cases selected, both face intense global competition and employ a considerable number of workers in the US, Germany, and Italy. Both industries rely on very highly skilled workers to conceive, design, and market new products, as well as less-skilled workers who perform rote tasks at jobs susceptible to outsourcing. However, on many other dimensions, they are quite different: textiles/apparel are manufactured goods, IT is a service; textiles/apparel is an ‘old economy’ activity whereas IT is quintessentially new; textiles and apparel firms are decreasing in size and importance as employers as IT companies expand; the barriers to entry for new producers in textile/apparel are low, while IT demands relatively high levels of education and infrastructure; textile/apparel production continues to resist mechanization at the same time IT has created and flourished under international standards, including skill standards. I chose three countries for study – Germany, Italy, and the United States –

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7 Of course, skill requirements on the low end for apparel workers, who need not always be literate, are much lower than entry-level skill requirements for IT workers.
because they are ideal-typical examples of industry-specific, firm-specific, and
general skills systems in the varieties of capitalism literature.

Both the political economy and the sociology literatures on skills suggest
that production decisions depend on available workforce skills. To ascertain
the impact of available domestic skills and domestic skill institutions on
globalization strategies, the primary method of data collection for this study
has been interviews with senior managers. As Crouch, Finegold, and Sako
demonstrated, national employment and wage statistics and international
trade statistics can tell us some things about globalization and skills (Crouch
et al, 1999), but these measures are often too crude to clarify how skilled
workers in advanced economies are being integrated into a global trading and
production system. Large N studies, for example, often characterize textiles
and apparel as low-skill industries. While production workers in the industry
often do have lower than average skills, design and marketing – a large share of
the value-added of the final goods – require high skills. To date, statistics on
value added by location of work for product groups are difficult to find. Only
detailed interviews with senior managers will reveal where along the production
chain firms have decided to outsource and/or offshore. Are different
arrangements of work, based on different assumptions about and availability of
skill, enduring in the global era? How are different types of capitalist systems

8 For a detailed list of interviewees, please see appendices.
adjusting to the exogenous shocks of globalization? Below, I preview the
findings of my study chapter by chapter.

Chapter Two Building Skills for the Industrial Age:
A Comparison of Education and Training Reforms in Germany, Italy, and the U.S

In Chapter 2, I investigate the historical origins of varying skill profiles in
three countries: Germany, Italy, and the US. These three countries, often
considered ideal types of different ‘varieties of capitalism’, have organized their
economies and supporting institutions around different skills profiles.
Building on Thelen (2004) and Martin and Swank (2004), who argue that
struggles between artisans and large employers determined national skill
profiles, I emphasize 1) the role of organized labor at the time of
industrialization and 2) the social value accorded to education and training in
institutionalizing national skills profiles.

Firms based competitive strategies on industry-specific skills (Germany),
firm-specific/tacit skills (Italy), or general skills (US). Once a predominant
skills profile became established in the workforce, workers and firms shared
incentives to support public policies and institutions that reinforced their
national profile. Many scholars have called national skills profiles “equilibria”
(Finegold and Soskice, 1988), a term which suggests that skills and production
strategies are in a natural balance. I argue that skill-building institutions were
born of political contestation and have continued to be a locus of struggle between firms, workers, and the state.

In the next three chapters of the dissertation, I turn to globalization as a de-stabilizing agent for skill-building systems, looking at these challenges from the firm’s perspective. A firm-centered analysis is important because, as Hall and Soskice wrote, firms “are the key agents of adjustment in the face of technological change or international competition whose activities aggregate into overall levels of economic performance” (Hall and Soskice, 2001). Moreover, if scholars like Campbell are right, and change in organizations precedes change in institutions, firms’ decisions will come before, and impact, meaningful reform of the training system (Campbell, 2004).

**Chapter Three: Fordism Adjusts?**

Chapter three focuses on the impact of globalization on a country with a general skills profile: the US. As is outlined in chapter two, American firms invested in expensive, fixed capital equipment that required only unskilled or semi-skilled workers. The resulting production strategy is often called Fordism. Fordist production relied on a small number of highly trained managers and engineers, plus a large number of unskilled or semi-skilled workers to mass produce undifferentiated goods. As a strategy for high-wage producers in a global age, Fordism is particularly vulnerable.
The chapter argues that existing research on adjustments to a post-Fordist era underemphasize the importance of institutional legacies, particularly of skill-building institutions, in deciding on production locations and strategies. Textile and apparel industries in the US organized production to suit their generally skilled (and generally low-skilled) workforce and flexible labor market. Using evidence from interviews, I demonstrate that firms' adjustment strategies were constrained by a typically Fordist (i.e., bifurcated and general) skill distribution. Domestic institutions facilitated moves to outsource production from the US. Where production did remain at home, an upgrade in management skills was rarely accompanied by a more robustly skilled workforce on the production floor. Fordist patterns, however, were not always replicated in new locations: US firms with distant relationships to skill-building and labor institutions at home were often more engaged with these institutions in host countries.

Chapter Four: Textiles and Apparel in Italy
Tacit Knowledge and Globalization

Chapter four focuses on the impact of globalization on a country with a firm-specific, or tacit skills profile: Italy. Unlike the US textile and apparel industry, which was built on a large, protected domestic market, economies of scale production, and low skilled labor, Italian textile and apparel firms grew to international strength with many small and medium-sized enterprises (SMEs)

That industrial district structure, set against the background of the weak Italian school system and high levels of regulation on large firms, created mechanisms for building a highly-skilled workforce outside of Italy’s formal education and national training programs. The skill-building system has been largely based on informal institutions, especially on-the-job training within firms, and geared toward imparting tacit knowledge. In the postwar era, Italian textile and apparel firms’ method of high-end, flexible production catapulted the industry to world leader, and challenged notions that the rag trade was inherently ‘backward’ (Piore and Sabel, 1984). The continued success of Italian textile and apparel firms in the cutthroat 1990s helped support the theory that tacit knowledge provides a powerful basis for competitive advantage in the global economy (Maskell and Malmberg, 1999). By the new millennium, however, Italy’s textile and apparel companies began to feel the heat from international competition, as well as the draw of low-wage production opportunities, and many firms radically altered their traditional strategies.

I argue that Italian firms’ advantage since the export boom in the 1970s has been production strategies based on tacit knowledge, most easily transferred through informal institutions or within organizations. Recent changes in Italian industry structure – both patterns of globalization that rest
on close ties to overseas suppliers and vertical integration of previously disaggregated production – are new solutions to the old coordination problem: how to build and share tacit knowledge. However, it’s far from clear that this emerging structure is stable, and can remain a base for solving the problem of skills. An over-reliance on tacit knowledge could prevent Italian firms from taking advantage of cost savings for basic inputs in low wage environments, ultimately undermining the industry’s competitiveness even in high-end niche markets.

Chapter Five: Textiles and Apparel in Germany
High-end Production, at Home or Abroad

Chapter five focuses on the impact of globalization on a country with an industry-specific skills profile: Germany. I follow the German textile and apparel industry’s adjustment to global competition. I find that German institutions, which produced a broad base of highly skilled technicians for the industry, steered firms toward a high-tech strategy. German firms maintained more managerial control over production than their competitors, even when production had been relocated to lower-wage countries. German employers had close relationships with offshore suppliers, often providing on-site technical assistance and quality control. As a result, German firms were able to leverage advantages of low-wage production but continue to compete in
high-quality markets. Though German firms shed jobs at a similar rate to their American competitors, the jobs they held were more likely to be high-skilled positions.

Germany’s edge in production, based in its strong skill-building institutions that resulted in an industry-specific skill profile, gave German firms a clear advantage in the period of intense globalization. However, in recent years, fewer apprentices have joined textile and apparel firms. Technical institutes are filled with foreign students, and overseas competitors continue to increase their know-how. How enduring Germany’s skills advantage will be remains unclear.

Chapter Six: New Skills and Old Training Institutions
IT Certification in Germany, Italy, and the USA

In Chapter Six, I shift from impact of global production and trade on national skill and market strategies to the impact of new, global technologies on national skill-building systems. Because institutions tend to evolve slowly (Hall and Taylor, 1996; Thelen, 2004; Pierson, 2004) and education and training institutions may be particularly resistant to change (Jacoby, 2000), I focus on information and communication technology (ICT) skills.

The computer revolution of the past twenty years put cheap, user-friendly, and productivity-enhancing new technologies within the reach of firms
in all advanced industrial economies. But without a sufficient number of skilled technicians to install and maintain the new machines, and without workers capable of exploiting them, these technologies were useless. Because the demand for IT skills erupted simultaneously and the technologies involved were standard around the world, the information technology boom presents a useful natural experiment for tracking the adjustment of domestic institutions under pressure from global standards. This chapter asks: how do national skill building systems accommodate increased demand for international and standard information technology skills?

Throughout advanced industrial economies, the expanded influence of multi-national corporations and cross-border production chains has led to the increasing importance of international standards. From product specifications to labor rights to IT platforms, international standards proliferate, and in many cases, regulatory power has moved from the national arena to the supra-national level. Increasingly, these international standards have teeth: they shift power to those who define them, and threaten existing players who must pay the switching costs to a new standard (Mattli and Buthe, 2003). Not only do these standards represent a shift away from national decision-making, in many cases, creating international standards puts regulatory power in private hands (Abbott and Snidal, 2001).

This case study of IT skill certifications suggests three ways domestic training institutions respond to globalization. First, I find support for the
theory that capitalist economies will adjust to common exogenous shocks, including technological change and globalization, in various ways. Though IT skills and the certification programs developed to foster them were standard internationally, American and German labor markets adopted them in different ways. Second, despite the varying configurations of investment and risk, IT certifications did force convergence in one important area: defining skill sets. Third and relatedly, the rise of IT certification programs underscores the growing importance of international, often for-profit actors. These new players included technology firms, who control the flow of information about their new products, and international trade associations, which have defined skill sets for the industry. Education and training, along with subsequent job classifications and wage distributions, have long been determined by national institutions. In the IT sector, high barriers to entry gave international actors more influence than we have previously seen in skill-building.

**Chapter Seven/ Conclusion**
As technology and trade weave the international economy into a tighter
knit, observers in academic and policy circles argue that producers in high-
wage countries can only survive by exploiting the potential of highly skilled
workers. But finding (or creating) a large number of capable workers remains a
challenge for firms. In fact, as we have seen in Chapter One, business
associations in many countries have pushed states to increase investment and
oversight of skill-building institutions. But if demands for institutional reform
are constant across the globe, skill institutions are different. In this chapter, I
investigate the historical origins of varying skill profiles in three countries:
Germany, Italy, and the US.

These three countries, often considered ideal types of different ‘varieties
of capitalism’, have organized their economies and supporting institutions
around different skills profiles. Building on Thelen (2004), who emphasizes the
struggles between groups of employers (artisans v. industry, small business v.
large employers) and the composition of organized labor in creating national
skill profiles in Germany and the US, I also analyze the history of Italian
education and training. I compare the development of skill building
institutions at two junctures: their modern inception, and in the late 1960s-
early 1970. Like Thelen, I find that skill building institutions, while
remarkably stable over time, evolved in ways that would have confounded their original architects. In addition, I argue that how skill debates were framed at the time of institutional formation continued to define the parameters of reform even after new domestic actors and international realities became salient. Below, after a brief introduction on the theory of national skill profiles, I turn to the history of skill institutions and reform in each country.

Accounting for National Skill Profiles

Economists have also long understood that skills tend to concentrate geographically, both the product and the reagent for successful firms. Marshall argued that clusters of firms in a particular industry produced a concentrated labor market of skilled workers for the industry. In such a district, Marshall wrote, “The mysteries of the trade become no mystery; but are as it were in the air,”(quoted in de Blasio and Di Addario, 2002: 7). Later, Romer advanced workforce skills as the engine of endogenous growth (1989), and others confirmed the relationship between skilled workers and higher productivity (Acemoglu and Pischke, 1999; Lynch, 1995).

Sociologists and political economists have emphasized the impact of state structures on skill development and production strategies. Maurice et al (1986) wondered what could account for within-industry wage differentials in Germany, France, and the UK. They concluded that the varying organization of production reflected the different structures of state-sponsored education and
training in each country. Streeck (1991) highlighted how Germany’s strong apprenticeship system and resultant highly-skilled workforce was at the base of ‘diversified quality production’, which allowed German firms to compete at the high quality, high price end of the market.

In recent years, scholars associated with the ‘varieties of capitalism’ school have drawn important insights from research on national skills profiles. Soskice (1988) highlighted German apprenticeship, giving the dual system credit for Germany’s ‘high skill, high wage equilibrium’. Estevez-Abe, Iversen and Soskice (2001) provide a useful framework for looking at skill creation from this perspective, proposing that production strategies are associated with three distinct skills profiles:

1) *industry specific skills*, acquired at vocational schools or through apprenticeships, and valued by employers throughout the industry (the predominant skill-type in Germany and Sweden),

2) *general skills*, earned through formal education, and valued by all employers (characteristic of the United States and Britain), and

3) *firm-specific skills*, learned on the job, and valued by the training employer but not other firms (prevalent in Italy and Japan).

Firms base strategic decisions on the dominant skill profile in their productive environment, Estevez-Abe et al suggest, and then push for social welfare protections that encourage workers to continue to invest in that skill profile. After one skill profile becomes predominant in an economy, firms and workers who prefer that type of skill will “tend to be in strong political positions, both in
terms of economic clout and sheer numbers” (Estevez-Abe et al 28). Many of these authors make bold claims about the impact of national skill profiles. Iversen and Soskice (2001) suggest “a new explanation of the welfare state based on differences in national skill profiles” (889); Cusack and Iversen (2007) suggest national skill profiles determined electoral systems (countries with industry-specific skill profiles chose proportional representation, while general-skills profile nations enacted first past the post systems).

At base, the varieties of capitalism literature understands skill-building institutions as bargains that spread the risks and costs of training in order to encourage the various parties to participate. Each national system can be seen as a different equilibrium. The German dual system of education and training, for example, binds participants in a national certification system. Because apprentice certificates are highly valued by external employers, apprentices have a strong incentive to complete their training. Knowing that young workers will stay to the end of their contracts makes early investments in their skills rational for employers. For both workers and firms, previous investments in the skills – time and energy spent attaining certification by workers, and decisions on production and market strategies that require highly skilled workers by firms – encouraged continued support of the system. In the United States, where firms have no similar holds over trainees, employers are relieved of the risk of depending on skilled labor by adopting business strategies that depend on general skills. Workers, in turn, pursue general
education and skills training to equip themselves for a volatile labor market. The Italian case has been less studied by varieties of capitalism authors, and the mechanism for skill building in Italy is less understood (see Marino, 1996). Estevez-Abe et al classify the Italian case as an example of a firm-specific skill profile. In this ideal-type, legal or social prohibitions against firing workers lead to long job tenure, and therefore bind workers and firms to make absorbing the cost in-firm training rational for employers.

Yet, as these authors admit, their theoretical framework does not account for the origin of the various skill profiles or the institutions that produce them. And though Estevez-Abe et al briefly suggest a mechanism by which the profiles will endure, their conception of these institutions is largely static and apolitical. Against this determinist and functionalist view of skill profiles, Thelen (2004) presents a nuanced history, arguing that skill-building institutions (so resilient that they appear to be 'locked in') actually depend on “active political renegotiation and heavy does of institutional adaptation, in order to bring institutions inherited from the past into line with changes in the social and political context” (8). In the country sections below, I draw on Thelen’s analysis, and particularly her insight that the intentions on institution-builders were often at odds with longer term their results. I also find that the national ideas about education used to legitimate the creation of national skill building institutions were particularly persistent.
EMPLOYERS AND SKILL BUILDING IN GERMANY

As various attempts to import German-style training systems have demonstrated, the German dual system of education is easier to emulate than imitate. The key feature of the dual system – that the majority of German youths spend half their training time involved in production at actual firms – required a high level of involvement from employers based on a long history of fruitful collaboration and has proven near-impossible to build from scratch even with strong state support (see Jacoby and Locke 1995). Indeed, two of the pillars of the German apprenticeship system were already in place in the pre-industrial era: a vocational mindset for education, which legitimated a public training system controlled by employers, and a strong artisan sector, with its economic and political strength integrally tied to its role in skill formation and certification.

Where other liberal traditions encouraged the study of classics, theology, or natural sciences, German philosophy and theology supported practical, work-based learning. Martin Luther preached that all occupations were opportunities for God’s work: “Each should remain in the trade (Beruf) to which he is called. . . . God is not concerned with the type of work but with obedience” (quoted in Taylor, 1981: 9-10). Weber later compared the German concept of occupation, or Beruf, to a spiritual vocation:
Now it is unmistakable that even in the German work *Beruf*, and perhaps still more clearly in the English word *calling*, a religious conception, that of a task set by God is at least suggested (Quoted in Taylor, 1981:9).

The cultural concept of *Beruf*, which implies acceptance of the paternal structure of the apprenticeship system, became an important legitimating factor of the dual system in later years.

The second pillar of apprenticeship, strong guilds, enabled apprenticeship to flourish in Germany as the system broke down in other proto-capitalist societies like Britain (Thelen and Kume, 2002: 204). In the pre-industrial era, Germany's guilds regulated training, and artisanal masters had a monopoly on training (Hansen, 1997:23). Though many artisan shops were traditional and small, according to Herrigel, guilds in industrial districts were the first to see the limits of on-the-job training under a single master (52). As early as the 1830s, master craftsmen (occasionally with support from large industrial employers) established and financed 'continuation schools', where apprentices received additional technical training after work hours or on Sundays. Some continuation schools were technically oriented, but most were established to fill a perceived gap in character education (Greinert, 1994).

In the 1860s, artisans' control of training was challenged by a series of liberal reforms, particularly an 1869 law that deregulated training, allowing whoever wanted to set up a workshop and take on apprentices. Despite the government's liberal turn, voluntary guilds survived, and masters continued to train. The system of training hit a major setback when the German economy
spun into depression in 1873. Artisans, who had been mostly responsible for organizing and funding continuing schools and for certifying craft training, struggled particularly hard and many small shops folded: in 1875, 60.23% of trade or industrial workers was employed by a firm with five or fewer employees, a number that fell to 39.87% in 1895 (Greinert, 1994: 23).

At the same time, the expanding large industry sector in Germany continued to absorb apprentices trained by artisans, but also employed an increasing number of low-skilled workers for automated processes. Poaching – where large firms hired apprentices after they had acquired skills but before their masters had realized any return in training investment – grew. A series of laws intended to shore up the artisan class, including the 1881 “Voluntary Guilds Law” that reestablished guilds’ authority over apprenticeship, culminated in the 1897 “Handicraft Protection Law”. Under this directive, artisans were compelled to join newly established Handswekskammern, or Handicraft Chambers, which would exist alongside the voluntary guilds and have authority over the apprentice system (Thelen, 2004: 44). Only experienced journeymen over the age of 24 would be allowed to take on apprentices. Chambers could regulate the number of apprentices master could assume, evaluate trainees via a Chamber examination, and revoke the training privileges of substandard masters (ibid). In addition, attendance at a part-time continuation school was made mandatory for apprentices. Crucially, the new Chambers were given a monopoly on organizing school-based instruction
and granting certificates to apprentices who had successfully completed their training (Greinert, 1994).

As Thelen (2004), Hansen (1997), and Greinert (1994) all note, the impetus for this reform based in politics, not skill demands. The decline of middle-class artisans in the 1870s led many to organize politically, founding the Association of Independent Craftsmen and Manufacturers in 1873, and to demand protection for artisans and their guilds. At the General German Assembly of Craftsmen in 1882, a majority favored mandatory guild membership and certificates of competence, which would restrict the operation of artisan firms to certified master craftsman. Though German governments in the 1870s rejected craft protection in favor of promoting industrial growth, by the 1880s, organized block of craftsmen voters proved enticing to several political parties: “The German Conservative Party was the first to react to the demands of the craft trade representatives, sensing an opportunity to rally voters from the commercial middle class in times of social and economic crisis,” and support for craftsmen protection soon came from the Center Party and the National Liberals as well (Greinert, 1994: 25-6). In addition to propping up the middle class, mandating attendance at continuing school was intended to quash “the aspirations of the rapidly developing Socialist movement” (Taylor, 1981: 16). Social conservatives worried about youth crime and the disproportionate involvement of the young in protests like the 1889 miners’ strike (Greinert, 1994: 32).
Continuation schools did not focus on new technical skills either before or after attendance was made compulsory. Most curriculums were general: “instruction consisted of repetition of subjects taught in the primary school together with some general knowledge and civics. . . . Few understood the importance of vocational education, particularly from a general economic standpoint” (Taylor, 1981: 16, 17). Despite this illiberal motivation for the law and its early implementation, Hansen argues that legislation was in fact heavily impacted by lobbying from guilds in Germany’s southwest, and planted seeds for knowledge-sharing and technical education (1997:45).

At the time of 1897 vocational education reform, large industry’s main interest, was, for the most part, to stay out of it. The Chambers of Commerce and Industry balked at a version of the bill that would have defined apprentices based on age, placing on them the burden to train all their young workers. The provision was removed from the bill, just one indication, according to Greinert, that industry, “the most important economic sector in Germany had no intention of accepting this emergent training model” (40). Indeed, according to the National Association of German Industrialists, as late as 1918 their factories employed “mostly young workers, and not apprentices” (quoted in Greinert, 1994: 39). These young people were primarily used as unskilled, low-paid labor, and training both on and off the job was minimal.

The most advanced industrial firms generally trained their skilled workers outside of the Chamber-regulated apprenticeship system, often setting up
private vocational schools at the plant (Greinert, 48-49). Only in the 1920s and 1930s, after straining under the cost of company schools, did large industry push against artisans’ monopoly on skill certification. Having consolidated its hold on the economy and with the backing of the government, the Chambers of Commerce and Industry gained equal footing with craftsmen in the organization and administration of the dual system (Greinert, 1994:44). By this time, according to some analysts, vocational education in Germany was indelibly influenced by work-based pedagogy and craft traditions (Dougherty, 1987).

Though the impetus behind the 1897 law was to shore up traditional artisans, its longer term impact on German industry was profound. As we will discuss in greater detail in Chapter Five of this dissertation, the willingness of so many workers to invest in higher-level industrial skills fueled a German production system hallmarked by quality and differentiated products (Finegold, 1988, Hall and Sosckice, 2001, Culpepper, 1999).

Skills for the Postwar Boom and the Reform of 1969

As employers implemented high quality, craft-based production strategies and workers enjoyed the benefits of apprenticeship certifications, the dual system formally established in 1897 proved surprisingly resilient (see Jacoby, 2000). During the occupation period, US and British officials tried to reform the education and training system with a greater emphasis on common
schooling. The occupation forces, together with many German Social Democrats, feared that the dual system bred conformity and obedience rather than discernment and a democratic spirit. In spite of determined pressure to reform along Anglo-American, general-schooling lines, the German system of early student sorting into academic and vocational tracks held.

German conservatives argued – ultimately successfully – that the dual system was not only an integral feature of German culture, its proven success at creating trained workers would be vital for Germany’s economic recovery. Business associations backed conservatives and thwarted reform. The Chamber of Commerce and Industry in Wiesbaden, for example, came out against a proposal to increase school-based training in civics and other general subjects. The Chamber maintained that any decrease in in-firm training would jeopardize Germany’s ability to continue to produce highly-skilled workers (Taylor, 1981: 106). In fact, throughout the postwar boom, German industry showed little interest in reforming a system that produced cheap (apprentice) labor in the short run, and a highly skilled and compliant workforce over the longer term. Employers who worried about a tight market for skilled labor often moved to reduce their risk to fluctuations in the labor market by introducing American-style automation rather (Taylor, 155), but even as large industry increased automation in the 1950s, German firms retained a higher percentage of skilled workers than similar firms in other countries (Herrigel, 1996:227).
But the booming postwar economy re-opened the dual-system debate in unions, government, and political parties. Large scale retirements of artisans trained before World War I, heavy losses in the generation that came of age during World War II, army needs for manpower during the Cold War, and a diminishing number of refugees from the east all resulted in a shortage of skilled workers and in unfilled apprentice slots (Greniert, 1991). Government feared the lack of skilled workers would rein in economic expansion, and called on industry to improve vocational training. Small craft enterprises began to decline in the mid-1950s, and the quality of their training came under attack:

For a long time, [the traditional craft trade training model] had remained virtually unaffected by developments in technology and modern training methods, i.e., qualification levels and the teaching of knowledge and skills retained much of their traditional character: learning was based on experience gained directly in the course of performing work (Greinert, 1991: 43).

Worry about the adequacy of training grew in the general public. A series of articles in the popular magazine Stern depicted training standards as erratic, and the quality of training in the handicraft sector as particularly woeful (Taylor, 1981:195). A federal commission set up to review education and training, the Deutscher Ausschuss für das Erziehungs-und Bildungswesen (DAEB) agreed that rapid technological advances, together with increased labor mobility, required workers with a more profound technical understanding and greater individual responsibility. Though craft trainers staunchly defended their methods and track records, public faith the vocational training system
was shaken. Prominent public intellectuals, like Professor Schlesky of the University of Hamburg Sociology Department, believed that training in the use of technology would be more important for continued economic success than training in a particular trade. Others warned of a shortage of highly-skilled technicians and engineers, particularly in relation to the Soviet Union (Taylor, 157, 161).

In this climate, unions – who had first called for a radical restructuring of the vocational education in 1919 – stepped up their demands for reform. Charging that the dual system trained 90% of German youth, with limited state oversight and no input from workers, unions demanded a radical restructuring, including: guaranteed, legally determined training standards, joint worker/firm oversight of training and certification exams, the establishment of state-run vocational schools not under the control of industry, the transfer of oversight for vocational training from the Economics Ministry to the Ministry of Labor, and an increased emphasis on basic and theoretical education. These proposals won support from vocational education teachers, who also believed that firms had too much control of the training system (Greinert, 1994).

Political parties, from the conservative Christian Democrats (CDU) to the Social Democratic Party (SPD), also seemed to see a need for greater state oversight of the industrial training system. A coalition of leading employer associations successfully blocked the introduction of reform legislation in
1962, claiming that bureaucratic control of the vocational system would ossify training structures (Taylor, 1981:183). But after the SDP entered a coalition government with the Christian Democrats in 1965, industry could no longer derail the coalition for reform. During the summer of 1969, the Bundstag passed and the Bundesrat ratified the Vocational Training Act. In stripping sole control for occupational certification from employers, the law was a major victory for unions and progressives.

Before 1969, firms organized the apprenticeship system with little outside input. The new law opened up the system considerably. First, the 1969 Vocational Training Act established a federal advisory committee for vocational training, comprised of six representatives each from industry and unions and five from the Lander, and set up a federal vocational training research institute. Second, employers were now required by law to hire capable instructors and to train according to federal government standards. Third and perhaps most important, the 1969 law stripped firms of their monopoly on skills certification. Instead of an employer-only examination board, the skills certification committees would include equal representation from workers and firms. Employers retained a veto over financial allocations.

The postwar boom in Germany created a climate that, together with the rising power of German labor, allowed reform of the vocational education system. As Thelen argues, the coalition supporting Germany’s training system had radically changed since its inception in 1897: large industry was left out
of the original reform, and organized labor opposed it (2004:7). Yet by the turn of the 20th century, large employers were important supporters and unions became the dual system’s greatest champions. The dual system had evolved, but the fundamental assumptions of the 1897 law – that the proper location for vocational training was the firm, that employers rightly maintained broad latitude to set curricula and to mold worker skills and attitudes, that the central purpose of training was socialization into a ‘beruf’ or vocation – were unchanged.

**American Education and Training**

As an aspiring democracy from its inception, the tradition of pre-industrial skill building in the US emphasized the importance of educating future voters. Early proponents of publicly-funded education, like Horace Mann, saw schools as part of a grand socio-political experiment: “The genius of Mann’s design, and the hub of a built-in dynamism that has characterized American education ever since, was the vesting of political control in the people” (Cremin, 1961: 10). Unlike in Germany, where continued schooling and economic activity were seen to serve the same purpose – the training of workers – most early education advocates in the United States believed vocational training to be only “peripherally related” to education’s main goal: good citizenship (Kliebard, 1986: 11). Shortly before he was named US Commissioner of Education,
William Torrey Harris chaired a committee of the National Education Association in 1889 on pedagogy. His report acknowledged that a great majority of children are destined to earn their living by manual labor. . . . [Because they face] a life of drudgery, [their education should be] devoted to spiritual growth, to training the intellect and the will, and to building the basis for a larger humanity (quoted in Kliebard, 1986: 11).

By the late 1800s, however, as the pace of industrialization in the United States increased, both employers and educators began to challenge the traditional separation of work and the school in the US. Reformers railed against traditional academic curricula that were impractical and far removed from the experience of the working class. Recitations and grammar drills, early educational progressives reported, drove immigrant children from schoolroom to factory in droves (Hansen, 1997).

Prominent educators, who became known as the 'progressive' school, aimed to bring vocations into American education. MIT President John Runkle, inspired by a Russian exhibit of miniature tools for training at the 1876 World’s Fair, became convinced that classroom-based instruction would be the best way to quickly train the skilled workforce for the new industrial economy. Runkle set up a School of Mechanical Arts, for students who sought technical training for industry rather than the scientific engineering curriculum offered at MIT, and became an enthusiastic and public supporter for vocational education in American schools (Kliebard, 1986:3-5). US employers were less enthralled with Runkle’s Russian system. Instead, they looked longingly at the
quality of Germany’s manufactured goods and then to the skills the German workforce. In 1898, the National Association of Manufacturers (NAM) sent a delegation to Germany to observe the emerging dual system. NAM president Theodore C. Search wrote that year

There is hardly any work we can do or any expenditures we can make that will yield so large a return to our industries as would come from the establishment of educational institutions which would give us skilled hands and trained minds for the conduct of our industries and our commerce (quoted in Kliebard, 1986: 29).

Several American firms set up company-based schools for their young workers, and others sponsored off-site training schools (Hansen, 1997, Chapter 5). However, most employers found private and company schools “too costly and cumbersome”; NAM shifted its focus from independent trade schools to public education and began to lobby for federal aid for training (Kliebard, 1986: 32).

In 1912, NAM proposed that a dual system be established in the US. They envisioned a minimum of five hours of instruction for 14-16 year old workers, during which employers would pay student’s wages “to make an industrial worker who is a good citizen, wise to his rights and obligation” (quoted in Kliebard, 1986: 32). But adopting a German-style system would require US employers to clear several hurdles.

First, the US economy lacked the artisan sector on which the German system was based (Thelen, 2004: 178). Though many craft-based firms were displaced by the rise of large industry in Germany, the most vibrant artisan shops survived and actually continued to train a disproportionate share of
skilled workers (Dougherty, 1987:172; see also Herrigel, 1996, and Hansen, 1997). In the US, the immature artisan sector never had the economic or political power of its German counterparts, and as we will discuss in detail in Chapter Three, craft-based skilled work was often completely displaced by automated production (see also Thelen, 2004 and Hansen, 1997).

Second, while the US did not have a large artisan class, the democracy did have an increasingly powerful working class: during the period of 1897 to 1904, union membership grew from 447,000 to 2,072,700. American unions were largely hostile toward apprenticeship, which they viewed as an employer scheme to underpay workers. Unions were similarly wary of trade schools, fearing that industrial trainees would supply be used by employers as 'scabs' and undermine union power (Kliebard, 1986: 34). Skilled workers, under attack on one side by increasing automation and de-skilling in US manufacturing, would not willingly relinquish power over the training system to management. At the height of labor-management tension at the McCormick plant in 1885, for example, management installed new molding technology, fired the existing workforce, and hired unskilled workers to man the machines (Kleibard, 1986:3). Thelen (2004) argues that US unions sought to manipulate the supply of skills by imposing restrictions on apprenticeship training, especially on the numbers of workers being trained . . . . This dynamic intensified competition for (and poaching of) skilled labor among firms which (a la Becker) further reduced firm incentives to train and pushed them instead toward strategies that minimized their dependence on skill (21).
As the substitution of technology for talent became the typical response of US industry to demands from skilled workers, workers grew increasingly wary of industry-controlled training. Workers, who in the United States were accustomed to a potential for social mobility, also feared that a vocational education track would relegate their children to a second-tier, inferior schools (Hansen, 1997).

Third, unlike in Germany, educators in the US were a powerful group, independent of business interest (Hansen, 1997, Chapter Six). ‘Progressivism’, which stressed that education relate directly to a student’s life and circumstances, was the dominant educational philosophy of the day, and many prominent educationists were members of the National Society for the Promotion of Industrial Education (Ravitch, 2000). But these educators had a philosophical and a practical problem with industry-based education and training. Philosophically, educators were uneasy with the socially conservative German system, which emphasized obedience and allowed for little social mobility. Thinkers like John Dewey and his followers believed in practical education as a means to empower students, not as a mechanism replicating existing economic and social conventions. Giving employers disproportionate power over vocational education violated the democratic spirit of progressivism. Practically, an industry-based system would cut out educators. NAM’s 1909 proposal for a national training reform included a stipulation that instructors be tradesmen, not professional educators – not a suggestion likely to sit well
with teachers and education academics who were fighting to gain professional status (Cremin, 1988).

Industry and progressive educators were willing to compromise, however, and seemed likely to win major reforms in vocational training (Cremin, 1988). Pragmatically, union leader Samuel Gompers joined the National Society for the Promotion of Industrial Education in 1909. Eventually, this grand coalition of industry, unions, and educators helped shepherd the Smith-Hughes Act of 1917, which provided federal funding for vocational training in public schools. Employers, who had fought long and hard for the legislation, actually got little of what they had originally wanted: no in-firm training, no independent trade schools, no management oversight of curricula or assessment (Hansen, 1997, see also Cremin, 1988). In addition, employers seemed to have little use for the skills the new vocational education imparted: one study in 1928 showed that young workers with Smith-Hughes training were less likely than their peers to find appropriate employment (CITE NEEDED). Unions succeeded in keeping public training funds out of employers’ hands. In the long run, however, workers suffered as their children were directed into inferior vocational education that was only loosely tied to the labor market.

Indeed, the Smith-Hughes Act and the broader project of vocational training in America was widely regarded as a failure (Cremin, 1988, Hansen, 1997, Kleibard, 1986). Without ties to industry and the market, curricula tended to focus on outdated technology and very basic skills. Vocational
programs were placed within ‘comprehensive’ schools, which featured university prep courses, and were taught by professional educators rather than industry and workers. Though this structure was a demand of union leaders who feared that separate schools would relegate the children of workers to second-class, subservient schools, the comprehensive school system in fact relegated vocational students to second class citizenship in academically oriented institutions (Hansen, 1997). Though fewer than 30% of high school students ultimately pursued university education, the system was geared toward them. The vast majority of students left school unprepared for college and poorly prepared for anything but unskilled work (Hansen, 1997, Cremin, 1986, Ravitch, 2000).

In the Shadow of Sputnik: The Defense Education Act, 1959 and the 1963 Vocational Education Act

In the early 20th century, when US firms adopted Fordist production strategies, which required an elite corps of engineer/managers and a mass of unskilled workers, the poorly performing education and training system seemed adequate for the economy. But in the 1950s, the Cold War pushed education and training into the spotlight. Published in 1955 and reprinted as a serial in many local newspapers, Rudolf Flesch’s Why Johnny Can’t Read launched a national debate on the literacy skills, or lack thereof, of American children (Ravitch, 2000: 357). Newspapers like the Detroit Free Press published interviews with personnel managers “from major corporations who
declared the [high school] diploma practically worthless because of the schools' 'cafeteria-style' education and low standards" (quoted in Angus and Mirel, 1999: 108). Life Magazine ran a series called "Crisis in Education" that compared the rigorous training in Soviet schools with the comparatively light fare at American high schools.

According to Lazerson and Marvin (1974), the main criticism of the education and training systems in the 1950s were

- first, that they were purveyors of questionable loyalty. . . and insufficiently patriotic, and second, that academic standards, particularly in math and science, were too low to meet the demands of technological economy and modern defense (31).

Business and educators all talked about the new economy as "a prodigious advance that quickly outmoded earlier notions of vocational education" (Cremin, 1988: 351).

Though the rhetoric about the need for skilled workers centered on the economy, this 'crisis' in education was almost entirely political in origin. The launch of Sputnik by the Soviets in 1957 intensified the debate, and the criticism of existing educational structures. Hyman Rickover, a vice admiral of US navy and head of atomic submarine program, began to tour the country stricter educational standards and expanded opportunities for the most gifted: "Talented children are this nation's reservoir of brain power. We have neglected them too long" (quoted in Angus and Mirel, 1999: 110). Rickover called for 'European-style education' with separate schools for the college-
bound and those headed to the factories. Critics attacked Rickover as elitist, and anti-American, and his proposals a betrayal of the American tradition of common schooling. In fact, Angus and Mirel argue, Rickover served as the perfect foil for educators who defended the American comprehensive school, where vocational and academic tracks were housed in the same building (1999: 112). Only in “democracy’s high school”, one critic argued, were students free to choose their curricular path, which guaranteed “equality of opportunity”, and, because students from many backgrounds would attend the same institution, all would be guaranteed “equality of status” (quoted in Angus and Mirel, 113).

Rather than reform secondary education, the main reform of the 1950s aimed to draw more students into university study. Congress passed the National Defense Education (NDE) Act in 1958 “to increase our efforts to identify and educate more of the talent of our nation”. The NDEA earmarked up to $90 million by 1960 for individual grants and loans for university expenses, and, in an amendment $15 million annually for advanced technical training in high schools (ibid).

Given that the 1950s demand for more highly skilled workers came more from government than industry, it is unsurprising that industry was a minor player in this debate. Though employers often complained of poorly skilled workers, managers at this time continued to compensate for lack of skills with machines. Fordist strategies required a small staff of talented managers and
engineers, and a large pool of semi- or un-skilled workers. In fact, in a policy report issued in 1971, NAM supported grants and loans for talented low-income students, but opposed general tuition subsidies as an inefficient, middle-class benefit, and the benefits of low-cost tuition to society were “demonstrably weak” (NAM, 1971).

STATE EDUCATION IN ITALY

If in Germany education was oriented toward the economy, and in the US public schools were meant to foster democratic citizenship, in Italy, formal instruction was organized by and for the state. Elementary education aimed to socialize loyal subjects, while technical and other secondary education produced competent and trustworthy functionaries.

In Italy, mandatory primary education roughly coincided with national unification. Revolutionaries had brought the pieces of Italy together, and politicians hoped a national language and culture, learned in public schools, would be the nation’s glue. The architect’s of Italy education and training system believed that “for the new state to put down roots and to strengthen its authority, it was necessary to extend primary education, and above all, to develop the secondary and higher schools, which were the only ones capable of

9 This legislation required local authorities to organize and fund schools, as well as enforce attendance laws. In practice, universal attendance often came later, particularly in Southern Italy where attendance enforcement was spotty throughout the 20th century (Barbagli, 1982).
providing a body of competent and ideologically trustworthy functionaries” (Barbagli, 1982: 8).

Curricula in technical middle and secondary schools centered on industrial and professional education, but even these schools concentrated on preparing students for the bureaucracy or the university studies rather than for employment in the private sector. Because the education and training system was geared toward the public labor market, some employers complained that workers with appropriate skills weren’t being trained in Italy at all:

While the Italian born and talented factory manager is not absent and there is no want of the expert engineer graduated from one of our advanced technical schools, to find skilled foremen one must usually look abroad, or at least our own leave much to be desired. ... There is a shortage in Italy of schools for artisans, schools directed at those who, once having learned to read, write and do arithmetic, intend to devote themselves to a skill (City Council of Biella, quoted in Barbagli, 1982: page 57).

As we will detail in Chapter Four of this dissertation, most private employers in Italy dealt with skill shortages via informal on-the-job training. As factories grew in number and sophistication, some groups of employers established local trade schools, occasionally with support from local government or private funds. However, unlike the continuation schools in Germany (which became part of a legally sanctioned process to certify worker skills), early vocational schools in Italy were left in local hands, and understood as idiosyncratic or ‘one-off’ in nature (see Hazon, 1991: 10).
The Gentile Reform of 1923

Despite rapid industrialization during the ‘Great Leap’ of 1896-1913, Italy’s education and training system continued to produce more technicians and professionals than the labor market could absorb. The ‘educated unemployed’ – holders of university degrees and secondary school diplomas, including technical certifications – pressured the government for jobs, and Italy’s bloated bureaucracy continued to grow. The Gentile Reform, passed by Mussolini’s regime in 1923, aimed to deal with the problem of ‘educated unemployment’ by dampening the opportunities for social mobility via education.

Before 1923, some technical and vocational students were able to continue their educations at the university level. Unlike the US and German reforms in the 20th Century, which at least purported to expand the state-supported possibilities for workers to acquire skills, Gentile quite clearly aimed to dampen demand for education and training throughout the Italian public system:

To the somewhat irate question, “How will we find employment for all the students?” I answer: Positions need not be found for all. Let me explain myself. The reform aims exactly at this: to reduce the scholastic population. . . . A little while ago I read in a newspaper the statistical news: in three years 1,500 engineers received the laurea (university degree) in Milan. What will they have to do, and where can they find work? . . . Naturally, the exorbitant number only puts pressure on the public administrations for finding jobs, in whatever manner. Now, one of the fundamental criteria of my reform aims directly at avoiding such pernicious defects (Gentile, quoted in Barbagli, 1982: 131).
In addition to protecting the state from irate job-seekers, the Gentile reform aimed to reward two professional classes that had supported Mussolini: the elementary teachers and the engineers/technicians. Though teachers would naturally look to the public system for employment, engineers and technicians should have had other opportunities, given the recent rapid expansion of Italy’s industry. However, prospects were indeed bleak for most engineers and technicians in the private sector, where certified technicians had difficulty finding work as laborers, and keenly felt the sting of de-professionalization (Barbagli, 1982).

Italy’s ‘educated unemployment’ during the early industrial period could be seen as evidence of a profound mismatch in the quantity of skills produced by the state education and training system and demanded by industry, but it is perhaps more accurately understood as a testament to a mismatch in the type of skills demanded. During this time, certainly, some of the districts that would become the ‘third Italy’ were evolving into local economies based on highly-skilled labor (see Chapter Four of this dissertation). Outside of Italy’s productive band, however, the extensive employment of child labor, persistent migration of rural workers to industrial areas, and the large percentage of small and medium sized firms with limited mechanization were “clear indicators of the low level of qualification required by the new work positions created by industry” in this period (Barbagli, 1982: 76).
Though low level professionals and technicians tried to increase demand for their labor in industry and the bureaucracy (with mixed results), through the Gentile Reform they succeeded in limiting supply. By cutting off the avenues open to the working class to obtain technical and professional qualifications, this class of workers managed to protect their advantage in the public sector labor market.

Reforms in the 1960s: Optimistic Projections and Open Admission

In the 1950s, the same skill-shortage/education crisis debate that saturated media in Germany and the US flourished in Italy. Despite continued high unemployment of technical school graduates, press, radio, and television reports focused attention on the state of the education and training system and its ability to supply competent workers for Italy's rapidly developing economy (Lombard, 2000:21). In 1961, a study by SVMEZ, an influential, quasi-governmental research institute, stoked this discussion by predicting "a growing inadequacy in the offer of highly qualified labor which would hold back the process of economic development itself" (Moscati and Pugliese, 1996: 119).

Italy's industrial sector did not seem to share this fear. At a 1959 conference on education and industry, the president of Confindustria, Italy's employer organization, stressed the need for character education, not vocational or academic instruction:
When we consider children who enter the world of work between 14 and 16 years of age, what industry requires of them on the strictly professional level is very little. Specifically professional knowledge can and often must be acquired later. . . . What industry requires of the school is above all the formation of character and development of the sense of personality, of the spirit of observation, of the critical sentiment and the capacity to judge the relative importance of actions and things. . . . Tidiness, order, discipline are indispensable elements (quoted in Barbagli, 1982: 308).

If any workers were in short supply on the labor market during the 1950s, they were “qualified and specialized workers” with industrial and craft skills in the rapidly growing third Italy (Lombard, 2000: 27). However, with the Italian education and training system focused on public labor markets, these skills were traditionally acquired on the job, or at local trade schools, outside the influence or oversight of the state, and with minimal state support (Catalano et al, 1987: 7-8).

SVMEZ’s forecast of lack of skilled labor became a public concern for employers, and business associations from Como to Lecco to Venice held public meetings to discuss the problem. Industry, however, did not look to the government for any radical changes in the national system of training and education. For unions, however, the SVIMEZ debate was an opportunity. The lower middle class technical school graduates, who had been blocked since the Gentile reform from higher education, wanted access to universities and the promise of social mobility and economic advancement (Barbagli, 1986). The perception of a ‘crisis’ of educated labor helped the Socialist and Communist representatives of this class broaden university admission in 1962 to certain
technical school graduates. Confindustria's president was in favor of the reform: Opening universities would introduce an avenue of mobility for the working classes, thus easing the pressure for more radical redistribution, and simultaneously direct some students who would have pursued academic secondary education into technical schools, thereby increasing the supply of technicians (Barbagli, 1986: 315).

In 1969, the Italian government broadened the 1962 reform, allowing all secondary school graduates university access. The following year, workers were guaranteed 150 hours of paid leave for training annually (Hazon, 1991). However, these reforms were a response to the massive student and worker demonstrations in 1968, not economic demands, and the reform did little to bring the Italian public education and training system any closer to the economy.

CONCLUSION

This chapter examined the origin of three national systems of education and training, and their resilience in face of reform movements after the postwar economic expansions. The predictions of varieties of capitalism theories held: during the postwar boom, employers in Germany largely managed to maintain ultimate control of the vocational training system that created the skilled workers at the base of their production strategy, US employers continued to ignore the production skills of workers and adopt Fordist strategies, and Italian
employers held onto their mistrust of the national government and state education systems, remaining focused on in-firm or local skill building institutions.

Employers’ beliefs about the goals of education and about the coming industrial order help to explain skill building debates and reforms. In the 1950s, many politicians and pundits believed that the economic order was undergoing a drastic structural shift. Business leaders, on the other hand, seemed less convinced that the postwar boom would require a radical re-thinking of production strategy. As a result, they by and large resisted radical change (in the case of Germany) or declined to become major players in the debate (in Italy and the US). But detailed in the introduction to this dissertation, the most recent boom and educational crisis, centered on globalization and the ITC revolution, has encouraged employers’ engagement. This suggests that the current debate may be of economic rather than political origin. Employers seem to believe in a major shift in their demand for skilled workers is underway, and have expended much time and some political capital on efforts to reform the skill-building system. A systematic comparison of employer preferences and strategies across the three country cases is in order.
Chapter Three
Fordism Adjusts? The US Story

From its earliest days, skill building systems in the United States privileged general skills and academic education over vocational training and firm-specific skills. As we saw in the previous chapter, this bias for general skills was underscored by strong union opposition to firm-based training. Employers embraced technology that would diminish their reliance on skilled workers (Thelen, 2004), and eventually ensured the institutionalization of a school-based vocational training system within comprehensive, academically-oriented schools.

By the middle of the twentieth century, the US skill building system both fueled Fordism and was a product of the low skill, mass production system. As a rule, employers organized their plants with expectations of high labor turnover and low labor skills, to maximize capital efficiency. The textile and garment industries followed this pattern, as firms’ strategies emphasized low wages and mass production. By the 1970s, however, scholars began to question Fordism’s sustainability. In the 1980s and 1990s, many researchers and pundits predicted the collapse of the system, at least in traditional industries like textiles and apparel, arguing that low-skill production was no longer a viable option for rich country manufacturers. Less clear in this research, however, was how managers would react to the collapse of Fordism,
and what skill set firms would need to implement new production strategies. This chapter asks: to face increasingly global competition, what skills do American textile and apparel firms demand? How are these demands shaped by legacies of Fordist production?

This chapter proceeds as follows. First, I discuss existing theory and research on transitions from Fordist to post-Fordist production regimes, arguing that scholars tend to overlook the central variable in a firm’s strategy: its skill base. Next, I provide a brief overview of the textile and apparel industries, highlighting skill development and training institutions for the sectors, and present the challenge posed by globalization. In Section 4, I discuss the strategies of adjustment of US apparel producers, and the institutional responses, followed by, in Section 5, a discussion of textiles. I then look at the organized political and institutional responses to globalization, and conclude with implications from the textile/apparel case for the debate on post-Fordism.

Theory: Post-Fordism?

Fordism, a production system for producing mass amounts of standardized goods, was designed to free employers from the need for skilled workers by breaking down jobs into small semi-skilled or unskilled tasks. In fact, as we saw in Chapter 2 of this dissertation, US employers in the early
1900s adopted Fordist/Taylorist methods specifically to de-skill their workforces by embodying knowledge in machines, thus undermining the strength of craft workers (see Thelen, 2004). In large part, Fordist employers avoided dependence on skilled workers, and eventually entered a political bargain to share with (largely-low skilled) workers some of the gains of their new productivity.\(^\text{10}\)

Globalization threw a wrench into this bargain. Once rich country producers lost protected access to home markets and developing country firms gained access to efficient capital equipment, Fordist production strategies became vulnerable to competition from low-wage producers. Three sets of arguments have emerged, that predicted: 1) a hollowing out of all formerly Fordist production, as rich country producers abandon 'low skill' product markets, 2) an upgrading/transforming of Fordist enterprises, as employers adopt flexible specialization strategies, and 3) a disaggregation of production, as lead firms stretch production across firm and geographic boundaries. Each set of theories, which I discuss in turn below, is based on assumptions of skill embodied in *products*, arguing that the characteristics of products will determine Fordist producers’ adjustments to a global era. This assumption is partly true, and each group of theories has managed to predict (to varying

\(^\text{10}\) Many textile and apparel firms avoided unionization; textile firms often relocated to the US South, where protections for labor were weak, and apparel firms hired undocumented immigrants who proved difficult for unions to organize. Wages in both sectors were low compared to other production worker wages in manufacturing, but relatively high compared to low-skill retail and service wages (Abernathy et al, 2000).
degrees) some attempts to adjust. However, as I will argue, for the US textile and apparel sectors, each of these theories underestimates the impact of the skill structure in the workforce in determining adjustment.

Since the American textile and apparel industries were based on low skill, captive market, and large batch strategies, in the 1990s many scholars and industry observers predicted that production at home was doomed (Crouch et al, 1999, Rodrik, 1997). The onslaught new producers in the 1980s induced ‘beggar thy neighbor’ strategies, where the threat of competition from developing economies put downward pressure on wages and social protections at home (Dannreuther and Petit, 2006. Despite restructuring (with workers bearing the greatest costs), many of these researchers assumed employers were engaged in a bitter and inevitably losing battle: even aggressive cost cutting would not bring Fordist producers in line with developing country producers’ costs. Over time, textile and apparel production would move to locations, like China, that could provide a mix of low-cost labor and sufficient infrastructure.

The ‘China takes all’ prediction for a post-Fordist world is based on several assumptions. First, it assumes that the most efficient production technology is available worldwide. This, in fact, is true: textile and apparel machinery producers sell to a global market. While some powerful buyers of very new technologies may be able to negotiate limited exclusivity agreements, and many machinery buyers ‘tweak’ or customize their purchases, most textile and apparel machinery could be described as turn-key. Moreover, global
machinery manufacturers are aggressively targeting low-wage producers (interview with US textile machinery sellers). In fact, as Table 3.1 demonstrates, lower-wage countries are increasing in their share of textile production machinery.
Table 3.1: Installed Capacity of Shuttleless Looms
By Leading Countries, 2000 and 2001

<table>
<thead>
<tr>
<th>Rank</th>
<th>Rank</th>
<th>Destination</th>
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<td>16.4</td>
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Table 3.2: US Textile and Apparel Employees, 1939-2002

Figure 3.3

US Textile and Apparel Employment, 1975-2002

However, a second assumption—that textile/apparel is a low-skill sector of the economy, and therefore countries with large pools of low-skilled labor will have a comparative advantage in production— is more problematic. Crouch et al (1999), for example, report that textile workers are at the bottom of skill rankings by manufacturing sector in the United States, and near the bottom in France, Germany, Japan, Sweden, and the UK (90-94). According to this view, given the same machinery worldwide and little need for skilled labor, rich countries will not be able to compete against lower-wage producers. Indeed, as detailed in Figures 3.2 and 3.3, employment in the textiles and apparel industries has declined significantly in the past twenty years.

But understanding textiles and apparel as low-skilled sectors may be too simple. It overlooks high-quality niches and high-tech subsectors (which are important in the Italian and Germany stories, respectively). Moreover, and more to the point when discussing Fordist production strategies and globalization, categorizing the textile and apparel industries as 'low skill' is overly simple: it may allow us to see the effects of international trade, but obscures the effects of globalization in the broader sense by assuming that production is, and will remain, vertically integrated within national borders. Finally, this stream of research predicts the end of Fordism, but doesn’t elaborate on what will replace it.
While one group of researchers has focused on post-Fordism’s implications for trade, another set of researchers focused as well on its impact on domestic industries. Scholars associated with the “regulation school” argued that in a given era, the “mode of accumulation” or production was supported and sustained by a particular, and compatible, “mode of regulation”. By the late 1970s, many of these scholars began to assess the Fordist mode of accumulation as exhausted (Jessop, 1999, Dannereuther and Petit, 2006, Palan, 2006, Paul and Zeitlin, 1991). Some authors, adding to the chorus of ‘China takes all’ theories that globalization had inaugurated a race to the bottom, announced the birth of the ‘competition state’ resulting in lower protections for workers and greater inequality: “The Post-Fordist period saw not only the collapse of the Fordist compromise, but also of the collapse of that political movement and its replacement by the pro-business politics associated with the competition State” (Palan, 2006). Pro-business politics threatened to erode social and wage protections for workers in rich countries. Other regulation school theorists saw opportunity in Fordism’s collapse: “The post-Fordist thesis can be expressed as a sea change from direct control (specifically Taylorism) towards responsible autonomy spreading responsibility to lower levels as layers of management are stripped away and more activity is carried out in smaller firms” (Frieden, 71).

The optimistic view draws heavily from Piore and Sabel’s (1984) account of a post-Fordist world comprised not of mass produced goods, but rather of
increasingly differentiated products, brought quickly to market to reflect the latest consumer demand. According to Piore and Sabel, producing timely and quality goods required a milieu of highly skilled craft workers or geographically integrated supply bases, as seen in Italian industrial districts or the Japanese kanban system.

Piore and Sabel carefully warned that a transition to flexible specialization would not happen automatically or inevitably. However, their research and the subsequent studies it influenced remained optimistic that aspects of flexible production could provide an answer to US firms searching for a post-Fordist strategy: “There is no reason to think that modern American employers could not provide the training, coordination, and social insurance needed to secure labor’s participation in a regionally defined craft community” (Piore and Sabel, 1984: 307). Flexible specialization, based on skill rather than scope, seemed a plausible long-term strategy for competing with low-wage producers. In addition, the program appealed to scholars and labor advocates as the mechanics of flexible specialization required worker training and the devolution of authority, which while increasing competitiveness, would also empower workers and lower inequality (Vidal, 2007).

As we will see in the empirical sections below, aspects of flex/spec strategies were indeed embraced as experiments by a few US producers. However, as research on other industrial sectors shows, American manufacturers were able to reap many of the gains of post-Fordist industrial
organization without a thorough implementation of flex/spec or lean production human resource practices; that is, without encouraging or creating the craft-worker skills, identity, and security that early authors considered crucial (Vidal, 2007). In addition, the flex/spec model seems to underestimate the potential to disaggregate production – even higher quality production – geographically.

A third group of scholars focuses on just these opportunities of geographic dispersion. The main advance in the ‘global value chain’ literature is the serious grappling with the notion that consumer products are made of components, which can (more and less easily) be manufactured and assembled in different places. Global value chain research, which includes several rigorous sector-level studies (see Bair and Gereffi, 2001; 2003, Kaplinsky, 2004, Gereffi, 1999, Sturgeon, 2002), goes far in explaining patterns of outsourcing and off-shoring in the US textile and apparel industries.

Gereffi et al (2005) summarize the global value chain theory, which has roots in transaction cost economics and the core competence management literature. They argue that global value chains will be organized differently based on the complexity of the knowledge needed for a particular transaction, the extent to which that knowledge can be codified (and therefore more or less easily transferred), and the capabilities of existing and potential suppliers (85). In apparel, supply relations have shifted from ‘captive’, where lead firms took responsibility for sourcing inputs and ensuring quality, to ‘relational’, where
more competent suppliers, including developing country contractors, took responsibility for functions from creating prototypes (samples) to managing distribution. With on-going trade liberalization, these authors expect that off-shore suppliers will continue to upgrade their capabilities and assume responsibility for higher value-added functions:

The establishment of overseas buying offices and frequent international travel supported the intense interaction required for exchanging tacit information and building personal relationships between buyers and suppliers. . . . To the extent that the ability to codify transactions is increased by this concentration [of production at a handful of low-cost sites], and the supplier capabilities continue to improve, we would expect the relational value chains in apparel to become more modular (Gereffi et al. 2005: 92).

Though the value chain authors recognize that there is no single best way to organize value chains – they cite Sony and Zara as examples of successful vertical integration – they acknowledge that lead firms in developed countries generally define products. Yet they view technology and supplier capabilities as independent variables rather than as outcomes of post-Fordist adjustment. Competence, or skill, is a key variable in this literature in determining where specific production functions will locate, but the political economic institutions that foster skill development are largely absent from the discussion.

These three strains of research offer insight into how US textile and apparel industries have adjusted to globalization. But these arguments seem to assume that product market decisions come first – that production
strategies determine demand for workforce skills, rather than available workforce skills determine production strategies, and seem underestimate the impact of the existing institutional environment. As we will see below, business managers decided market strategy and define products based on predominant workforce skill distribution. Firms in advanced economies that traditionally relied on low-skill, Fordist strategies had more than one option, but not unlimited options. The history of Fordist production in the US textile and apparel industries, as well as the range of human capital institutions that grew to support it, primed employers to implement strategies based on a Fordist distribution of skills at home.

Skill Building and Globalization in the Textile and Apparel Industries

Industrial production of textiles began in the United States in the 1790s with intellectual theft. A British immigrant to the US, who had apprenticed at the Arkwright and Strut spinning plant in England, committed the plans for the machines to memory and sailed to New England. Backed by American investors, he recreated the British mill in Rhode Island.11 By the late 1800s, several technical schools and universities offered training and advanced degrees in textile engineering, including the New Bedford Technical School, MIT, and the Philadelphia Textiles School. In the twentieth century, however,

11 This history recounted here draws heavily from Abernathy et al, 1999, A Stitch in Time, p. 21-38.
northern universities pulled back from textiles as the large mills migrated south in search of cheaper, non-union labor. MIT’s textiles engineering specialization, established in 1883, was phased out in 2002 (Backer, 2002).12 As the textile industry shifted south in search of non-union labor, the center of gravity for skill-building in the industry shifted too. Since 1950, the largest centers for textile engineering and management training have been southern universities, including Clemson University and North Carolina State. These universities also became centers for textile and apparel research.

But as textile machinery makers in the US began to fail in the 1970s, these schools lost important ties industry and to cutting edge textile technologies (interview notes, see also Spinanger, 1998). Textile studies curricula began to focus on general business management and finance rather than technology and production; some prospective textile managers eschewed specialist training altogether in favor of general business studies (interview notes). As enrollment in textile engineering courses declined, two prominent fabric research centers, Virginia Tech and NC State, merged.

While universities and technical schools trained textile managers, production workers in mills received little training at all. In keeping with Fordist work organization, most shop floor employees entered the factory direct from general schooling, often without any formal qualifications. At one typical

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12 Also, New Bedford Technical School, founded to train engineers and managers for southeastern Massachusetts’s booming mills in 1895, later merged into the University of Massachusetts at Dartmouth.
factory, almost 50% of shop floor workers had not completed high school (Lancaster, 2006). Line workers were trained on-the-job, for narrow tasks, and job rotation was rare. Community colleges in southern states had a legal mandate to provide training that was directly relevant to local industry, and several institutions did develop textile-related curricula (NC Community Colleges, undated). However, a several shortage of basic skills in the textile workforce, many of whom were functionally illiterate and innumerate, posed serious challenges for local skill-building institutions. Rather than upgrade workers’ technical or business know-how, most community colleges found they were forced to spend the bulk of instruction time on the three “R”s (interview notes, see also Lancaster, 2006).

The US textile industry’s reliance on a low-skilled workforce had serious implications for production strategies. One Italian textile manager, who worked for a while at a state of the art Burlington factory in North Carolina during the 1980s, was amazed at the rigidity of the production system there. In fact, in order to avoid machine down-time when changing to from one product to another, the mill would often run a weave of the same color fabric for an entire week. The manager’s previous plant, in Italy, would change production runs as often as 30 times per week with limited downtime. According to this manager, the problem at the Burlington plant was that workers there didn’t have the requisite understanding needed to keep the machines running and maintain any flexibility at the same time (interview with

Building Skills for the Garment Industry

Just as textile institutes sprouted near fabric mills, skill-building institutions for the apparel trade clustered near garment production, first in New York, and then in Los Angeles. The school that later came to be called Parsons School of Design launched its fashion department in 1906, and began to supply visionaries for Seventh Avenue. Though Parsons focused on the art of fashion, another local institution focused on the science. The Fashion Institute of Technology, carved out of the top two floors of New York City's High School for Needle Trades in 1944, aimed to create “the MIT for the fashion industries” (FIT, undated). Early emphasis in FIT’s program was technology, with required courses in pattern making, draping, and marker making. Likewise, Los Angeles Community College's fashion department grew out of programs designed to train sewing machine operators. As LA's sportswear industry grew, the community college system offered programs to help new immigrants land production jobs. Soon, however, garment employers were asking the LACC to focus on higher-level skills. Sewing could be taught on the job, usually in a few days’ time; but firms needed help training pattern makers,
Despite some experimentation with flexible production systems in the late 1980s and early 1990s, few US clothing manufacturers believed that they could gain or maintain competitive advantage in a high-wage environment through up-skilling shop floor workers (interview notes, March 2004). One prominent initiative – a cooperative effort of garment manufacturers, unions, and local government in New York – was founded to upgrade production worker skills in 1984. By 2001, the organization had shifted its training focus to mid-level and management personnel, and the emphasis of its curriculum from production technology to general management skills (finding capital in an uncertain industry, for example) (interview notes, February 2002). As with textile skill-building institutions, the emphasis in fashion schools shifted over time from production to product conception, and from manufacturing to marketing (interview notes, Spring 2002 and April, 2005). In fact, by the 1990s, many apparel training schools had begun to de-emphasize technical training in favor of general design and business skills.

Globalization: A Challenge to the Fordist System

Though Southern, good-old-boy textiles managers often clashed culturally with their clients in the rag trade, for most of the twentieth century
their political goals were aligned. Both favored continued protection for their domestic markets, and both feared unions and union-friendly legislation. Prior to the rise of international garment sourcing in the late 1970s, weaving firms and garment manufacturers employed Fordist production philosophies on the shop floor and strongly coordinated lobbying in the political arena. Big textiles, in particular, were a powerful political force through much of the 1900s, in their southern states and on the federal stage. For years, the American Textiles Manufactures' Institute (ATMI) was one of the most powerful lobbies in Washington and was consistently successful at defending its growing domestic market (interview notes, also Hitt, 2005).

However, this success of American textiles this 'success story' had feet of clay. Wages and training for textile workers were among the lowest for US manufacturing employees (see Figure 3.4). Moreover, despite a capital-intensive strategy, American textile manufacturers had no comparative advantage in capital: in fact, the US textile machinery industry was not competitive with Italian, Swiss, and German equipment makers (see Figure 3.5). Unlike counterparts in Italy and Germany, few American mills had co-development relationships with machinery manufacturers that might give them access to leading-edge technology and new developments in fiber science (interview notes). How did the US textile and apparel industries, built on and oriented toward a protected domestic market, adjust to a world of increased international trade and investment?
The period after 1990 proved to be a turbulent time for many of these firms and their workers. Garment manufacturers, with capital and infrastructure needs that were much more limited than textile producers, faced both the threats and the opportunities of globalization first. As garment imports from Japan and Taiwan rose after 1970, a few apparel firms became early adopters of global production strategies.

One prominent example is Liz Claiborne, a company with $4.99 billion in revenue in 2006 (see Harrison, 2003; Bonacich and Waller, 1994, Gereffi, 2001). The firm was founded in the 1970s, and built its success on offering women ‘related separates’ – coordinated skirts, blouses, blazers, and trousers that were appropriate for the office – at a time when women were entering the workforce in large numbers. In its first years, Liz sourced garments domestically, predominantly from large apparel manufacturers located near textile mills in the US south. By 1978, the firm was importing most of its garments from Taiwanese manufacturers. Liz dealt with Asian suppliers on a ‘cut, make, trim’ basis, the same kind of arrangement that the firm had with suppliers in the US. In addition to technical expertise, Claiborne would supply fabric, garment specifications, and trims (e.g., buttons, thread, etc.) to its sewing contractors.
Sourcing overseas, even when the costs of tariffs, transportation, and import quotas were factored in, cut costs significantly. Claiborne managers found quality and delivery times from Asia more than satisfactory. The combination of pertinent designs (produced at Claiborne headquarters in New York and New Jersey) and low-cost production (outsourced to sewing contractors, mainly in Asia) was a winning formula. By 1990, Claiborne’s annual sales had reached $1 billion per year, and the brand was strong enough in the market to demand unprecedented concessions from retailers who wanted to stock Liz Claiborne apparel.

Though Claiborne was one of the earliest and most successful mid-priced apparel manufacturers to source garments from Asia, they were not the only ones. More and more US clothing “manufacturers” began to turn to Taiwan, and later South Korea and other Asian locations, for garment production (see Figure 3.6). As Claiborne and other large apparel companies increasingly turned east for garment assembly, factories in Asia learned a lot from their clients, both about the technical aspects of production and about supply chain management. Asian producers upgraded their capacities, graduating from CMT orders (for which the client would provide all the inputs, and the assembly factory would merely ‘cut, make, and trim’ the garments) to full package production (for which the assembly factory took responsibility for sourcing inputs, quality control functions, and in some cases, sample making, marker making, and sizing).
Figure 3.6

US Apparel Imports, 1985-1995

Dept of Labor, Download Aug. 07
http://www.dol.gov/ILAB/media/reports/iclp/apparel/2c.htm
Newly capable factories were a perfect resource for new American clients: US department stores and large-scale chains that wanted to expand into private label (or own-brand) apparel. These clients’ core capabilities were in retail, not in garment production, and the stores had little desire or capacity to oversee and finance the infrastructure of the branded apparel companies. Full package producers in Asia enabled them to sell own-label merchandise without the stable of experts in production, sourcing, sample-making, and quality control that branded manufacturers like Liz Claiborne maintained. Though many branded and private label garment firms took advantage of global sourcing opportunities, others were less agile, or too rooted in their communities, to source overseas. Large, vertical firms like Levis struggled in the new environment.

Though still called ‘manufacturers’ in the industry, by the 1990s, fewer and fewer American apparel firms were producing any merchandise in-house. American garment assemblers who survived the onslaught of competition from low-wage countries tended to concentrate, paradoxically, in high-wage areas like New York and Los Angeles. Many of these factories found niches as quick-turn suppliers of replenishment merchandise, helping stores to re-stock styles that proved popular and merited the higher cost of production because they carried lower risk (interview notes, April, 2002). Others, particularly in the garment district in Los Angeles, concentrated on product markets where fashion was particularly volatile. Fashion denim, where the final “wash” or
chemical treatment of the fabric changed constantly, and the difficult and fickle junior girls market, were two examples (interview notes, March 2004). However, in most cases, these were strategies to survive and not strategies to thrive. Garment contractors complained that US wage, health, and safety requirements impinged on their ability to compete against increasingly low-wage, largely unregulated, overseas competition, and many fired their workers and closed (see Figure 3.7).
Figure 3.7

US Employment, Selected Sectors 1993-2002

- Apparel and other textile products
- Books
- Drugs
- Electronic and other electrical equipment
- Motor vehicles and equipment
- Textile mill products
By and large, even these service-oriented, quick turn firms remained under intense cost pressure and relied on very low wage, low-skilled workers.\textsuperscript{13} The director of a garment contractors' association in the Los Angeles area reported that the two most consistent demands from his members were for information on how to deal with labor violation citations, and for information on investment opportunities in non-apparel businesses (industry association interview, March 2004).

Though sewing contractors waded through unpredictable waters in the 1980s and 1990s, the biggest losers during this adjustment were US apparel workers (see Figure 3.7). The garment union (once the ILGWU, now called UNITE), had fought relocation of jobs to the non-union US south for years, but was largely unsuccessful in forestalling the shift of apparel production overseas. UNITE switched from direct confrontation with employers to campaigns that could leverage their political muscle, with efforts to require that uniforms (for military and municipal workers, as well as those worn by Catholic school students) be "Made in the USA". Success was limited (interview notes). By and large, by the end of the century, even union officials recognized the futility of trying to keep sewing jobs in the US. According to activists with ties to UNITE, the union shifted its organizing focus from garment-making

\textsuperscript{13} Managers in the California apparel industry stressed that many immigrants could in recent years get better and better wages outside apparel factories. Interview notes, March 2004.
sweatshops to commercial laundries and other work sites less susceptible to the overseas threat (interview with NY industry association, April 2002).

Production workers have certainly lost in this adjustment process, but some apparel firms successfully adapted to the new global garment system. Winners included large firms, like Liz Claiborne, but also small and mid-sized companies. A new and growing network of international production agents allowed smaller ‘manufacturers’ to source from low wage locations without bearing the expense of or the commitment to multiple locations in Asia or Latin America. In particularly fickle markets (like junior girls’ fashion) and in higher margin sectors, US fashion companies still turn to local garment contractors for quick turn and quality. Though these small firms make small share of the market, they often capture high margins (interview notes, 2004).

Small and medium-sized apparel firms lack the humongous sourcing arms of Wal-Mart or the Gap. However, several have developed strategies that allow them to capitalize on their core competencies – leading edge design and marketing – without a global presence. Missy Plus\textsuperscript{14}, a sportswear manufacturer in Los Angeles, is one example. Missy Plus sells low-end apparel for the fast-growing ‘missy’ market (overweight teenaged girls). This consumer is particularly fickle, and even at low price points, time-to-market is crucial to the success of most styles. At a 2004 visit to the firm’s headquarters, the firm’s founder and head designer explained that her designers meet weekly,

\begin{footnote}
\textsuperscript{14} A pseudonym.
\end{footnote}
and pitch their ideas and samples to buyers at several national retail chains, which marketed Missy Plus products under their own brand names. Most sewing took place at the on-site factory of Missy’s partner, a Korean-American assembler. Though the firm was courting a partner who would supervise some production overseas, Missy’s founder believed that some production, and all design, would remain in LA close to the target market (interview notes, March 2004).

Another reason to keep a strong foothold in the US is to stay near design talent. One large, upscale jeans manufacturer, based in LA, sources some 20% of its most basic styles in China in 2003-4 (interview with firm US A-12). However, overseas sourcing had its problems. The trend for distressed jeans – which were artistically ripped at the factory where they were sewn – was conceptually difficult for many Chinese workers. In addition, high-end jeans required special washes for denim fabric. Designers in LA traveled to the washing plant each week or more frequently to check on the process, and on new developments in the look. But “designers hate to go to China. All they do is complain,” said one manager. In this case, the need for design talent to interact with the (outsourced) production team meant that a fair amount of garment assembly stayed on-shore. Boutique labels for premium denim, founded in LA and selling at price points from $200 to $1000 per pair of jeans, were the source of much of the garment district’s revitalization. These labels asked for very small batch production of highly customized, luxury products –
the definition of flex-spec production. In fact, orders from small designers saved LA producers who almost went under when large firms shifted sourcing to Mexico and China in the early 1990s (Barbaro, 2007). The LA rebound sounds a lot like Piore and Sabel’s ‘flexible specialization’, with one major difference: while designers and managers want to be close to production, manufacturing workers on these small batch orders remain low skilled, mostly undocumented migrants, rather than skilled ‘craft’ workers.

Boutique labels, which fall short of the minimum orders many overseas factories require and lack the staff and capital necessary to oversee international production, have been a shot in the arm to garment producers in LA. But the technological advances that aided large US firms in their shift to sourcing from low-wage areas have become increasingly available to even the smallest firms. Computer aided design, when it was first introduced, required a large capital investment that put CAD technology out of the reach of all but the largest and richest manufacturers. By 2002, however, small IT firms were producing CAD systems priced with the little guys in mind. One firm, a textile equipment manufacturer that expanded into apparel software, aimed to make globalization safe for small designers. Their proprietary design system – from the computer programs that translate CAD files from one format to another, to the drop-in centers for small designers, to the 48 hour sample service from India – was designed to facilitate work processes in apparel to migrate to the location with the best productivity fit. Using this system, even small firms with
little infrastructure could efficiently outsource low skill functions to low wage
areas, while keeping product conception, design, and marketing close to
consumers (interview notes, March 2004).

RESPONSES IN THE HUMAN CAPITAL SYSTEM

As US apparel firms began to concentrate more and more on certain
parts of the apparel value chain, employers wanted different skills from their
workers. In interviews, managers have said they need designers who
understand the business of fashion as well as design, and managers who
understand global supply chain management. Designers need to understand
production costs, said one manager, and be able to deliver specifications that
meet particular price points. “We aren’t producing couture here,” said one high
level executive, “We need our designers to understand that” (interview with firm
US A-9). Business and technical skills are in even greater demand in source
countries. One of the largest US apparel firms, which has set up a sewing
factory in Mexico, found the demand for skilled technicians and mid-level
managers so keen that they allied with a local university to establish offsite
training for employees (interview with firm US-14).

Training institutions in the US reported that they have tried to anticipate
new demands from employers. The Garment District Industry Council (GDIC),
a New York organization that brings together employers, unions, and
government officials, concentrated in the early 1990s on cross-training
production workers. At that time, garment producers in New York hoped that more broadly skilled sewers would smooth over the bumps of worker absenteeism, and allow factories to respond more quickly to changes in fashion by switching from shirt to dress production, for example. This strategy, inspired in part by the enthusiasm for flex/spec success in Italy, was a serious departure from the low-skilled, low-wage, large-batch mentality that had ruled the American garment industry since its inception. But more skilled line workers failed to improve competitiveness as much as GDIC's organizers hoped. Firms continued to specialize: small shops in New York tend to concentrate on sewing dresses or knitwear or handbags, and cross-training of production workers and introduction of team techniques failed to increase productivity enough to impact competitiveness. Instead, factory managers in the New York district found their main business need was access to capital, and the managerial expertise with which to find and invest it. GDIC's programs switched focus from training line workers to training middle managers and entrepreneurs (interview notes, 2003).

LA Community College also shifted its apparel curriculum from production to management skills. The garment program at the college was originally intended to train the lowest-skilled workers in the factories. Curriculums focused on how to operate sewing machines and basic work-readiness. Over time, however, employers found that such skills could be picked up on the job, and instead asked LACC to concentrate on more
advanced training. LACC's apparel department shifted its focus from basic skills instruction to an associate's degree program. Entering students were required to hold high school diplomas, and their classes prepared them for entry-level design and management positions rather than shop floor production jobs.

As training institutions for lower-level apparel workers move up the skills chain, higher education institutions have also shifted focus. As US firms outsourced more and more production and detailed design of their products, fashion schools, including the Fashion Institute of Technology and Parsons in New York, and OTIS in LA, added new programs in marketing, in 'fashion-related' fields like cosmetics (interview notes). Curricula shifted toward general business skills, with diminished emphasis on technical capacities like production engineering, pattern-making, and fabric chemistry. At the highest levels, large firms seek managers with MBAs and expertise in distribution and organization of global supply chains. These skills were not deemed to be industry-specific. In Italy, managers stress the luxury nature of fashion; one US distribution manager pointed to the garments around them and said they "might as well be produce" (interview at firm US-12). This manager's attitude, that goods were undifferentiated, was reminiscent of a Fordist mindset.

The skills-building system in the US, which had always focused on general skills, seemed – at least in the apparel industry – to be moving ever more toward general skills and away from industry specific skills. What's more,
as US garment firms based their strategies ever more on general design, marketing, and distribution competencies, the 'general skill-based' competitive strategy was self-reinforcing. Several managers reported that sector-specific knowledge seems to falling out of the US apparel workforce. One textile agent reported that apparel designers today no longer have a sufficient technical knowledge of fabrics to understand quality and costing (interview with US-06). A professor of garment production in New York feared that this lack of technical understanding could shift power from US buyers to foreign suppliers (interview notes, 2003). The supply base for apparel is so competitive, however, the real growth in power could accrue to established overseas factories or agents with the technical capacity to evaluate and monitor suppliers. In the apparel value chain, detailed design and sourcing were two functions that remain (at least in part) controlled by home country (US) firms. As technical understanding of apparel disappears from the American workforce, more and more of these functions could leave the US, too.

In the long term, is the loss of technical capacity a serious risk for US firms? The debate on this question remains open. One sourcing manager at a large US apparel maker believed that the future of his company was in broad concepts and marketing. Even distribution, he believes, could be outsourced: he envisions the day when he will send his suppliers "a sketch and a check" (interview with US-A12).
However, most US apparel managers interviewed believed that design would remain their core competence and design excellence their primary strategy (interview notes). Innovative design is needed to gain a price premium, but an ever more complete separation of design from sample making and production could impact the ability to innovate. To a much greater degree than many global product chains (electronics, for example), apparel remains a tactile product – the “hand” of the fabric, the line and movement of the drapery, the feel of a cut on a model – are all subjective, but integral to the success of a design. Particularly at the medium to high end, in fashion-influenced segments where margins are highest, separating design from production could result in less successful design. Product cycles in apparel are extremely short (many firms sell six to eight distinct ‘mini’ collections per year). Other global industries, like autos and electronics, build new models on platforms and refine a particular design over several seasons; apparel ‘models’ often change whole cloth six times per year. As a result, designers who are cut off from the production process have less opportunity than their counterparts in other sectors to refine a product over seasons.

For designers, being separated from production is particularly risky at the highest end of the market. Take Calvin Klein, for example.\textsuperscript{15} In 2003, the firm was sold by its founding designer/entrepreneur to Phillips Van Heusen. The acquisition was particularly attractive to PVH for its mid-level brands,\textsuperscript{15} This description relies on Horyn (2006).
including the bridge line Calvin Klein, and CK Jeans. PHV was less interested in hands-on production of Calvin Klein’s couture line. (In the apparel industry, couture is often a ‘loss leader’; firms lose money on a few $8000 dresses in order to drive sales of many $80 bottles of perfume and $8 pairs of panty hose.) PHV closed Calvin Klein’s couture sample shop in New York, and licensed all production and distribution of the line to Vestimento, a high-end apparel production firm based in Italy. But the firm’s lead designer, Francisco Costa, remained in New York. In the midst of preparing his second fall line for Calvin Klein, Costa sent designs to Italy to be made into samples, but was unsatisfied with the results. Barely a month before showing his collection, he tossed his existing designs and started work all over again, with a New York tailor sewing and adjusting Costa’s ideas in real time. This process allowed Costa to work out his ideas and be more creative. His fall 2004 collection went on to win critical acclaim and financial success (Horyn, 2006).

Clearly, lower-end designers (who call browsing in trendy boutiques “research”) must meet price points that are 1/100th of what couturiers charge. Cost constraints may preclude multiple iterations of samples regardless of location. However, there could be serious long term consequences for branded firms when design capacities fall out of skill set of the home labor market. The consequences to outsourcing detailed design, and perhaps eventually product conception, for branded apparel firms remains to be seen.
Strategies of Adjustment: American Textiles

While successful apparel firms managed to survive increased international integration by moving production offshore or focusing on quick-turn, textile manufacturers had a rougher time adjusting. Textile managers were long accustomed to production strategies based on economies of scale and large, protected domestic markets. But faced with increasingly international, lower-wage competition, managers grasped at several ideas that would allow them to survive in the new environment. These post-Fordist strategies, leveraged against the firms’ generally-skilled American workforces, included regionalization, new markets, and niche / up-market production. In this section, I discuss each of these strategies in turn. Unfortunately for US textile producers, none has yet proven to be a clear winner.

Regional and Global Strategies

The most common response of US textile producers to globalization was to focus their strategy on regional apparel production, based, as was customary in the textile industry, on market protection. By the late 1980s, many managers adopted a ‘hemispheric’ strategy. Starting with their support of the Caribbean Basin Initiative (CBI), the US textile lobby broke with domestic sewing firms. Under the terms of CBI, fabric made in the US could be exported to several countries in the Caribbean to be sewn into garments. When re-imported to the US, duty would be assessed only on the value-added. Since
fabric accounts for at least 80% of the cost of most garments, this tax savings was quite large (Birnbaum, 2000: 53). Later, the support of textile manufacturers was key in ensuring the passage of NAFTA.

As competition from low wage producers in Asia hit the US textile and apparel industry hard, American managers seized on a regional-production model as a survival strategy. US textile managers saw low wage Mexican garment workers and highly sophisticated US textile mills as natural partners. A regional production and sourcing strategy was the industry's future: in fact, NAFTA promised a "renaissance for the textile industry", argued the former chairman of Guilford Mills in 1993 (NYT: 1993).

Indeed, NAFTA brought a dramatic increase in Mexican garment production and exports. By 1995, Mexico surpassed China as the largest importer of garments to the US, and the number of garment production establishments in the maquiladora sector grew from 398 in 1994 to 1,088 in 2000. As apparel production in Mexico boomed, enthusiasm for NAFTA spurred many US textile firms to invest in warehouses in Mexico, and as the decade wore on, many committed serious resources to building production facilities in the country as well. Of US textile firms competing in the apparel segment, seven of the top ten companies built or invested in Mexican production facilities.16

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16 Based on list in Textile World. Non-apparel textile firms (e.g., carpet producers) have been omitted.
The most ambitious investments, like those planned by Burlington, Guilford Mills, and Delta Woodside, aimed to integrate textile production and garment assembly in one firm, leveraging US management, marketing, and sales talent with low-cost labor in Mexico. These firms intended to offer customers full-package production services, a “one stop shop” for apparel brands like Liz Claiborne, Ralph Lauren, or the Gap. A vertical strategy would allow the textile firms to ensure a market for their fabrics, and capture a greater share of the end product’s value-added, they hoped. Bair and Gereffi dubbed this strategy a “mill-directed” network (Bair and Gereffi, 1997).

Unfortunately for the US textile managers who bet on a regional economy and for the Mexican workers they employed, NAFTA’s early promise petered out by the end of the decade. Mexico’s US imports of apparel have declined since 2000, at a time when the number and value of garments China sends to the US continued to grow rapidly. And Mexico is not the only recent loser – several other (lower wage) producers in the Caribbean Basin region, where apparel firms enjoy proximity and favorable access to US markets, have also experienced slowed or negative growth (see Figures 3.4 to 3.6 above).

This downturn in intra-regional imports is quite recent, and follows the 1997 depreciation of several Asian currencies, a recession in the US in 2001, and a worldwide dip in trade after the September 11 terrorist attacks. However, the downturn in the Mexican garment sector may signal a structural change rather than a temporary development. First of all, the regional strategies of
several lead firms seem to be breaking down: Burlington, Cone Mills, Dan River, and Galey and Lord have all closed or scaled back their investments in Mexico since 2001 (see Table 3.7).

<table>
<thead>
<tr>
<th>Firm</th>
<th>Investment</th>
<th>Future?</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Closed six Dimmit sewing plants.</td>
</tr>
<tr>
<td>Galey and Lord</td>
<td>Purchased Dimmit Industries, a Mexican manufacturer of shorts and trousers.</td>
<td>Closed one textile facility.</td>
</tr>
<tr>
<td></td>
<td>Set up two textile plants.</td>
<td>Jobs lost: 3500</td>
</tr>
<tr>
<td>Dan River</td>
<td>JV with Mexican apparel firm, planned to invest /send 275 looms</td>
<td>Withdrew 2/26/01</td>
</tr>
<tr>
<td>Guilford Mills</td>
<td>$30 million apparel factory closed after 11 months</td>
<td>Announced closing on 3/6/02; company plans to reinvent as a US-based auto supplier</td>
</tr>
<tr>
<td>Cone Mills</td>
<td>Large denim plant in Parras, Mexico</td>
<td>Needs $18 million in financing</td>
</tr>
</tbody>
</table>

Critics charged that US textile mills, with limited knowledge of apparel markets and even less understanding of garment construction, lacked the retail contacts and the production know-how to jump into the clothing business. However, even firms with solid experience in garment production failed to make a go of a vertical/regional production strategy. US textile firms, built on Fordist principles around low-skilled labor and protected markets, lacked the flexibility to compete effectively with thousands of overseas competitors, large and small. In addition, most US managers were unable to find or develop sufficient skills in their Mexican workforces and partners. In one exceptional case, US managers were so committed to their Mexican production cite that they joined forces to establish a technical university nearby to satisfy their skill demands (interview with US – A09). In the mid 1990s, one manager said, Mexico built its reputation on replenishment, free of the unpredictability of quota, and the ability to produce large runs efficiently: basically, US Fordist organization south of the border. By 2001, the apparel market moved away from commodity products and toward merchandise with greater fashion content. Instead of 20,000 units of the same style, customers wanted 5,000 one way, another 5,000 cut differently, etc. “We told our facilities there that we

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17 Tarrant Apparel Group, one of the US’s largest and most successful private label manufacturers, had built a textile plant in Mexico in the late 1990s as the lynchpin of a regional sourcing strategy. By 2003, the firm took a $22.3 million loss in 2003 on its Mexican textile facilities and a $11 million write down on its Mexican inventory, negotiated long-term leases for its mills, and its CEO announced it, "... became obvious to us that we needed to exit our Mexican initiative.” Tarrant Apparel Group Press release, http://www.tags.com/news/20030814.html, August 14, 2003.
need much shorter runs. They included some of the biggest and best Mexican plants and they couldn’t manage the change,” said one manager. Though the Mexican factories had talented upper management, good workers, and new equipment, a lack of good mid-level management left them unable to provide consistent delivery of complicated orders (interview notes, 2002 and 2003). As Mexican plants lost orders, they were “grabbed up by Asia”, the manager said, a region where few US textile firms had invested.

Researcher who predicted the rise of regional apparel markets, like Abernathy et al (2003: 21), argued that shifts in sourcing apparel to Mexico and CBI would be “very beneficial” for US textile interests and a potential boon to Mexican fabric producers. In fact, a regional apparel sourcing strategy depended on both a healthy and competitive textile industry AND agile and competent garment assemblers. As Chinese producers began to beat Latin American sewers on price and almost match delivery times, retailers in search of quick re-orders looked to the better-managed factory, rather than the closer one. Falling air freight costs around the turn of the century made far-flung suppliers even more attractive. As the director of sourcing for one major US apparel firm said, “If I do it right, I can bring it in by air from Asia, and I can have goods air-freighted from Asia at lower cost than trucked in from Mexico” (interview with US – A12).

Most US textile managers who banked on regional strategies to face globalization relied too heavily on their own, diminishing advantages
(particularly tariff protection), and overlooked serious challenges to producing in lower-wage regions in the hemisphere. American investors’ commitments to the Mexican textile and apparel industry have declined rapidly since 2000. Between January 2001 and September, 2003, 325 of 1,122 clothing maquiladoras have shut down (Forero, 2003).

**New Market Strategies**

In parallel to, or instead of, a regional apparel production strategy, some textile managers shifted toward new products and markets that could also make use of their traditional strengths in scale production. These included home furnishings, auto/industrial textiles, and non-woven textiles.

Many textile producers hoped that the home furnishings sub-sector – including products like curtains, sheets, towels, and carpets, would be more ‘naturally’ protected than the apparel sector. Unlike apparel, home furnishing textile products require little labor input – hems for sheets and curtains can be sewn without operators, and carpets are more capital-intensive than jackets. In addition, some of these products are bulky and heavy, so transportation costs from far-flung low wage areas should be a greater concern. However, like apparel, the home furnishing industry in the US has been hit hard by imports. Fashion content in home furnishings is relatively low, so US manufacturers have little advantage despite their time-to-market advantage. And even when labor content is low, the worldwide availability of capital equipment means that
producers in low wage environments have a small but appreciable cost advantage. In fact, the home furnishing market for the textile sector may be much like electronics production – for relatively standardized, high volume products that are made with turn-key machines, even small labor cost differentials can determine the location of production (Sturgeon, 2001).

Manufacturers who have tried to move into other industrial sub-sectors of the textile industry may find greater success. Rather than depend on trade protection via politics or transportation costs, these producers hope to trade on their co-location with customers as an advantage. Despite constant cost pressure on suppliers by US auto firms, vehicle producers do require steady inputs from certified suppliers. Supplying auto firms means thin margins, said a manager of a firm that hoped to expand its auto-carpet business, but so did supplying garment makers. At least auto firms required a steady, and preferably local, supply for key inputs. A sewing factory that lacks inputs is both more flexible and much less expensive when idle than an auto assembly line (interview with US-21). This strategy has its flaws: textile managers tethering their firms’ futures to the US auto industry are not exactly hitching their wagons to shooting stars.

A final strategy based on entering new markets involves innovation – a strategy that has been successful for some German textile producers. In the United States, Burlington emerged from bankruptcy hoping to trade on advances in wrinkle and stain resistant fabrics. However, research and
development in the US textile industry has generally been low. Much R&D has been concentrated in international fiber companies, especially DuPont. The tendency of these firms to license their new technologies worldwide would seem to undercut the advantage of developing them in the US. Even DuPont has a limited commitment to textile R&D: the firm has been looking to shed its textile division for years, but has had no success in finding a suitable buyer.

Niche/Upmarket Production

As we will see in the next section of this paper, a typical strategy of Italian firms besieged by low-wage competition is to move up-market, and to seek out niche markets that large foreign producers cannot or will not serve. US textile firms have tried this strategy, too. One wool producer in New Hampshire began to weave cashmere and camel hair into $50 per yard fabric – a serious step up from the wool it traditionally sold at $6 per yard (interview notes). The strategy proved successful for much of the 1980s and 1990s: in fact, the firm was named one of the world’s top ten plants by Textile World in 1991. However, by the late 1990s, as more and more customers began to source garments in Asia, orders dried up. “The first year [a US apparel manager contract its sewing in Asia], he will source from here. The next year, he will source in Asia.” Land’s End, the catalogue firm, was a big customer until they switched to a Chinese sewing contractor, and began to source fabric from the Prato region of Italy. This northeastern firm found they couldn’t
compete with high-end Italian weavers, because they lacked the long-standing relationships with upmarket apparel companies and because the market for higher-end, US made goods was too small.

Eventually, the New Hampshire weaver decided that it had no future in production in the US, and in 2003 shipped its machinery to a joint venture in Inner Mongolia, China. The mill shed all its production workers, hanging on only to a Chinese-born engineer who would help run the Asian operations and bringing in-house its New York based agent to continue sales. The Chinese JV has been rife with quality and delivery problems. The same managers who earned praise for their New Hampshire mill found cultural differences and bureaucratic snags major inhibitors to success in China.

Other weavers who have focused energy on higher-end design and quality have been more successful. A couple of large US denim producers took advantage of a now years-long trend for $100 plus pairs of jeans. The designer denims became so popular after 2000 that manufacturers couldn’t import high quality denim from Italy and Japan fast enough. Two large US mills, long known for uninspiring fabric designs and for accepting only massive orders, modernized their product lines to attract new buyers, and delivered the orders quickly enough to make up for the shortfall from Italy. These firms left US denim manufacturers with favorable impressions, and given the local nature of high-end fashion jeans, probably gained long-term clients (interview with US-
A7). However, this agility and creativity remained the exception rather than the norm in the US textile industry.

RESPONSES IN THE HUMAN CAPITAL SYSTEM

Textile skill-building institutions responded to the US textile crises in similar ways to textile firms. Many downsized or closed altogether. MIT’s textile engineering section closed in 1992, after one hundred years. The National Textiles Center (NTC), a consortium of eight universities with substantial research programs in textiles, failed to receive federal funding in 2007-08 for the first time in fourteen years. Others re-oriented away from their traditional markets: Philadelphia College of Textiles changed its name to Philadelphia University.

The strongest textile skill-building institutions have tried to respond to the crisis in the US textile industry in similar ways as apparel institutions: by emphasizing business and marketing skills, and by re-defining the industry. Just as apparel became “fashion”, including non-garment accessories and cosmetics, textile universities began to talk about technical weaves instead of fabric. UMass Dartmouth maintains a department of textiles and soft materials, but its seven professors have shifted the focus of the curriculum to reflect the “transition from textile manufacturing being a major employer in New England to research and development and specialty products being the major employer” (UMass, 2006). Textile technology students were required to
complete a minor concentration in general business studies as well. But given the US industry's traditional emphasis on scale production of protected goods, low investment in R&D, and lack of a strong textile machinery sector—that is, given the general and generally low skill set of much of the textile industry workforce—the broad transformation of the US textile sector into a technology sector seems a challenge indeed.

Political Strategies: Protection v. Up(grading) and Out(sourcing)

As we have seen above, the US apparel and textile industries, linked in their fates for most of the 20th century, pursued different strategies when threatened by globalization. Manufacturers in both subsectors grew to strength by producing large runs of standard goods, using unskilled and low wage labor, for protected domestic markets. But as globalization eroded protection and accelerated demand for quick time to market, apparel manufacturers, who were less dependent on expensive, fixed capital, were more agile. Large apparel manufacturers and retailers learned how to exploit cost advantages of overseas production. The industry shed workers, but share of higher-skilled, non-production workers increased (see Figure 3.3). Successful firms based their strategies on the core competences of their workforces, and of the American managerial workforce: a high level of general skills, particularly in marketing, logistics, and retail distribution. The schools and technical
institutes that supplied the fashion industry with human capital both facilitated, and responded to, this new strategic direction. At home, apparel firms pushed for free trade, and in host countries, several large US firms began to engage with local skill-building institutions in order to ensure a supply of the skills that fit their production strategies.
Textile interests, in contrast, continued to bank on the combination of large-scale Fordist production techniques, together with protection (be it the tariff protection favored by holders of the regional strategy or ‘natural’ protection claimed by those aiming to co-locate with auto firms): “We were looking at protecting the US border with quotas and tariffs. It seems, then, that every day we woke up with another chink in the armor,” said one textile CEO (Phillips, 2007). But as the textile industry gained only small and temporary concessions in the face of international trade liberalization, plant shut downs and job losses mounted. As employment and revenue figures fell, so did the political muscle of the textiles lobby. Big textiles lost a series of
political battles. By March 31, 2004, the largest textile employers’ association and the most vocal advocate of protection for the industry, the once-mighty American Textile Manufacturers’ Institute, suffered membership and resource declines so severe that it folded. The industry lobby re-organized as the National Council of Textile Organizations, largely based on a strategy of allying with low-cost sewers in the region (Johnson, 2006). The legacies of the global textile quota regime continued to protect the industry even after the Multi-Fiber Agreement expired in 2005, via ‘safeguards’ that limited imports from China. However, by 2007, the widespread elimination of quotas prompted a reorganization of the US Office of Textiles and Apparel (OTEXA), and even as textile interests continued to lobby for regional trade deals including a “yarn forward rule”, this strategy seems limited.

Conclusions: Globalization and Post-Fordist Production

Without market protection, low-skilled, large-scale production can not survive in rich countries like the United States. But as I have discussed in this chapter, various theories of the nature of post-Fordist underestimated the

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18 Unlike trade policy for other industries, which was ultimately decided by the White House after review by the International Trade Commission, policy on textile and apparel imports was set by the Committee for Implementation of Textile Agreements (CITA). CITA was created by Richard Nixon during his 1972 re-election campaign in an effort to cement support from Southern textile states, and retained has broad control over textile and apparel quotas, as well as anti-dumping petitions. Historically, the committee has been chaired by a political appointee with ties to the textile industry, and through 2006, CITA proved responsive to industry cries, demanding early, unanalyzed import data from the Census bureau and subsequently imposing safeguards against Chinese imports. See Hitt, Greg, “Made in Washington: How the Textile Industry Alone Won Quotas on Chinese Imports --- An Obscure Beltway Agency Can Dictate Terms of Trade; Implications for Diplomacy” in The Wall Street Journal, 10 November 2005, page A1.
impact of disaggregating production across borders. The ‘winner takes all’
school oversimplified by defining entire industries high skill or low skill, when
textiles and apparel show that high-end design and marketing functions
coexist in the same industry (if not always the same country) with low-end
production. ‘Flexible specialization’ arguments assumed that high-end niche
products required a workforce with high-level craft skills, when garment
manufacturers in New York (as well as producers in other industries, see Vidal
2007) have been able to achieve high quality and harness some of the savings
from high performance work organization without the costs of a high-skilled,
participatory workforce. The value chain literature, despite its insight into the
power structures within sourcing relationships, underemphasizes the political
and institutional foundations in home countries that determine the
composition of workforce skills and underlie production strategy decisions.

In this chapter on the textile and apparel sectors in the United States, I
find that the existing structure of workforce skills at the time of the
globalization shock – structures that resulted more from political economic
institutions than from firm strategies – explained patterns of globalization
strategies, at the micro-level (production and location strategies) and at the
industry level (political and lobbying strategies). As we will see Chapters Four
and Five, these strategies differed from competitors based in Italy and Germany.
Chapter Four
Italy: Adapting Informal Institutions, Building Tacit Knowledge

Unlike the US textile and apparel industry, which was built on large, protected domestic markets, economies of scale production, and low skilled labor, Italian textile and apparel firms grew to international strength with many geographically clustered small and medium-sized firms focused on exports (see Signorini, 1994; Locke, 1995; Dei Ottati, 1996; Graziani, 1998; White, 2000). That industrial district structure, set against the background of the weak Italian school system and high levels of regulation on large firms, created mechanisms for building a highly-skilled workforce outside of Italy’s formal education and national training programs. Beginning with low wage labor and low-end goods, Italian producers improved quality and increased exports.

In the postwar era, Italian textile and apparel firms’ method of high-end, flexible production catapulted the industry to world leader, and challenged notions that the rag trade was inherently ‘backward’. In fact, Italy’s firms, and the high skilled, niche strategies they employed, seemed resilient in face of globalization and its surge of low-wage competition after 1980. At a time when other high wage producers were fighting to hold on to their domestic markets, Italian textile exports grew fivefold, from E541 million in 1970 to E25,980 million in 2005. The success of Italian textile and apparel firms, and of other industries clustered in ‘districts’, prompted scholars to reexamine assumptions of Fordist primacy and identify ‘flexible specialization’, the production system
embodied by Italian districts, as an alternative model that was both competitive in the market and more egalitarian in organization (Piore and Sabel, 1984).

The continued success of Italian textile and apparel firms in the cutthroat 1990s, as the US and German industries shed workers and firms, bolstered arguments that Italy's flexible districts were resilient in face of low-wage competition, and helped support the theory that tacit knowledge provides a powerful basis for competitive advantage in the global economy. By the new millennium, however, Italy's textile and apparel companies began to feel the heat from international competition, as well as the draw of low-wage production opportunities, and many firms radically altered their traditional strategies. What impact did Italy's tacit knowledge skill profile have on Italian firms' globalization strategies?

As we will discuss in this chapter, Italy's skill-building system has been largely based on informal institutions, and geared toward imparting tacit knowledge. Italian firms competing in international markets relied on these skills as a source of advantage in international markets. However, an over-reliance on tacit knowledge could prevent Italian firms from taking advantage of cost savings from acquiring basic inputs in low wage environments, ultimately undermining the industry's competitiveness even in high-end niche markets. This chapter asks: 1) To face increasingly global competition, what skills do Italian textile and apparel firms demand? And, 2) how does Italy's history of networked production shape these new demands? I argue that
Italian firms’ advantage since the export boom in the 1970s has been production strategies based on tacit knowledge, most easily transferred through informal institutions and networks, or within organizations. Recent changes in Italian industry structure (both patterns of globalization that rest on close ties to overseas suppliers and vertical integration of previously disaggregated production) are new solutions to the old coordination problem — how to build and share tacit knowledge. As pressure from globalization advances, however, both via upgraded competitors in low wage nations and imported workers and entrepreneurs in Italian districts, it’s far from clear that this emerging structure is stable, and can remain a base for solving the problem of skills.

This chapter, based on data from on-site interviews with 45 firms and secondary associations Italy as well as public sources, aims to answer these questions. It is organized as follows. The next section outlines the theoretical debates on workforce skill profiles. I suggest the literature on tacit skills as an explanatory framework for understanding the globalization choices of Italian firms, arguing Italy’s political and economic institutions produced a workforce rich in tacit skills and that tacit skills were the basis for Italy’s relative strength in the global economy. Section III presents globalization as a shock to the district system of production, and particularly, its impact on the supply of tacit skills. Section IV presents the globalization strategies of textile and apparel

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19 For description of the sample, see Appendix.
firms in turn, examining how these strategies were designed to guarantee the supply of increasingly rare tacit skills, and then discusses collective strategies to ensure industry skills in the global age. Section VI concludes with questions about the impact of restructuring on skills development.

II. The Origin and Impact of Skills Profiles: a Survey of the Literature and Italy’s Place

In recent years, two bodies of research have attempted to explain the origin and impact of workforce skills profiles. One, the ‘varieties of capitalism’ literature, links the character of skills in the workforce to national policies and institutions, and identifies skill building institutions as one of the basic systems that structures political and economic life in advanced economies. A second literature, on tacit knowledge, focuses on social relationships, often within local networks or regional districts, as the basis of skill formation.

Varieties of Capitalism and Skill

Aiming to explain persistent within-industry wage differentials in Germany, France, and the UK, Maurice et al (1980) found that organization on the factory floors mirrored the structure of state-sponsored education and training in each country. According to neoclassical economic theory, firms should be unwilling to invest in workers’ transferrable skills, and workers unwilling to invest in anything but (Becker, 1968). Scholars found that
German-style vocational training systems got around this impasse via complementary institutions that provided credible commitments to all of a return on their investments. The result, Germany's highly-skilled and well paid industrial labor force, allowed manufacturers to compete in high quality markets (see Streeck, 1989, Finegold and Soskice, 1988).

Much of this research defined countries' skill profiles as either industry-specific, where coordination between employers, workers, and the state led to incentives that encouraged investment in high-level vocational skills, or general, produced as a result of a lack of such coordination (Estevez-Abe et al, 2000). As Estevez-Abe et al and others argue, the existing skills profile in their local environments is among the most important factors that influence firms' product market strategies. Employers subsequently support policies - training and education policies, but also employment and unemployment insurance policies - that will perpetuate the dominant workforce skill (Estevez-Abe et al, 2000; see also Mares, 2000). Estevez-Abe et al argue, in fact, that social welfare protections are not put in place to buffer individuals from the whims of the market, but rather to structure individual’s incentives in line with national production strategies. But this analysis begs the question: which came first, workforce skill profiles (which require supporting institutions), or product market strategies (which push employers to favor particular skill

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20 In management studies, a large body of research suggests that individual firms are most successful when they identify and focus on their 'core competence'. See Gereffi, Humphrey, and Sturgeon (2005), pages 81-83 for a review of this literature and its implications for global supply chains.
supporting institutions)? In fact, as Estevez-Abe et al. all conclude, these analyses do not explain the origins of national skill profiles and the policies that support them, not do they address "the attempt of firms to engage in particular product market strategies" (182).

Varieties of Capitalism Model for National Skill Profiles and Institutions

<table>
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<tr>
<th>National Skills Profile</th>
<th>Production strategy/organization of production</th>
<th>Employer support for social/skills policy</th>
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The varieties of capitalism literature, while insightful on how the existing skill profile shapes firm policy demands – the dependent variable in their studies – says much less on how existing skill profiles shape production strategies. Production strategies are the central intervening variable, but first link in the model is underdeveloped.

Two recent studies have helped fill this gap. Culpepper (2006) focuses on how enterprise scale plays as a determining role in decisions on production strategy. He notes that larger Swiss firms spent much more money on research and development than the dominant smaller firms in Austria (17),
presumably causing the resulting higher demand by Swiss employers for formal skills. Thelen (2004) argues that national skill profiles originate in the “behavior and strategies of leading firms in skill-intensive industries” (278).

Around 1900, she argues, such firms in different countries pursued similar policies in attempting to secure a skilled workforce, including in-house training and union exclusion. However, firms’ interests in a stable supply of skilled labor brushed against existing training institutions and nascent labor groups, which varied from one country to the next. In Germany, large employers dependent on skilled labor jockeyed with small artisans, who had at the time a legal monopoly on skill certification despite often inferior training and conditions for apprentices. In efforts to attract and train the most promising workers, large firms eventually sought to gain more control over the skills development and certification, finding potential allies in unions and the Social Democratic Party. As a result, Germany transformed but retained “the idea of a collectively managed system for monitoring how firms train their workers” (296).

In the United States, in contrast, without a strong artisan tradition, American employers who tried to implement company-based training faced strong union opposition. American managers pushed for capital-intensive technology and implemented Fordist, mass-production organization in order to reduce their reliance on politically powerful skilled workers: “the goal was above all to rationalize production and reduce dependence on skilled labor.
altogether through technological change, work reorganization, and product standardization” (Thelen, 2004: 281, emphasis in the original).

Thelen and Culpepper have advanced our understanding of how these national skill profiles, which seem surprisingly stable, have actually evolved over time as new market realities and new political actors shape existing institutions toward new ends. However, the varieties of capitalism literature does not help us understand the Italian case.

Italy is classified as an example of firm-specific skill economy by Estevez-Abe et al (2001), based on its long job tenure and robust employment protections, as well as its lack of strong vocational institutions and its weak formal education sector. However, Italy lacks Japanese-style job rotation and formal in-firm training, even in large firms, is scarce. A main incentive for in-firm training is the difficulty of firing workers, due to job protection laws. Though Italian job tenure statistics are among the longest of all OECD countries, the figures may be misleading, particularly for workers in Italy’s industrial districts. Italian firms with fewer than fifty workers are not bound by the most stringent job-protection legislation, and Italian SME managers routinely sub-contracted new orders rather than increase firm size expressly in order to escape the regulation. One study found that job tenure in medium-sized Italian firms was no greater than in British firms (Burgess et al, 1997).

Moreover, theories that credit the dynamism of the Italian economy to industrial districts don’t square with the long job tenure/ firm-specific skills
story. As I will discuss below, industrial districts are characterized by high numbers of firm births and deaths, entrepreneurialism, and widespread self-employment in micro-firms. How Italy’s industrial districts have produced workers capable of world-class quality, highly flexible production remains murky: one leading comparative study of skill building in Germany, Spain, France, and Italy concluded that skills were evidently produced in Italy, but by somewhat mysterious means (Regini, 1997). The varieties of capitalism story, which emphasizes formal vocational education and training (VET) institutions and national social policy, and categorizes skill profiles as general, industry-specific, or firm-specific, seems to mislabel the Italian case.

_Tacit Skills and Industrial District Production_

A second body of research, produced largely by management scholars, seems to provide more appropriate categories for Italy. Rather than general versus specific skills, these scholars distinguish tacit skills, which are embodied in individuals and transferred via social relationships, from codified knowledge. The pioneer of this line of thinking is Michael Polanyi, who explained tacit knowledge with the phrase “we know more than we can tell” (1967). Lam’s more recent definitions are helpful:

Explicit knowledge can be aggregated at a single location, stored in objective forms and appropriated without the participation of the knowing subject. Tacit knowledge, in contrast, is personal and contextual. It is distributive, and cannot be easily aggregated. The
realization of its full potential requires the close involvement and cooperation of the knowing subject (2000: p 490).  

Most skills clearly involve aspects of codified and tacit knowledge. That said, distinguishing tacit-intense from highly codified knowledge systems and production processes does give us insight on the strategies available to managers. Large reservoirs of shared tacit knowledge lower transaction costs and thus increase efficiency (Belussi, 2002, Lam, 2000), and seem to foster innovation (Nonaka 1994, Cole, 2004). Because it is by definition embedded in particular individuals and locations, tacit knowledge can provide a lasting basis for a competitive advantage in a global economy:

... the more easily codifiable (tradeable) knowledge can be accessed, the more crucial does tacit knowledge become for sustaining or enhancing the competitive position of the firm. ... The fundamental exchange inability of this type of knowledge increases its importance as the internationalization of markets proceeds (Maskell and Malmberg, 1999, 172).

While Maskell and Malmberg seem to underestimate the challenges in accessing even codified knowledge, the tacit knowledge paradigm seems to fit the Italian textile and apparel industrial districts well (as I will discuss in detail below), and explains the districts' robust performance at a time when other advanced economy competitors began to hollow out production in face of low-wage competition. However, the literature is less clear on how to leverage tacit

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21 This sharp distinction between knowledge types may be more theoretical than practical. While Hedström and Whitley (2000) argue, much of what is classified as tacit knowledge could, given infinite resources, be codified, yet at the same time all knowledge has a tacit component, because all knowledge has a social component.

22 The oft-cited hoards of new engineers in India and China, for example, have, on average, a level of knowledge on par with what a US associates degree signals (Wadhwa et al, 2005).
knowledge to take advantage of global production and market possibilities, and, in an era of rapid technological change and codification, on how enduring an advantage tacit knowledge might be.

Rather than identify a national skills profile, the tacit knowledge literature takes the organization or (in areas of high interaction between networks of firms) the local region as the unit of analysis. As Lam points out, “Although recent literature has stressed the importance of tacit knowledge in organizational learning and innovation, it has neglected the role of institutions in shaping this” (2000: 508). Though sociologists and economic geographers have of late focused on local areas and ‘learning regions’ (Florida, 1994), these economic and social decisions in these areas are structured by national political institutions (Gertler, 2006). This empirical study of Italy’s textile and apparel sectors aims to bring the relationship between national political economic institutions and production strategies in Italy’s districts.

In addition, the current chapter aims to address the apparent contradiction in the literature on the globalization of production with tacit-intense processes. The recent wave of globalization differs from past surges in international trade because producers’ now have the ability to disaggregate production between firms and across borders (Berger, 2006). The same properties of tacit knowledge that theoretically provide tacit systems with an advantage in a global economy – that the creation of tacit skills requires co-location of producers, suppliers, and customers (or marketers), and often a
common culture as well – are a disadvantage to producers trying to take advantage of non-local technology and the opportunities of disaggregated production. As Rullani writes, “The local actors need to transform their cognitive ‘engine’ that has served them so well up to now. . . .This opening up to distance relationships is perhaps more painful for local networks than for the other forms of organization,” (2003, 13, 15).

**Italian Textile and Apparel Production: A Tacit-Skills Profile**

**Districts and Italian Production**

In the Italian textile and apparel industries, national regulations and local environments determined the trajectories of technological innovations and dispersion of knowledge. The persistent growth and success of small and medium enterprises (SME) networks in postwar Italy has attracted a huge amount of scholarly interest. Since Piore and Sabel examined the Italian district system as an alternative to Fordist production in 1984, countless studies have aimed to explain why the decentralized, largely informal method of ‘flexible specialization’ became and remained so competitive (see also Herrigel, 1996 and Hirst and Zeitlin, 1997). Marshall’s original argument on the success of industrial districts focuses on the agglomeration effects of clustered firms – that nearby firms in the same sector create and perpetuate environments that foster success. He attributes the positive results of
agglomeration to 1) a concentrated labor market of skilled workers for the industry, 2) savings due to geographic proximity to suppliers and customers, and 3) technological spillovers. In such a district, Marshall wrote,

> The mysteries of the trade become no mystery; but are as it were in the air. . . . Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one may start a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the sources of further new ideas (quoted in de Blasio and Di Addario, 2002: 7).

While classical economists who followed Marshall emphasized the economic incentives for skill building and disaggregated production in districts – agglomeration helped mitigate the risks of specialization – a group of Italian scholars emphasized the social components of districts. Giacomo Becattini, whose early studies helped revive districts as a research agenda (particularly in Italy), emphasized the importance of social relationships in districts’ economic outcomes: in Italian districts, small and medium sized firms were deeply embedded in local communities where employers and laborers lived and worked together; in fact, he wrote, “community and firms tend to merge” (quoted in de Blasio and Di Addario, 2002: 7; see also Tappi, 2003). Deep social relations between economic agents promoted long term cooperation among firms, facilitating disaggregated production and encouraging entrepreneurship (Becattini, 1990). Local institutions, including local governments, political parties, unions, employer associations, banks, church groups, and cultural organizations, supported social interaction and
community identification, which magnifies agglomeration effects. Several authors emphasized that what Brusco and Righi called “a climate of social consensus and strong credibility” were essential (though not sufficient) to the success of coordination, particularly between public and private sectors (1989: 405; see also Bianchi et al, 2001).

Though much of the literature on industrial districts focuses on disaggregated production and small firms, it is important to note that large companies have played a vital role in many areas. In Prato, for example, textile production until the end of the 1940s was dominated by large, integrated mills. Only in the 1950s, when postwar recession and the loss of old markets caused the shutdown of several large factories, did skilled ex-factory workers turned entrepreneurs set up small workshops (Lazerson and Lorenzoni, 1999: 240). Likewise, in the hosiery district of Castel Goffredo, the bankruptcy of a large, vertically integrated firm (Noemi) unleashed the workers who became the key links in the new, small firm network (ibid). Moreover, in some districts, lead firms continued to play a key role even as the constellation of small firms grew. Basile and Giunta report that in districts that have responded to globalization by upgrading, the process was “usually piloted by a lead firm” (2004:11).

Economists and sociologists tended to emphasize the market-based and local explanations for the emergence of industrial districts, but national political institutions played a large role. A vibrant population of small firms was key for fostering flexibility, skills transfer, and innovation in Italian
industrial districts. As Lazerson (1995) catalogues, Italian tax laws and industrial relations institutions encouraged an environment of small, often family-run firms. Small firm employees were ineligible for generous unemployment benefits, saving their employers 5 to 10 percent on indirect wage costs. In addition, artisanal status qualified firms for subsidized credit and exemptions from certain labor regulations. And laws that make overtime costly spared family firms, where artisans substituted sweat equity for paid labor (Weiss, 1988: 51).

As Italian regulations encouraged the growth of small networks of firms rather than vertical enterprises, small enterprises in turn encouraged flexibility and skill transfer. One manufacturer in Como, Italy’s silk region, followed a typical strategy: despite success and ample capital, the owner-manager decided to remain small in order to avoid government and union regulations. Instead of expanding his own firm, he capitalized local start-ups, often run by relatives or ex-employees (interview with firm IT-AX). The original firm financed and leased machinery for the new firms, and provided them with production orders and technical oversight. By investing in other district firms, the manager expanded his firm’s sales capacity and revenue without subjecting himself to increased regulation. At the same time, he helped produce a set of technically adept manager/entrepreneurs.

Since small firms couldn’t afford large amounts of fixed capital, breaking up the production processed allows for greater flexibility and efficiency at each
Where vertical US producers traditionally combined spinning, weaving, dying, and finishing in the same firm (if not in the same building), Italian district producers split these steps between firms. However, stretching production across firm boundaries—particularly for textiles and apparel, where aspects of the final product like "hand" or feel, drapery, and color have been difficult if not impossible to codify—required common understanding of the production process. As one the head of Biella's employers' organization said, echoing Marshall, "here, textiles are in the air" (interview with IT-X). The district model of production rested on this assumed baseline to facilitate the easy transfer of tacit knowledge. The need for firms to work with and for competitors also relied on the trust acquired through iterated market and non-market interactions.

Where American textile firms' strengths were rooted in expensive capital machinery, as standard technology brought weaving out of homes and small workshops and into large, paternal, corporate mills, the roots of Italian success were both humbler and more ingenious. In Prato, the system of small and medium-sized enterprises stemmed from the failure of Fordist weavers. When machines were transferred from large firms out to the workshops of small subcontractors, they were often modified by local craftsmen in idiosyncratic ways. In recent interviews, several managers reported they purchased standard capital equipment from global manufacturers, but 'tweaked' the machines in-house. These informal customizations, which firms claimed
reaped significant production and quality advantages, were protected only as trade secrets (interviews with I-TN, I-TAJ, I-TK, and I-TU).

Customizing machinery was just one example of the tacit knowledge produced in, and generally contained in, Italian industrial districts. Distinct qualities of textile and apparel products (including fit, feel, and color) have long been difficult to specify, particularly when compared to other industrial products. Efficient sub-contracting for these items required a high level of tacit knowledge gained through iterated interactions. The small scale of most Italian textile and garment enterprises, combined with their reliance on secrecy rather than patents to protect technological advances, reinforced their dependence on tacit – and therefore local -- knowledge.

Italy’s weak national government encouraged firm owners, municipal politicians, and labor leaders to forge informal, negotiated solutions outside of the national political system (Berger and Locke, 2001). Because these solutions were based on trust forged through iterated interactions, they tended to be local, thus building and reinforcing the district system of production. Employer organizations in industrial districts provided entrepreneurs with a means to pool resources for R&D, market research, international marketing, and training.

Italy’s weak formal education system, which focused almost exclusively on the state labor market and was protected by the government from private sector demands, also encouraged managers and workers to find local, often
tacit, solutions to skill needs (see Chapter 2). Universities were far removed from the economy, and technical high schools, which in industrial districts did have ties to industry, had to follow national curriculum dictates; formal education in Italy historically correlated with unemployment (Barbagli, 1982).
Figure 4.1: Tertiary Education in Italy, the US, and Germany

Tertiary attainment for age group 25-64

Source: SourceOECD download, Sept. 2007.
Perhaps unsurprisingly, levels of formal education were lower than in other OECD countries (see figure 4.1). In textile districts, formal education levels remained below the (already low) national average through the 1990s. Drawn by hot labor markets, workers left formal education for the mills at young age, and were trained largely on the job. Family firms groomed the new generation for management, sometimes after university studies in related disciplines, but often not. As exports from Italian textile and apparel firms boomed in the 1990s, employment was as low at 2% in areas like Biella — in fact, Biella faced a shortage of workers and began to employ North African immigrants to fill open positions (interviews with industry association and textile workers’ union).

Local technical institutes, like Texila in Biella, Istituto Tullio Buzzi in Prato and ENFAPI in Como, played an important role in socializing young workers into their industries.23 However, while these local schools and training centers were valued by many employers for providing a base of knowledge, Italian textile and apparel workers acquired higher level skills informally. In particular, training centers played a limited role in the transmission of medium and high level skills. Given the highly flexible division of labor between firms in districts and the often ad-hoc nature of technological

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23 A public-private partnership of local banks, textile firms, and unions, Texilia provided textile workers with hands-on experience on cutting-edge combed wool machinery — a task that public technical schools, with their nationally devised curricula and regulations, were at the time ill-equipped and ill-inclined to do. Eventually, Texilia expanded its mission to include a research consortium and partnered with government schools, including the local istituto tecnico and a new, branch campus of the University of Turin (interview with Texilia trainer, 1998). See also Mistri, 1999.
advancement in the districts, training could not be standardized (Alberti, 2001). Many of these skills were learned on-the-job, a type of training that in pure market conditions would be expected to produce specific skills (Becker, 1986, see also Thelen, 2004, chapter 1). Given the importance of sub-contracting relationships in district production and relatively high labor turnover in productive regions, however, the resulting capacities are better understood as tacit, district-based skills than as firm-specific skills.

Skills are notoriously difficult to measure. The most common proxy for skill is the level of formal education (either years in school or hours in training), a measure that fails to capture Italian district workers’ skills. As Dunford (2006) demonstrates in the figure below, value-added in the Italian textile and clothing industries continued to increase from 1970 through 2000, in sharp contrast to the sectors’ competitors in the UK, Germany, and Denmark. In fact, Italian manufacturers fetched high prices on world markets: Italian imports to the US, for example, counted for only .62% of the total volume of US imports, but for 2.25% of the dollar value (see Figures 4.2-4.5). Italy’s success in high end markets suggests a rephrasing of Polanyi’s famous phrase “we know more than we can tell”. In Italy, industrial districts’ export success demonstrates that ‘they know more than the statistics tell’.
Figure 4.2: Value Added in Textiles and Clothing

Figure 1 Trends in TCI value added 1970-2002 Source: elaborated from OECD (2003a)

<table>
<thead>
<tr>
<th></th>
<th>Index (1970=100)</th>
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</thead>
<tbody>
<tr>
<td>Textiles and clothing</td>
<td>200</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>160</td>
</tr>
<tr>
<td>Textiles and clothing</td>
<td>120</td>
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<tr>
<td>Manufacturing</td>
<td>80</td>
</tr>
<tr>
<td>Textiles and clothing</td>
<td>40</td>
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</table>

United Kingdom

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<tr>
<td>Textiles and clothing</td>
<td>200</td>
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<tr>
<td>Manufacturing</td>
<td>160</td>
</tr>
<tr>
<td>Textiles and clothing</td>
<td>120</td>
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<tr>
<td>Manufacturing</td>
<td>80</td>
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<tr>
<td>Textiles and clothing</td>
<td>40</td>
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West Germany

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<tr>
<td>Textiles and clothing</td>
<td>200</td>
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<tr>
<td>Manufacturing</td>
<td>160</td>
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<tr>
<td>Textiles and clothing</td>
<td>120</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>80</td>
</tr>
<tr>
<td>Textiles and clothing</td>
<td>40</td>
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</tbody>
</table>

Denmark

<table>
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<th></th>
<th>Index (1970=100)</th>
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<tbody>
<tr>
<td>Textiles and clothing</td>
<td>200</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>160</td>
</tr>
<tr>
<td>Textiles and clothing</td>
<td>120</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>80</td>
</tr>
<tr>
<td>Textiles and clothing</td>
<td>40</td>
</tr>
</tbody>
</table>

Source: Dunford, Michael, "Industrial Districts, magic circles, and the restructuring of the Italian Textiles and Clothing Chain" Economic Geography, 2006; p6.

Figure 4.3: Italian Shares of US Textile Imports, 2006

<table>
<thead>
<tr>
<th></th>
<th>% Share of Volume, in Square Meter Equivalent</th>
<th>% Share of $ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>0.62</td>
<td>2.25</td>
</tr>
<tr>
<td>Apparel</td>
<td>0.23</td>
<td>1.85</td>
</tr>
<tr>
<td>Non-Apparel</td>
<td>0.92</td>
<td>3.57</td>
</tr>
</tbody>
</table>

Figure 4.4: Costs of US Textile Imports by Country of Origin

Average Cost of US Imports of Non-Apparel Textile Imports by Source, 2006

Source: Calculations based on OTEXA data, downloaded Sept. 2006.
Figure 4.5: Costs of US Apparel Imports by Country of Origin

Cost of US Apparel Imports by Source, 2006

Calculations based on OTEXA data, downloaded Sept. 2006.
III. Globalization Shocks: Italy’s Textile and Apparel Sector Faces New Challenges

During the 1990s, as manufacturers in the US and Germany began to scour the globe for low-wage production locations, many Italian textile and apparel managers remained confident largely as a result of their high-skill, high-quality, high-end strategies. Even through 2000, most Italian managers still felt it vital to maintain a production presence in the districts due to the local abundance of skilled labor. 32% of the firms in MIT study volunteered that the high level of skills in their home district was actually what rooted them; an additional 9% said they stayed on shore for reasons of innovation, intellectual property, or a worry about foreign creating competitors.24 One manager boasted of his plant’s ability to change over 50 looms per day, “a number that would make the Chinese faint,” he said. “Italians have a great ability to change quickly. Our DNA is different, and our creativity is very great” compared to American competitors, he said (interview with Firm I-U).

However, after the new millennium, exports slowed and Italian confidence began to wane. Though the textile/clothing industries in Italy had seen downturns, many managers and industry insiders described the situation after 2000 as more structural than cyclical (interview notes). According to

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24 JP Fergusson compiled these figures from the MIT Globalization Project Data. Because the study was structured as a series of open-ended interviews, not all firms were asked directly about skills or why they chose to keep production at home.
Sistema Moda Italia, the textile/apparel employer association, the number enterprises in the sector dropped from 73,344 in 2001 to 61,624 in 2005, a drop of 16%; employees fell from 609,600 to 524,900, a 14% dip. Turnover declined by 15% and production by 18% in the same five year period (see Figure 4.6).
Figure 4.6:

THE ITALIAN T/F SECTOR (2001-2005)
(Millions of Euro, current values)

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnover</td>
<td>61.194</td>
<td>57.890</td>
<td>55.297</td>
<td>53.528</td>
<td>51.923</td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-5.4</td>
<td>-4.5</td>
<td>-3.2</td>
<td>-3.0</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>53.227</td>
<td>50.935</td>
<td>48.269</td>
<td>46.189</td>
<td>43.703</td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-4.3</td>
<td>-5.2</td>
<td>-4.3</td>
<td>-5.4</td>
<td></td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-3.3</td>
<td>-5.9</td>
<td>1.0</td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-7.8</td>
<td>-8.8</td>
<td>4.7</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Trade balance</td>
<td>14.802</td>
<td>13.674</td>
<td>12.091</td>
<td>11.891</td>
<td>11.004</td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-7.6</td>
<td>-11.6</td>
<td>-3.3</td>
<td>-5.9</td>
<td></td>
</tr>
<tr>
<td>Domestic market</td>
<td>38.425</td>
<td>37.281</td>
<td>36.178</td>
<td>34.498</td>
<td>32.899</td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-3.0</td>
<td>-2.9</td>
<td>-4.6</td>
<td>-5.2</td>
<td></td>
</tr>
<tr>
<td>Companies (number)</td>
<td>73.344</td>
<td>71.082</td>
<td>68.857</td>
<td>64.376</td>
<td>61.824</td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-3.1</td>
<td>-3.1</td>
<td>-6.5</td>
<td>-4.3</td>
<td></td>
</tr>
<tr>
<td>Employees (thousands)</td>
<td>609.6</td>
<td>596.0</td>
<td>567.0</td>
<td>543.2</td>
<td>524.9</td>
</tr>
<tr>
<td>Yoy % change</td>
<td>-2.2</td>
<td>-4.9</td>
<td>-4.2</td>
<td>-3.4</td>
<td></td>
</tr>
<tr>
<td>Employees/Company (number)</td>
<td>8.3</td>
<td>8.4</td>
<td>8.2</td>
<td>8.4</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural indicators (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export/Turnover</td>
<td>47.3</td>
<td>48.3</td>
<td>47.6</td>
<td>49.7</td>
<td>51.2</td>
</tr>
<tr>
<td>Normalized trade balance</td>
<td>34.3</td>
<td>32.3</td>
<td>29.8</td>
<td>28.2</td>
<td>26.1</td>
</tr>
<tr>
<td>Attitude to import (on turnover)</td>
<td>30.5</td>
<td>32.4</td>
<td>33.0</td>
<td>35.6</td>
<td>38.0</td>
</tr>
<tr>
<td>Attitude to import (on production)</td>
<td>38.8</td>
<td>38.4</td>
<td>39.4</td>
<td>43.2</td>
<td>47.6</td>
</tr>
</tbody>
</table>

Source: SMI-ATI, ISTAT, Movimprese and SitaRicerca

As import quotas gradually relaxed in anticipation of the expiration of the Multifiber Agreement in 2005, Italian producers lost market share at home and were forced to trade in less protected markets abroad. Competition from low wage countries began to threaten not only low-end producers, but creep into higher-value added niche markets that Italian firms had dominated. One industrial district worker, with 25 years experience at her firm, said that, “Until around 2000, Prato worked. Now. . . .” (interview at firm I-TR). A sense of crisis was prevalent throughout our interviews. As one manager in Italy’s silk district said, “Here in Como, we’ve already lost the low and middle end. Even our niches are in danger” (interview with I-TW).
Figure 4.7


Italian Textile and Apparel Exports, 1970-2004

Source: ISTAT download, August 2006.
When high-end markets came under threat, features of the Italian production system that had supported firms’ traditional strategies also buckled. A wave of mergers resulted in the closure of several ‘local banks’, at the same time larger banks began to measure creditworthiness according to standards set outside their districts (Tappi, 2003). Managers and potential entrepreneurs complained of a lack of access to capital (interviews with firms It-AG, R, U). R&D collaboratives stalled. Finally, as we will detail below, the failure of some firms and a trend toward vertical integration for others reduced the number of local suppliers and clients in the industry. All these developments reduced the flexibility of firms, which had allowed them to remain so competitive despite competition from low wage producers.

Adjustment Strategies of Italian Textile Firms

Clearly, the Italian model of textile/apparel production, which had proved so resilient in the 1980s and 1990s, had to adapt. To survive in the new era, Italian textile firms turned to a variety of strategies, including relocating production, improving efficiency at home, supplying clients on a just-in-time basis, expanding their reach to the ends of the value chain, and branding their products. In all these strategies, Italian firms aimed to capitalize on their historic strength: tacit skills.

Relocation the Italian Way
Compared to garment plants, textile mills were not labor intensive, but even textile managers could not ignore the pull of low labor costs forever. In the early 1990s, the firms in our sample were still committed to production within Italy: only two of twenty textile companies had any manufacturing outside the home country. But by the end of the 1990s, half of the firms had invested in production facilities outside of their headquarters, in Eastern Europe, Latin America, or China (interview notes). Many managers felt pressured to set up production facilities in low wage areas where their clients – apparel manufacturers – had begun to source (ibid).

However, the Italian firms’ pattern of foreign investment differed significantly from the arms-length pattern seen in the US fashion industry. Compared to American fabric makers, Italian textile companies were likely to send their own employees to oversee the foreign ventures as on-site managers, were more committed to keeping a large chunk of high value added activities in the home country, and were more willing to reassess the success of foreign expansion. Graziano (1998) found that in 70% of FDI operations, Italian firms retained control via majority ownership or other forms of control. Italian firms in our sample reported that they moved to stay close to key customers and to gain access to new markets, rather than primarily in search of low labor costs. New production locations were established specifically to maintain lower-value-

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25 As discussed above, several large US firms did establish new mills abroad, particularly in Mexico. However, when large US-financed mills failed to find early success, large textile companies followed the example of some smaller American firms and began to source, at arm’s length, from foreign firms.
added product lines that were no longer profitable to produce in Italy, or to produce intermediate goods that would be finished back at headquarters (interviews with Firm I-X and Firm I-AL; see also Lynch, 1999).

Though a few firms reported success with foreign ventures, many were surprised at how difficult the adjustment was. Expat managers proved difficult to recruit and expensive to retain. As one firm owner said, “If I didn’t go to China, no one else would” (interview with IT-AG). At one sewing contractor, owners were forced to offer equity stakes in order to get Italian managers to relocate to the new production site. Another manager lamented that his foreign venture required too much direct oversight: “I now spend 50% of my time in China, and have it under control. Every time I go back it’s unraveled a bit and I have to tighten things up” (Firm I-L). Another entrepreneur considered setting up an operation in China, but decided that corruption made the environment too risky, and that he would have to spend “too much” time there (interview with Firm I-AB).

Though some firms did manage to slash costs for factory labor, many found that maintaining Italian managers at foreign plants could cost twice or three times as much as at the home office, which cut significantly into projected savings. Moreover, capable local managers proved difficult to find or train: one large textile firm, which had set up a spinning plant in the Czech Republic in 1994 and tried to train local talent, still maintained Italian managers on-site in 2002. Another manager complained that he had to
maintain fifteen Italian expat managers in Romania at 100 times the cost of local workers there.

In addition, firms that had moved production to low wage countries often found labor and other expenses in the new location actually cost more than their highly productive workers back home. A men’s shirting mill near Milan provides one example. By the mid 1990s, the firm’s management began to fear low-wage production, and decided to invest in a joint venture in Asia. The new, state-of-the-art, greenfield mill was built in a region traditionally known for its weavers. However, despite a difference in total labor costs of $70 per month for Asian workers and $2300 for Italian workers, productivity of the firm’s Italian workers was so much higher that total labor costs per unit of production were $6 in Italy versus $15 in Asia (interview with firm I-U). Distressed at the Asian site’s slow learning curve, the Italian parent company managers began to spend more and more time at the Asian plant, working with local managers to increase productivity. But by 2002, the Italians gave up, and were looking for someone to purchase their stake in the JV. The firm’s president found the host culture a serious impediment to knowledge transfer, and finally concluded that the quality and productivity gap was too great and unlikely to close. Another manager, who had set up a manufacturing plant in China, raved about how adept and diligent the workers were. He did say, however, that teaching the Chinese to recognize and appreciate quality was his greatest workforce challenge.
This is one example of a common problem with Italian mills’ foreign investments: the tacit knowledge base, which facilitated trade in industrial districts, proved difficult to transmit to new environments, and the district experience and mindset of Italian managers proved a hindrance in organizing ventures abroad. Of 19 firms in our sample that set up production in low wage countries, all reported significant problems, particularly with finding or training local managers, and three eventually abandoned their foreign locations (interview notes). As the owner of technical textiles firm, a rare manager who considered his firm’s investment in China a success, explained:

I watched how Americans worked in China. They made very, very detailed lists of tasks. Their experiences in working in the US with low skill, unqualified workers prepared them for operating in China. They’re organized for dealing with stupid people (interview with IT-L).

Better and Faster from Home

If expanding abroad required managers to shed their Italian mindset, another common strategy for competing in the global market required firms to be ever more Italian. These firms reacted to low-wage competition by increasing flexibility and quick response: “Our philosophy: we do little things in little volumes. We focus on sophisticated, top of the line products, not product for a mass market. We can fill orders in fifteen days” (interview with I-AB).

Another manager described his firm’s inventory policy not as just-in-time, but “just in case”. Of course, maintaining large inventories of high quality
goods in Europe is expensive, but enough customers were willing to pay a premium for last-minute, guaranteed supply that the inventory costs were a good investment. Yarn spinning firms, which produce an undifferentiated product and were perhaps most vulnerable to low wage competition, were particularly adamant about their need to provide customers with immediate, local delivery. As one manager said, “Our strategy is to be able to offer our customers everything. We now have the full range of spun products” (interview with Firm I-M).

Firms that aspired to quick-turn, niche production, one-stop shopping, or just-in-time supply aimed to provide far better service than competitors in low wage countries, and to command a price premium as a result. But some Italian district managers argued that their workers’ superior productivity made their firms competitive with low-wage mills: “We contain labor costs because our workers are multi-skilled and we rotate them among machines,” said one manager (interview with I-AB).

Closer to the End Customer: Building a Brand
In addition to securing quality and supply, many firms wanted to touch the end customer. Several textile firms experimented, with varied success, with launching clothing lines. Even with well-laid plans, however, entering the garment market was risky for textile managers, who reported that they were wary of alienating their clients (apparel designers and manufacturers) by
becoming competitors (interview with Firm I-AB). Though some managers were skeptical of the value of ‘Made in Italy’ and brand names for intermediate goods like fabrics (Firm It-R), other managers aimed to build a market for branded textiles. One manager said his company bought a small, struggling competitor in order to get their brand name and their well-regarded designers (interview with Firm I-U).

Bringing the District into the Firm: Verticalization

Another common strategy of firms in Italian textile districts was vertical integration. Rather than outsource steps in the production process to local partners, several of the most competitive firms were expanding their activities along the value chain, often through acquisition of smaller suppliers. In becoming vertical producers, these lead firms had two main goals: 1) to maintain control of quality and delivery, and 2) to capture higher value added steps on the value chain, including design and marketing. According to one textile manager, in a world of global competition, “bigger is better” (interview with IT-M). An integrated firm could control relocation of low-end production or supply from low wage areas, but still maintain high quality, quick response, and niche designs, he explained.

In addition to concerns about managerial control, the direction of fabric innovation may have pushed verticalization, as new technology evolved “towards innovations able to lead to a higher integration among the different phases of processing, in order to make production more flexible and reduce the
time of the process” (Alberti, 2004: 12). As a silk manager explained, once his firm moved from making simple silk to weaving more complex products, he could no longer outsource production to ‘terzistis’ as had long been his practice. The old structure didn’t work for the new products, he said, so he brought back the looms he had leased to sub-contractors and now conducts all production in-house (interview with Firm I-AB). But despite the technological push to integrate production, many firms stuck to their traditional strategies of coordination and niche specialization. According to Alberti, surviving smaller firms combined to streamline production – often integrating weaving, dying, printing, and finishing – but these groups of small firms rarely had relations with customers outside the district and most had not been able to capture the higher value-added functions like marketing (Alberti, 14).

For weaker firms, stabs at vertical integration could seem to outsiders as signs of desperation. Several firms with little or no experience reported moving into the production of consumer goods. Examples include a handkerchief producer in Como that tried to launch a fashion line, learning painfully that they lacked the design expertise and market knowledge to compete in the ultra-competitive garment sector (interview with Firm I-AM), and an apparel component supplier that bought a stake in Sicilian garment firm, describing the investment as “an experiment” and an attempt to “to do something” in face of rising competition in its core product markets (interview with firm AL). The Sicilian firm produced high quality men’s suits, and with the new investment,
would begin producing under their own brand, hoping later to attract orders from major US labels. What the northern component supplier brought to the venture, other than capital, was unclear.

Evidence from our in-depth interviews for the trend toward vertical integration has also been confirmed by large studies of Italian districts (Camuffo, 2004; Alberti, 2004). The integration trend supports the varieties of capitalism hypothesis that firms will respond to exogenous shocks with strategies based on their institutional advantages. Firms in industrial districts traditionally competed in high-end niches by employing flexible production, based on tacit knowledge. In face of international competition, successful firms aimed to retain tacit knowledge as a source of advantage. This know-how, once available informally in the district, became increasingly elusive when some firms closed, others relocated parts of production overseas, and still others moved into different market segments. As a result, lead firms decided to secure the knowledge by bringing it in-house.

Adjustment Strategies of Italian Fashion Companies

In the US, clothing manufacturers’ globalization strategies differed sharply from textile firms’ adjustment plans. As in Italy, US textile and apparel production differed: clothing manufacturers were more labor intensive and typical garment assembly required lower-skilled labor than textile production, but apparel companies were also closer to the end customer. Like their
American competitors, Italian clothing firms were better situated than textile firms to take advantage of branding as a means to capture value. However, where US apparel managers broke early with textile interests, aggressively pursuing overseas, arms-length sourcing and open markets from the 1980s while textile manufacturers argued for increased protection and experimented with FDI, the globalization strategies of Italian garment companies were more aligned with those of Italian textile firms. Like Italian mills, clothing companies relocated some production, upgraded operations at home (including speeding time to market), moved forward on the textiles/apparel value chain (in many cases, into retail), and focused on building brands.

Out of Italy: Producing Abroad

Despite clothing managers’ universal emphasis on the commercial value of a “Made in Italy” label, firms in our sample had relocated a significant chunk of garment assembly to Central/East Europe or Asia. Branded companies were drawn by low labor costs, and non-branded firms often co-located at the behest of important clients. However, Italian managers reported significant differences in off-shore strategy and execution than their American and German counterparts.

First, branded firms limited what they would produce in host countries to non-core goods. Lower-end goods, including T-shirts and simple knits, were prime candidates for sourcing outside Italy, while signature items like denims
(for a branded sportswear company) or men’s wool suits (for a designer apparel firm) would always be produced at home, managers reported (interviews with firms I-A and I-AH). Though managers mentioned that Italian quality was an important reason for keeping core production at home, they emphasized the marketing reasons behind their decisions: the “Made in Italy” cachet on signature items could be extended via branding to less expensive goods.

By selective outsourcing, these firms hoped to maintain the image of “Made in Italy” quality while reaping the benefits of “made in Eastern Europe” labor costs. As one luxury sector manager said, his firm “has always carried the ‘Made in Italy’ label. For us to move toward non-EU countries for production will require a radical change in culture. It’s radically different from what we do now.” However, the same manager was spearheading a plan to move production of the more simple items in the line to a low wage site (interview with I-C). While he didn’t anticipate quality problems – the onsite Italian managers would be able to avoid those – he feared that delivery times from central Europe could be erratic.

Second, because they were eager to maintain control of their supply network, when venturing abroad most Italian managers invested directly in new facilities or at a minimum worked closely with captive suppliers (interview notes). This preference for ownership contrasted starkly with US clothing companies, who embraced arms’ length supplier relations and full-package production in the 1970s and 1980s, and went further than German apparel
firms, who preferred close supervision of supplier companies to ownership of overseas facilities. The experience of Italian clothing manufacturers also contrasted with their textile compatriots: unlike Italian textile managers who set up shop in low-wage environments, many clothing managers reported big gains in labor productivity by moving out of the home country. One firm, a producer of luxury men’s and women’s trousers, reported that shop floor workers in Portugal, though only half as expensive as their Italian counterparts, were equally productive (interview with IT-F). Romanian workers, whose wage costs equaled one quarter that of Italian workers, were 70% as productive. Another firm, which had set up a plant in the Czech Republic, reported that Czech workers earned 20% of wages in Italy, but were 80% as productive (interview with I-K).

Relocation, however, did carry some unexpected costs. To get the factory in Portugal up to speed, Firm F had to send five Italian technicians to work on site at expat wages, and had to offer equity participation to induce Italian managers to relocate (interview with IT-F). In its Czech plant, Firm Q had successfully hired local skilled technicians, but reported no success in training local managers. Other firms reported difficulty moving to non-Italian locations. A large footwear firm, with fifteen expat managers at its Romanian production location, paid the Italians three times the average salary of an Italian worker in Italy (interview with I-O). Firm P, another example, stepped back from sites in Indonesia and Morocco as those investments proved too
difficult to manage. Firm V’s poor results with various sub-contractors in central and east Europe convinced its managers that success required a directly owned, and Italian-managed, subsidiary (which they set up in Romania). For smaller companies, the expense and hassle of managing production abroad often proved too much: as one hosiery company manager said, explaining his decision to withdraw from Romania, “Here [in Italy], we use all our machines” (interview with I-H). In Romania, lack of skilled operators and maintenance personnel meant that capital often sat idle.

The few firms in our sample that did try to hire sub-contractors off-shore reported difficulties (interviews with Firm V and others). In fact, the only firm in our sample to report success with American-style arm’s length subcontracting was a footwear company that successfully relocated production to Asia. Managers there credited an American consultant as key to the transition from Italian production to Chinese sourcing (interview with IT-S). Non-branded fashion companies were more apt to report that production in Italy, despite high labor costs, remained more efficient than moving to lower wage locales. One firm, which had opened a factory in Romania, bemoaned that though quality at the new site was finally up to its Italian sister-plant, production costs were higher in the new local (interview with Firm I-V).

*Staying at home: for efficiency, for ‘Made in Italy’, and for innovation*
Other managers remained committed to home-country production despite more efficient production abroad. One luxury firm reported that costs at its Spanish plant were 25% lower than in Italy, but planned to maintain its Italian production. Managers at this firm (Firm I-I) believed that the value of a "Made in Italy" label was increasing, and would more than compensate for higher production costs at home. Other firms reported that even as more garment assembly moved to low-wage sites, management committed to maintaining prototype and sample-making facilities in Italy. One manager of a trouser maker argued it was vital to maintain a presence in Italy because his firm's success depended on innovation, and the environment in Italy was more stimulating than at satellite production facilities: "Here is where the product is conceived" (interview with Firm I-P). This belief that a firm must be co-located with the innovative center of its industry echoes the literature on tacit knowledge and innovation (Nonaka, 1994, Cole, 2003).

For branded and non-branded Italian garment firms alike, proximity to Italian innovation and design was a key reason for loyalty to production at home. Some firms reported that relying on the traditional flex-spec strategy, moving up-market into high-end niche markets, was no longer viable in face of global competition. "Even our niches are in danger. China and India are creative, too, and can go after the high-end market," said one tie manufacturer (interview with Firm F). However, other specialist producers were more confident in their unique quality and ability to innovate. At a piece dyeing firm
near Milan, which sells nothing under its own brand name, the proprietor had faith in his up-market niche strategy: “When potential clients come here, I tell them we are the most expensive of all the firms that do what we do. But we give them the highest quality. . . . Clients go, but they return. We won’t lose money” (Interview with firm I-J).

*Branding and Retailing*

Two-thirds of the garment firms in our sample reported that some of their production was sold to end consumers under the firm’s own brand names. One firm reported attempts to end licensing relationships, as management felt that they could earn a better return than the traditional 5-8% fee by producing or arranging production of the goods in-house (interview with firm IT-A).

However, branding was far from a sure-fire strategy. Managers at firms that predominantly sewed for other firms’ labels reported tiptoeing toward building or strengthening in-house brands, as, like textile manufacturers, they feared alienating their customers and losing orders for others’ products (interviews with firms I-U, I-J, I-P). Moreover, building a brand from scratch was a challenge, particularly for firms who were inspired by the business case to do so but lacked a clear design platform and marketing expertise (interviews with firms I-C, I-AL, I-AM, and I-AX).

Even for firms that already had a strong brand presence, moving forward along the value chain into retailing proved difficult. Fixed costs in retailing
were high, and managers found negotiating foreign retail markets a particular challenge (interviews with firms A, D, I, X). Italy's biggest international retail success, Benetton, expanded its retail presence aggressively in the US during the 1980s and 1990s, only to close most of its stores by 2000. The firm, with successful retail outlets throughout the EU, reentered the US on a smaller scale after 2001 (Misonzhnik, 2001).

Focus on Design
More than ever, Italian garment managers reported that their strength remained high quality fashion design. None of our interviewees reported offshoring R&D for garments, even for detailed or technical design, and most remained adamant that even sample making would remain in the home country. At a tour of one high-end factory about 90 minutes outside Milan, managers indicated that several members of the firm's design team were on site, overseeing construction for the next season's collection (Firm I). Managers believed that integrating design with execution, at least at the prototype stage, was absolutely vital to ongoing success, and that would keep sample making and some garment production at home in Italy. According to fashion historian Valerie Steele, a strong understanding of textile production and garment construction has long been considered the base of Italian fashion design (Steele, 2003).
However, at the same time firms recognized superior design as a sine qua non of survival, several fashion managers reported that recruiting talented designers was increasingly a problem. In the past decade, famous Italian brands like Gucci and Cerrutti imported foreign-trained designers to spearhead their signature collections, and many design teams included non-Italian members. One branded sportswear maker sponsored, at considerable expense, an annual international competition for young designers in hopes of hiring the best contestants (Firm AH). But firms in our sample, particularly those outside of Milan, reported that recruiting and retaining design talent was a constant concern. Alberti (2004) found that firms in Como had particular trouble holding onto stylists, to the extent that the district was no longer a center of creative design: “Today, these high-value phases are outside the district”.

**Bringing the Outside In? Immigration and District Production**

As some textile and apparel firms evolved away from the district model via verticalization or experiments in off-shoring, other became ‘less Italian’ even though they stayed at home. As discussed above, formal education rates in wealthier parts of Italy, including industrial districts, were lower than the national average, consistent with the Italian norm that reversed the oft-found correlation between high levels of labor market success and formal education. In postwar Italy, school attendance and degree attainment rates instead followed unemployment: where labor markets were active for youth, students
left the classroom for the workshop (Barbagli, 1984). However, throughout the 1990s, a series of Italian education reforms (which raised the school leaving age to 18) and an international secular trend toward higher education dampened young workers' enthusiasm for production jobs (interview notes). As Italian workers gained more formal education (Rechi, 2007), textile industry associations and individual employers reported that job market entrants turned down their noses at textile and apparel production (interview notes; also IT-AC and IT-D).

In several industrial districts, firms solved labor shortage problems by hiring large numbers of immigrants, predominantly from North Africa and China. Though the period after 1990 saw large increases in immigrants in many areas of Italian life, the textile and apparel industries were particularly affected: Murat and Paba (2004) compared over thirty industry and service sectors, and found the share of immigrant workers highest in leather and shoe production, followed closely by textiles and clothing. This influx of low wage labor contributed to Italian competitiveness in the 1990s: Fioretti (2001) argues that large numbers of clandestine and low wage workers from China helped Prato, in particular, keep up. In Carpi, a knitwear district, union officials estimated that Chinese workers comprised one-third of the textile and apparel workforce, though almost half of the 1600 immigrant workers were undocumented (Hadjimichalis, 2006). In a short decade, immigrants managed to transform the industrial landscape in Prato: one study found that 2,500 of
Prato’s 4,275 textile factories had Chinese owners – and predominantly Chinese workers (Nadeau, 2007).

Presumably, these new workers, though at the bottom rungs of the production hierarchy, were successfully integrated into the factories, and the foreign-born entrepreneurs into marketing networks. There is little evidence that either district training institutions facilitated the integration of these migrants, however. Alberti found managers in Como believed the local institute “to be mis-positioned in the local education system and still far from satisfying the local training demand” (2006: 13). Many Chinese-owned firms hired native Italian designers and worked with local agents (Nadeau, 2007). But the longer-term impact of this influx of non-Italians on tacit-intense network production at the time when the district system experienced its greatest challenges merits further investigation.

Collective and Political Responses to Globalization

Just as globalization required managers to respond with updated (but still tacit-intense) production strategies, textile and apparel industries organizations regrouped but focused on old strengths. In contrast to the US, where apparel and textile interests divided over their stances on trade liberalization, Italian employer groups consolidated in 2005, forming one
national association to represent fashion manufacturers throughout the textile/apparel chain. Sistema Moda Italia, the organization consistently pushed for market protection, especially preferential rules of origin: SMI's representatives were called 'the worst enemies' of trade liberalization by a negotiator at another EU textile employer organization (interview with G-GT). Representatives of Italian industry have successfully argued for European labeling rules that favor the domestic industry (allowing, in some instances, cloth woven in China but dyed in Italy to bear the 'Made in Italy' mark). SMI lobbied consumers, too, sponsoring successful marketing campaigns to bolster the international image of Italian fashion products as high style and high quality.

The sizable literature on industrial districts often points to employer organizations as key nodes in the transfer of knowledge, and vital institutions for collective research and development (Brusco, 1982, You and Wilkinson, 1994). However, outside of marketing and lobbying, firms reported mixed views of their associations. Some local organizations were proactive in responding to delocalization. In one example, an organization in the Veneto set up a service in Romania to help its Italian members cut through the red tape entailed by foreign direct investment and off-shore production (interview with IT-V). Città’ Tessile in Biella, another industry association, began to provide training for workers in off-shore factories (Texilia, 2006). However, none of the companies in our sample reported that district business associations were
important in determining or executing their in-firm responses to globalization.

Several managers bemoaned a lack of skilled workers, particularly younger workers, but few saw local institutions as the answer (interview with firms IT-K, IT-N, IT-R). In fact, as Rolfo and Vitali found in their study of Biella, there is a structural discrepancy between the specific needs of competitive firms and the ability of associations to provide general solutions:

[The basic] failure was the discrepancy between the training demand and the training supply: the former asked for a low-cost and generic training program, as all the new workers are trained on the specific machinery within the firm; the latter supply a high-cost and specific program, as the machineries were new and innovative. . . .

Within the district the innovative needs are highly personalized (as was seen with the training needs) and limited to solutions to a specific problem. Therefore, it is very difficult for the local technological operators to put forward a research topic that fulfills the technological needs of the whole district and that is at the same time sufficiently “operative” (that is, aimed at solving connected problems) and thus worthy of investment by the firms (1998:4).

According to one manager in our sample, the district-run R&D centers were neither big nor strong enough to answer the threat of competition from Asia (interview with I-E). As in the past, textile and apparel firms continued to provide most of the industry’s training and innovation in-house. However, in spite of a lack of demand for associations’ services and many industrial district managers’ clear frustration with the employer groups, Alberti’s longitudinal analysis of Como found that between 1998 and 2002, individuals in the silk industry continued to share a belief that “Institutions are at center stage of our
activity”(2004:15). This attitude may reflect that even if their formal training and R&D programs have failed as mechanisms for up-skilling, district institutions, like the employers’ association marketing collaborations and local university’s textile program, continued to be seen as a locus for the transfer of tacit knowledge.

One executive at a large synthetic fabric company argued that for many firms it was no longer an advantage to have close ties in the district: successful firms were getting larger, and strategizing with an international scope, so they had little reason to forge tight relationships with local partners (interview with Firm E). In fact, as successful firms increased the scale and/or scope of their activities and unsuccessful companies shut their factories, incentives to invest in local organizations diminished, resulting in the diminished organizational capacity, provoking a downward spiral. One cashmere yarn spinner, who reported a boost in orders after two local competitors shut their doors, still worried about the thinning out of the textile/apparel supply chain in Italy: “If cotton and wool production go to China, the supporting firms, including dyers, and the training system will go too. Now, we have a textile environment here. That culture does a lot,” he said (interview with Firm IT-N).

Conclusions: Globalization and Industrial Districts

The Impact on Skill Building
Recent research in political economy highlights firms’ production strategies as a central variable in the creation, maintenance, and evolution of structural political economic institutions. Yet little attention has been paid to how firms decide which strategies to execute, and how their choices are shaped by institutional factors.

This chapter investigated the globalization strategies of Italian textile and apparel firms. I argued that weaknesses in Italy’s formal education and training structures, together with Italian regulations that favored small firms, led managers to develop a system of networked production based on tacit knowledge. Managers chose tacit-intense production strategies aimed at exploiting that knowledge. When threatened by new international competition, most successful Italian textile and apparel firms behaved as ‘varieties of capitalism’ scholars predicted. They fell back on their strengths: a system that allowed maximum flexibility to create outstanding quality, creative products, with quick response to market demand. Underlying this flexibility were Italy’s highly competent textile and apparel workers, who learned their advanced skills on the job and shared a tacit understanding of the industry. Agile managers, talented craftsmen, and creative designers formed the backbone of firms’ various responses.

Workforce skills can be viewed as a ‘make or buy’ decision: in the past, Italian managers chose to create skills locally, due to the insufficiency of state-sponsored formal education and training. Italian firms have often chosen to
keep skills creation close to home: this allowed firms to share tacit knowledge, but may be a disadvantage in creating and managing production relationships that span national boundaries.

In the past, local industrial district institutions and social ties facilitated the transfer of tacit knowledge. Recent changes in Italian industry structure (both seeking low wage advantages through directly owned offshore production sites, and the vertical integration of previously disaggregated production) provided new solutions to the old coordination problem – how to build and share tacit knowledge. But it’s far from clear that this emerging structure is stable, and can remain a base for solving the problem of skills.

Through bringing tacit knowledge into the firm, verticalization attempted to maintain control of product quality and reliable supply. But by thinning the production network, verticalization could undermine the system’s traditional strengths. First, districts achieved flexibility by spreading risk among a large number of smaller firms. Vertical firms, with few or no local sub-contractors, have to bear all risk of capital investments on their own. Second, more vertical firms and fewer SMEs undermine the strength of employer organizations. Less collaborative R&D and market research, combined with diminished entrepreneurialism, restricts the flow and transfer of information. If, as one Biella entrepreneur claimed, that in the districts, “textiles are in the air”, concentration of firms threatens to make the air stuffy. Verticalization, and its accompanying hierarchical structures, particularly threatens knowledge
diffusion (Alberti, 2004:13). Converters, for example, the traditional
middlemen who often organized the stages of production across several small
firms and spread knowledge of new products and processes, are being
squeezed out of the value chain.

In some ways, the cumulative result of these changes has been a move
from production fragmented between firms but within regions to production
that may be consolidated within companies but can span borders. As many of
our interview subjects found, the high skills and tacit knowledge at the base of
their production strategies proved stubborn to graft to new locales. As Italian
fashion companies add sourcing and producing to their list of international
activities, a few interviews revealed a shift from tacit-intense production to a
greater reliance on explicit knowledge. Firms most successful at off-shoring
had managed to convey Italian quality standards with as few expat managers
as possible, in some cases by breaking down technical and quality information
into small, explicit bites – that is, by becoming less Italian (interviews notes).

Fashion historian Valerie Steele credits Italy’s designers’ success to their
close relationships with the innovative and high-quality domestic textile
industry (2005). While selective off-shoring puts that relationship at risk, the
trend toward vertical integration in the Italian fashion chain seems to be an
attempt to secure this traditional advantage. However, the medium to long
term consequences of a system based on larger firms with less dynamic local
districts remains unclear. Industrial districts produced the skilled workforce
responsible for Italy’s incremental innovations in the industry, but an ever-greater share of young workers choose formal education over the on-the-job variety. Rather than reinforce traditional strengths of the Italian system, these changes suggest a challenge to the tradition tacit-intense production and innovation in Italy.
Chapter Five

Textiles and Apparel in Germany:
High-end Production, at Home or Abroad

Unlike the US training system, which was born of union/employer discord that it never overcame, or the Italian skills system, which considered the needs of the state rather than skill needs in the labor market, the German apprenticeship system has been regarded as the basis of Germany’s successful export-driven, diversified quality production strategies (Streeck, 1987) and as means of producing both high skills and high wages (Soskice, 1988). A large body of literature, discussed in chapters one and two of this dissertation, discusses how the system has managed to balance the interests of firms and workers in order to encourage business and individual investment in training. The resulting ‘German Skills Machine’ fueled Germany’s high-end, high export, manufacturing-oriented economy in the postwar years (Culpepper, 2001; see also Streeck, Soskice and Finegold, Thelen, OECD 1994, Acemoglu and Pischke 1998). In recent years, however, as German producers face the challenges of radical new technologies and increased international competition, the ‘German skills machine’ seems to be sputtering (see Wagner, 1999, Thelen, 2004, Busemeyer, 2007).

While several studies investigate the impact of globalization on training institutions, we know less about the impact of training institutions on firms’ evolving practices in international markets. But the link between skills institutions and production strategies is crucial. Streeck argued the
apprenticeship system sits at the foundation of the high level of craft-based skills in Germany, and encouraged and reinforced a set of strategies, called 'diversified quality production' (DQP),\textsuperscript{26} that allowed German firms to compete at the high quality, high price end of the market (1992). If domestic skills institutions have been central to German employers' strategies through much of the postwar period, how do these existing VET systems impact firms' decisions on outsourcing and cross-border production?

This chapter examines the impact of workforce skills on German firms' globalization strategies through lens of the textile and apparel industries\textsuperscript{27}. In the next section, I discuss theories that link skills institutions to production strategies, and their implications for political economy generally, and for Germany in particular. In Section III, I introduce the textile and apparel industries as case studies for tracking the relationship between training institutions and business strategies, and outline recent challenges to producers in the two sectors. In section III, I discuss the globalization strategies of German apparel firms, and then in section IV, German textile firms.

To preview the findings, I argue that German institutions, which produced a broad base of highly skilled technicians for the industry, steered firms toward a high-tech strategy for production at home, and high quality strategy for out-sourced production. German firms maintained more

\textsuperscript{26} For the importance of craft skill on German high-end export production, see also Herrigal (1996, Thelen, 2004, Finegold and Soskice, 1999, Steedman and Wagner, 1988).

\textsuperscript{27} Data sources include 24 interviews at firms and four at supporting institutions in Germany, as well as national statistics and secondary sources and over 80 textile and apparel interviews in other countries. See Appendix for details.
managerial control over outsourced production than their competitors, even when production had been relocated to lower-wage countries. German employers had close relationships with offshore suppliers, often providing on-site technical assistance and quality control. As a result, successful firms were able to leverage advantages of low-wage production but continue to compete in high end markets. Though German firms shed jobs at a similar rate to their American competitors, the jobs they held were more likely to be high-skilled (and higher wage) positions. Germany's edge in production, based in its strong skill-building institutions that resulted in an industry-specific skill profile, gave German firms a clear advantage in the period of intense globalization. However, in recent years, fewer apprentices have joined textile and apparel firms; German technical institutes are filled with foreign students, and overseas competitors continue to increase their know-how. How enduring Germany's skills advantage it will be remains unclear. I discuss the implications of my findings in Section V.

Skills Institutions and Production Strategies: Theories and Implications

As outlined in the introduction and in chapter two of this dissertation, in the 1980s and 1990s Germany emerged as the ideal case of a society with a 'high skill, high wage' labor market equilibrium: a human capital system that fostered high investment in – and returns to – skills, for employers and workers alike (Streeck 1987, Finegold and Soskice, 1988). Thelen writes:

In the literature on contemporary labor politics, Germany's vocational training system has conventionally (and quite correctly) been seen as a
crucial institutional support for the country’s high-skill, high-wage, high-value-added manufacturing economy. As such, the vocational training system has been viewed as a key element in a larger institutional complex that actively supports a production regime organized around a kind of ‘diversified quality production’ that reconciles Germany’s strong unions with strong performance in world manufacturing markets (2004: xii).

Some scholars, in fact, view training systems as the key element in determining preferences for social policy, and as a causal explanation for the variety of social protection and even electoral systems across democracies (Soskice and Iversen, 2001, Iversen 2003, Mares 2001, Cusack and Iversen, 2007). According to these political economists, once a national skills profile becomes established, it becomes self-reinforcing. Employers choose production strategies based on the skills in the local workforce, then support other policies that will sustain their access to the skills they have grown to rely on. Thus, skill-building institutions become interconnected with other key political economic institutions, and tend to be stable over long periods of time (Hall and Soskice, 2001, and Mares 2001). Estevez-Abe et al (2001) argue, in fact, that social welfare protections are put in place not primarily to buffer individuals from the whims of the market, but rather to structure individual’s incentives to invest in skills that are in line with national production strategies.

This literature assumes that production strategies, particularly high-quality production strategies, were decided based on availability of a skilled workforce. Production strategies then determine employers’ preferences not just for skill levels but also for political and social policies to ensure continued access to workers the particular skills they need. In coordinated economies,
employers resist any interference from government that threatens firms’ access to the skills they rely on (Thelen 2004, Wood 2001), and in environments without strong existing coordination, even sustained reform attempts by motivated governments tend to produce feeble results due to lack of strong industry support and participation (Jacoby 1999, Martin 2000, Culpepper 2003, Finegold and Soskice 1994). Indeed, evolution and revolution of publicly-supported skills systems (and, perhaps, the social protections designed to sustain them), depend on firm preferences, which are grounded in production strategies. As Culpepper writes:

... Government policy and partisan turnover are the wrong places to look for the politics of institutional change in skills systems. As in other parts of the political economy, much of the battle over social change may take place beyond the parliaments and bureaucracies under whose light many political scientists prefer to look for political conflict (2007:612).

In recent years more attention has been to change in formal political economic institutions (Streeck and Thelen, 2005, Culpepper, 2007, Thatcher, 2004, Hancke et al 2007). However, the link between those institutions and changing national production strategies is less well understood. In the Varieties of Capitalism literature, employers’ production strategies are central – they determine political preferences, and in turn the resilience of political economic institutions and of social welfare policies – so this lack of attention is puzzling.

As explained by Streeck (1989), German producers arrived at diversified quality production strategies in an era of relatively closed borders, tight labor markets, and integrated production. Germany’s dual system managed to
created incentives for firms and workers to invest heavily in skill formation for specific industries (see Chapter two, also Thelen 2004). Key to the success of the system was its ability to attract top quality workers. Unlike in other European countries where state-run vocational schools were detached from firms and viewed as repositories for the less talented, the German dual system was seen as an alternative path to advancement in a career (Regini, 1997). In fact, workers with certified skills had access to good jobs, and many dual system graduates went onto further training and management positions (Culpepper, 2001). As long as employers were active participants in the system, and apprenticeships led not only to good, skilled jobs but the opportunity for advancement off the factory floor, dual system training was an attractive option, and many talented students committed to learning industrial skills. Since apprenticeship drew talented young workers, firms had a strong incentive to invest in the training programs (in order to gain access to the best labor market entrants), and to orient training to high-level, industry-specific skills (in order to maximize returns to their investment in training). Germany’s apprenticeship systems solved the problem of underinvestment in skills by rewarding firms that invested in training and mitigating opportunities for poaching skilled workers by firms that failed to invest (Streeck 1991, Wagner, 1998, Culpepper, 2003).

The willingness of so many workers to invest in higher-level industrial skills fueled a German production system hallmarked by quality and differentiated products (Streeck 1988, Soskice and Finegold 1992, Culpepper...
Managers arrived at DQP strategies as a way to maintain competitiveness in export markets despite high labor costs and high regulation. But just as globalization opened new markets, the emergence of disaggregated production and global supply chains expanded the universe of managers’ potential production strategies (Berger, 2006). Indeed, as Lane and Probert (2004, 2006) indicate, globalization allowed firms to escape the regulatory and resource confines of their home environments.

The logic of DQP argues that managers chose strategies to leverage the strength of industry-skilled workers at home. Will coordinated national institutions still structure production decisions outside the home country? How do workforce skills in the home country impact production choices? To address this question, I track the case of globalization in Germany’s textile and apparel industries.

*Textile/Apparel Training and Production: Background and Recent Challenges*

As in other countries, in Germany, textiles were among the first industries to develop. By the 18th century, textile districts emerged in Saxony, Rhineland, and Wurttemberg, where small and medium sized firms often competed with larger British mills by focusing on non-competing products, including hosiery, lace, worsted wool, and silk hats, produced with flexible machinery (Herrigel, 41). After World War II, as increased consumer buying power fueled the industry, textile and apparel production moved further away from their origins as a craft for home use to a factory-based “mass production
based on mass consumption” (Faust, 12). As Herrigel reports, the textile industry was the largest industrial employer in the newly-formed West Germany and the country had a huge pent-up demand for clothing and household fabrics (167). During this period, German clothing manufacturers adopted specialized, single purpose equipment (a machine, for example, for sewing only collars) designed to speed up production of large runs (Faust, 12). Textiles companies invested heavily in capital equipment to reduce the need for labor (Adler 2004, Taplin 2006).

However, this Fordist configuration for the industry was limited and short-lived. From the 1970s, consumer demand both slackened and diversified (Faust, 12). At the same time, German producers began to feel competition from lesser developed countries, many of which had targeted the apparel industry as an entry into export-led development (13). Though these pressures were common in advanced economies, German textile and apparel firms faced a very different regulatory environment than American and Italian competitors. As we have seen in previous chapters of this dissertation, US firms repeatedly sought low-wage, non-union labor (in the US South, for textiles, and in immigrant-heavy cities for garments). Italian firms relied heavily on family labor (Capecchi, 1990) and took advantage of a system of regulation that allowed small firms to skirt many labor regulations (Lazerson, 1995). In Germany, strong unions and strict enforcement of labor regulations cut off low road/low wage production strategies available to firms in other western countries (Faust 2004, Lane and Probert 2006).
With low road strategies eclipsed by German regulations and union strength, by the 1970s clothing producers returned to multi-purpose machines that enabled firms to respond to flexible demand (Faust 2004:14, and Steedman and Wagner, 1988: 306). German managers’ continued investment in machinery was atypical of clothing firms internationally, and designed to leverage the high skills of German workers. Steedman and Wagner (1988), in a comparative study of German and British firms in the 1980s, found that in German plants, more than 75% of machinery was less than five years old, whereas in a comparable sample of British firms, over 75% of machines were more than five years old (298). The newer machinery was a worthwhile investment for firms trying to get the most out of their more expensive workers: labor cost between 50-100% more for German firms than their British counterparts, Steedman and Wagner reported. Moreover, flexible machines allowed German managers to take advantage of their more skilled workforce: 80% of all machinists in Germany had completed a two-year apprenticeship; in Britain not a single production employee in the sample matched those qualifications (303). German supervisors had completed three year apprenticeships and “meisters” managed technical planning and production sequencing. Better trained technicians were able to minimize waste and speed up production: one manager estimated that skillful technicians saved 12 percent of his total production cost. Finally, Steedman and Wagner found, in over 2/3 of German firms, the manager or owner had completed a two or three
year tertiary-level course in clothing technology; few British managers had specialist training.

The wide skills gap between the workforce available to German managers and that in other high wage countries impacted the organization of production. With their more qualified workers, German managers ceded low-end markets and adopted high performance work strategies: instead of setting compensation based on piece rates, as had been common in Germany and as remains common in the apparel industry internationally, German managers organized workers into groups and quality circles (Adler, 1986). Flexible, quick response strategies required workers to shift quickly and easily from one production run to the next, a situation only possible due to Germany’s highly trained production workers. The result was a clear example of Streecks’ diversified quality production: Steedman and Wagner found German producers have moved into products with higher value-added – produced in small batches with more styling and more detail – and have virtually abandoned the production of long runs and simpler standardized styles to low-wage countries . . . . It is remarkable that average German products exported from this section of the industry (women’s jackets and suits) sell on export markets at more than twice the price of corresponding items from Britain, and that total German exports of women’s clothing was twice the value of British exports (1988: 305).

In addition to high end production in Germany, firms began to outsource production to lower wage jurisdictions. Relocated production, particularly to east and central Europe, was encouraged by the 1982 Outward Processing Trade Agreement. Designed to bolster western European textile producers, OPT allowed firms to re-import clothing fabricated in certain CEE countries
from West European-made textiles back into West Europe with additional tariffs due only on the value added. German manufacturers were more enthusiastic on OPT trade than all their Italian, French, and British counterparts, and in 1988, organized six times the OPT production as French firms, their nearest large competitor, and 200 times the volume of Italian producers (see Figure 5.1, Dunford and Greco, 2004). Through early embrace of OPT, German apparel manufacturers gained experience overseeing production at distant sites (Faust et al, 2005).

As the very existence of the OPT agreement indicates, by the 1980s many in the apparel and textile industries recognized a growing international division of labor in the industry. Managers undertook a government-supported program during the decade to reorient production around flexible work organization, to better utilize the skills base provided via the apprenticeship system (Faust, 17). Though the program’s initial goals were not attained, Faust

**Figure 5.1: Outward processing of clothing, 1988-98**

<table>
<thead>
<tr>
<th></th>
<th>Outward processing of clothing</th>
<th>Average annual rate of growth</th>
<th>Share of total extra-EU imports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Euros million</td>
<td>%</td>
<td>1998</td>
</tr>
<tr>
<td>France</td>
<td>200</td>
<td>347</td>
<td>463</td>
</tr>
<tr>
<td>Germany</td>
<td>1216</td>
<td>1830</td>
<td>3246</td>
</tr>
<tr>
<td>Italy</td>
<td>6</td>
<td>21</td>
<td>316</td>
</tr>
<tr>
<td>Netherlands</td>
<td>161</td>
<td>209</td>
<td>369</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>41</td>
<td>35</td>
<td>145</td>
</tr>
</tbody>
</table>

reports that managers did realize some increase in flexibility: “It is an irony that the skill base provided by the German vocational system was less relevant to develop a production system in line with the idea of ‘diversified quality production’ at home, but rather to develop a cross-border production network with the help of the ‘German’ apparel technician” (Faust et al, 2005: 17).

In the textile sector, the apprenticeship system also formed the backbone of diversified quality production. Most firms were capital intensive, and participated in dual system training for production workers and technicians. In addition, Germany’s strong textile machinery sector and world class textile engineering institutes fueled know-how in the industry (interview notes). Like clothing managers, textile manufacturers harnessed workforce skills to implement flexible manufacturing and new technologies:

... textiles and apparel producers, which had wallowed in a marginal backwater of inefficiency during the era of mass production, also enjoyed a recovery and rapid rates of growth in the 1980s. ... Successful manufacturers in these sectors were those who were able to move up-market into higher-quality products, integrating traditional manufacturing skill with new technologies while at the same time being attentive to consumer demand (Herrigel, 1996:182).

Top managers at German textile firms often rose through the technical ranks rather than sales (interview notes). As Herrigel notes, many textile firms saw a boost in the 1980s due to Outward Processing Trade. In fact, Germany continued to be one of world’s largest textile exporters in the 1980s and 1990s, even as domestic apparel manufacturing capacity fell.

Adjustment Strategies in Apparel since the 1990s
As discussed, apparel firms in Germany began to deal with low wage competition in the 1970s, and subsequently embarked on an international production strategy earlier than many competitors in the US and Italy. However, as Steedman and Wagner (1989) found, firms’ decisions keep high end production at home while outsourcing lower priced goods built of the strength of their skilled workforce: “Germany’s apprenticeship system and other skill institutions allowed firms to globalize production without a major loss of technical capacity and to continue to compete on their workforce’s technical superiority despite dispersed assembly” (304). Though apparel employment did decline in the 1970s and continued to suffer in the 1980s, the industry continued to employ over 164,000 workers as late as 1990 (see Figure 5.2, Figure 5.3).

**Figure 5.2: Companies, Employees, Sales, and Exports In the German Apparel Industry**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of employees</th>
<th>No. of companies</th>
<th>Sales (billion €)</th>
<th>Exports (billion €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980&lt;sup&gt;a&lt;/sup&gt;</td>
<td>248,776</td>
<td>3,210</td>
<td>10.60</td>
<td>1.55</td>
</tr>
<tr>
<td>1985</td>
<td>118,132</td>
<td>2,456</td>
<td>11.30</td>
<td>2.30</td>
</tr>
<tr>
<td>1990&lt;sup&gt;b&lt;/sup&gt;</td>
<td>164,023</td>
<td>2,074</td>
<td>13.70</td>
<td>3.11</td>
</tr>
<tr>
<td>1995</td>
<td>105,872</td>
<td>1,252</td>
<td>12.04</td>
<td>2.70</td>
</tr>
<tr>
<td>2000</td>
<td>66,199</td>
<td>695</td>
<td>10.74</td>
<td>3.11</td>
</tr>
<tr>
<td>2001</td>
<td>60,889</td>
<td>613</td>
<td>10.51</td>
<td>3.12</td>
</tr>
</tbody>
</table>

Notes: "the numbers for 1980 and 1985 refer only to the former federal territory of west Germany; the values for 1990 and later are for East and West Germany; delimitation according to WZ 93-statistical frame. These are enterprises with more than 20 employees. Source: Statistisches Bundesamt (n.d.); und Zeitreihen des Statistisches Bundesamts, 5400077, Produzierendes Gewerbe, Betriebsergebnisse insgesamt, nach Hauptgruppen, Abschnitten, Unterabschnitten, Abteilungen, Gruppen und Klassen der WZ93, Bekleidungsgewerbe (18), www-zr.destatis 2002 (German Federal Statistical Office, National Accounts, Manufacturing Industry, Wiesbaden) Source: Adler (2004:305)
However, in the 1990s, as producers in low wage countries continued to increase production and upgrade quality, and as quotas on imports were gradually eliminated in anticipation of the end of the MFA in 2005, the industry went through a major structural change. Employment was gutted by over 66%; output also fell, by a less drastic 23.3% (see Chart 5.2). Adler (2004) reports that 58.9% of German apparel production remained at home as late as 1987; by 2002, that figure had fallen to 19%. Home-based production continued to trend down, according to our respondents. In his survey of the industry, Faust (2004) found “only a few cases left in which manufacturing comprises more than making prototypes and parts of sample production” (30).

But the news was not all dire. Despite an ever more intensely competitive landscape, German firms remained export-oriented: they
accounted for almost one-fifth of the EU’s sales to non-EU countries in 2000 (Euratex, 2002) and the industry’s 6% export growth rate since 1995 was higher than their counterparts in the US, the UK, and Italy (Groemling and Matthes 2003, cited in Lane and Probert 2004). Moreover, German firms managed hold on to more of their better jobs. Faust reports that white collar employment as a percentage of total employment in German apparel firms jumped from just over 20% in 1991 to over 45% in 2004 (see Figure 5.4). In comparison, the share of non-production work grew also in the US apparel industry during the same period, from 11% in 1992, but remained far lower, at 22%, in 2004 (see Figure 5.5).

5.4: Employment Structure of German Textile and Apparel Industries
% White Collar Employees, 1991-2004

Source: Faust (2005:57)
5.5: Employment Structure of US Textile and Apparel Industries:  
% Non-Production Workers, 1991-2004


How did the German industry manage to increase exports and maintain high end employment during restructuring? In interviews, German managers talked about several general strategies to compete in the new environment—including upgrading product line and product quality, strengthening brands, increasing fashion content, and gaining more control over marketing and distribution—that sounded familiar from interviews with American and Italian managers. But German apparel manufacturers implemented these strategies in very different ways than their counterparts in other high wage countries.

Unlike the majority of competitors in the US who adopted arm's length sourcing or the Italian garment assemblers who globalized late, often preferred

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28 Of course, not all strategies were common to all countries. For example, some US firms intended to continue to compete at the mid- to low-end of the market; no German firms embraced this as a primary strategy.
to set up wholly-owned subsidiaries, the predominant mode of production relocation for German apparel firms was highly coordinated contracting of high end products. Indeed, as Lane and Probert argue, German apparel globalization strategies enabled German firms to maintain the product standards consistent with diversified quality production and a strategy of branded marketing . . . . However, the German approach also required a greater commitment of effort and expenditure, obliging them to recreate, in an individualistic way, the level of skill that had been supported by institutional structures in their domestic setting (2006: 63).

While American firms sourced large chunks of their products via arm’s length relationships with suppliers or agents, German apparel firms continued to control production even when they did not own the overseas facilities. Continuing this up-market, diversified quality production was only feasible given German firms’ ready source of highly skilled technical workers.

Despite the fact that German clothing firms were shedding workers over this period, industry maintained a trainee to employee ratio of 7.5% in 2001, and apprentices continued to learn tailoring skills (Lane and Probert, 2004:17; see also Figure 5.6). Though firms maintained their commitment to training, as training ratios held steady, overall numbers of trainees declined along with overall employment – by half in textiles and by 2/3 in apparel (see Figure 5.3).

In interviews, managers said that only with close supervision from home-trained technical personnel could they source abroad and maintain quality standards (interview notes). The ready supply of capable supervisors willing to travel to new supplier sites was key to managers’ strategies. After 2000, home
production was extremely limited, but “operatives at the technician level have become the backbone of production organization and quality monitoring in foreign production sites of both third-party suppliers and within company subsidiaries” (Lane and Probert 2004: 46).

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textiles</td>
<td>4669</td>
<td>4822</td>
</tr>
<tr>
<td>Apparel</td>
<td>3312</td>
<td>3144</td>
</tr>
</tbody>
</table>

Eurostat Download, June 8, 2008

In relocating high-end production predominantly to Central and East Europe, relationships with supplier firms were highly coordinated, as would be predicted by Varieties of Capitalism theory (Hall and Sosckice, 2001). German firms were more likely to retain control over the selection of fabric and other inputs than competitors in the UK and the US. In many cases, the German client firm provided credit and machinery to their suppliers (interview notes). German firms provided close support and oversight: nine of thirteen firms in our sample reported a significant presence at the suppliers’ facility, via full-time quality control managers employed by the German lead firm or via frequent visits from German technical staff. But as they retained control, many German firms also transferred know-how. Faust (2005) reports the example of a German clothing manager invested in a Romanian production site at the urging of his (German) customers: “The entrepreneur stressed that he was only able to establish and develop the green-field project in Romania
because he as able to use the highly qualified personnel (technicians) from his factory at home. Only after this had been achieved the German location was closed down” (34). Suppliers who had trouble reaching German standards for quality and delivery times were given advice and granted time “to improve and adapt”, said one respondent (interview with firm Ger-A6). Another manager reported not only sending technicians to its suppliers, but inviting suppliers’ employees to Germany for training (interview with firm Ger-A8). Most firms reported that having expensive expat oversight was meant to be a transitional strategy:

At the beginning of the expansion of the company, for example, in the Far East, we had more German expats, but since then we only have a small number of expats. Our policy is to build up or to look for experienced people in the relevant country and also to manage the company they the local people, rather than having for example a German or a European as the boss (interview with firm Ger-A3).

Given this large investment in their suppliers, it is unsurprising that German managers preferred to buy a high volume of their suppliers’ production capacities (Lane and Probert, 61). As one manager said: “With our quality control system with production, I think we influence our suppliers heavily, so sometimes they are treated as our own factories” (interview with firm Ger-A1).

In contrast, a US sourcing manager was not at all happy to hear that his firm was the sole customer of one supplier, and ordered the supplier to diversify its clients (interview with US-AF).

Though recreating DQP was a success for many German firms and their non-production employees, the strategy was not without risks. In disengaging from production and in replicating their home skill base, German firms clearly
jeopardized a key competitive advantage. This tension was clear in our interviews. One manager states clearly that maintaining production know-how is a key goal:

We still have technicians, who are experts in design and in quality and fabrics and production methods and techniques. . . . It was clear for us in the beginning that we do not want to outsource this know-how that we have. Even though, as I mentioned, we don't have any production facilities here any more, we still had a sample production until two years ago or one year ago here even, where we could experiment with samples. And of course also, when few days before a [trade] fair started, we could still say ‘we need this sample here’ and they did it overnight. So this flexibility of course we don’t have anymore. But still it was our strategy not to outsource our complete know-how. Not only design, but also the know-how with regards to production know-how (interview with firm Ger-A-13).

In fact, in contrast to US and UK clothing companies, several German respondents cited control over production – the selection of fabrics, the exact factories used, production specifications, the level of quality control – would be a business function that they would never outsource (interview notes). “We do the complete design in-house, we do the patterns in-house for wovens, we have quality control, we do the marketing, we do the strategy – we do all of that in-house,” said one manager (interview with firm Ger-A5). Another manager said he was ‘really sure’ that his firm would keep sample making and purchasing in-house, but then reversed himself:

We will keep in-house – I'm really sure of this because it's very, very important for us – the creation, the [prototypes] department. It's the heart of the company as I told you. We will also keep in-house our purchasing, that means the development of the materials and the close contact with the fiber industry. . . . If for example, and I hope this will not be the case, in ten or twenty years there will no longer be a textile industry in Europe, we must transfer our design to another region, because these always belong together. Design and the textile industry should be, is, very close (interview with Ger-A3).
The skills base developed in the German institutional setting was mainly used to develop a specific strength in product design, to upgrade their manufacturing partners abroad, and to establish adequate supply chain management systems (Faust, 44; interview notes). However, whether the German institutional context will continue to structure production decisions in this way remains uncertain.

The first question is whether the apprenticeship and further training system at home can continue to produce sufficient numbers of highly trained technicians to oversee this international version of DQP. Though apprenticeship profiles were updated as recently as 2006 (BiBB, 2006), and researchers report broad efforts in the German manufacturing sector to keep skill profiles up to date (Culpepper and Thelen, 2008), limited production at home provides trainees fewer chances to observe and experience the arc of production, and reduces opportunities for tacit skill transfer. In addition to negative effects on training outcomes, loss of production at home could impair managers’ capabilities, in oversight and in innovation, as well. According to one apparel firm manager: “You have to have a certain amount of own manufacturing capacities to know what’s going on regarding delivery times, deadlines, prices, calculation, and know-how. We have been losing know-how before because we did not have any high volume manufacturing site any more” (quoted by Faust, 2005: 32).
Second, apparel suppliers in low-wage countries have dramatically improved their capabilities in the past decade (interview notes; Faust, 2005: 44). Faust sees examples of a move from intense oversight and high quality production at low-wage suppliers to cost-cutting and a more loose supervision of suppliers. In one case, a private label producer decided to cut its number of suppliers from 200 to 60, sticking with larger sewing companies with presumably higher capacities. In streamlining its supply network, the German firm was able to not only cut transportation costs and lead times, but to reduce “dramatically” its workforce of traveling German technicians (Faust, 2005: 44). The German employees, whose main function had been quality control and technical support at the suppliers’ production cites, were replaced by technicians from host countries and employed by suppliers, but trained by the German firm.

Though most Central and East European suppliers had not developed the skills to produce to German specifications without close German supervision at the time of our interviews, Faust reports that “there are some hints that a number of CEE originated companies have developed their capabilities” (2005: 40). Several of our respondents also remarked on supplier upgrading, particularly in China (where producers are known as having great technical capacity and very low costs, but no design talent) and in Turkey (where producers are more expensive, but produce very quickly and are increasingly a source of design ideas) (interview notes). Since German apparel firms’ relative success in Europe has been squarely based on the technical
skills of the home staff, these improvements in workforce skills abroad could be destabilizing.

Adjustment Strategies in Textiles since the 1990s

Compared with apparel construction, textile manufacturing is relatively capital-intensive. Employment declines in apparel during the 1980s and 90s were primarily due to trade and weak demand, loss of employment in textiles during the same period is better attributed to increased productivity (Dunford 2006: 12). The impact of trade on Germany’s textile industry was mitigated by Outward Processing Trade Agreement, which encouraged apparel firms to order EU-origin fabric to retain favorable terms for re-importation. Though the German textile industry did not grow during the 1980s (as the American and Italian industries did), German textile firms managed to hold on in terms of production and employment (see Figure 5.7).
But the 1990s proved a period of painful adjustment for textile firms. Employment halved, from over 200,000 in 1992 to less than 100,000 in 2004; over the same period, the percent of managerial workers increased in the industry (albeit less dramatically than in apparel) from about 24% to 31%. The product mix of many firms shifted away from traditional apparel textiles and toward technical products (interview notes). Unlike the textile employer organizations in the US and Italy, the German Gestamtextil trade group disavowed protectionist goals and exhorted members to prepare for an onslaught of low-wage competition via upgrading at home and international production strategies (interview notes). Just as apparel manufacturers marshaled the technical strengths of their workers to supervise outsourced production, textile firms leaned on their engineers and high-skilled line workers to reorganize German firms. In the tradition of diversified quality production,
firm managers employed strategies to meet intensified global competition based on high skills, high responsiveness, and coordinated technological advances.

*Upgrading and Overseas Investment in Manufacture for Apparel*

For German textile firms that planned to remain competitive in the apparel subsector, managers emphasized their capacity for highly efficient, large production runs and just-in-time supply around the globe (interview notes). These firms aimed to be a one-stop-shop for apparel company sourcing managers; they aimed to provide inputs for garments in the country of assembly (interview with GerT-3), and with the customer’s desired country of origin (interview with GerT-4). Managers emphasized the need to concentrate on high efficiency, relatively large production runs. “We won't be a specialty supplier. We say, we need to fill our lines with mass, cost-competitive products,” one manager said, “We have better know-how and we’ll be competitive [in mass products]” (interview with GerT 6). Another manager, who claimed that producing for small niches was popular with customers but largely unprofitable, said “we don’t want to be too Italian” (interview with GerT-3).

For a couple smaller firms, upgrading within the apparel sub-sector was an important complementary strategy. One producer of elasticized fabric was enthusiastic about joint research to create a comfortable, lightweight fabric with UV protection built in (interview with GerT-2). Another producer felt that increased fashion content in his line of corduroy for apparel would complement
his firm’s growing product line in filtration parts (interview with GerT-11). Some firms in our sample reported that their technical support was a major advantage in the service they could offer clients around the world. One manager reported that ten or fifteen years ago, technicians at client garment factories had a higher level of training. By 2000, technical skills had declined in Europe and were even lower in Asia. This manager felt the training and technical support offered by his firm was a major advantage over his competitors (interview with GerT -1).

Overwhelmingly, managers felt that their best chance to remain competitive in mass production despite high German wage rates was to leverage their talented engineers and skilled production workers. One manager said that the ratio of engineers to production workers in his firm was 1:5 (interview with GerT-10). Local textile trade schools and textile engineering programs provide a ‘good base’ of skills for his workforce, which he shores up with lots of internal training. Each of his production workers has been trained for a second job, and one-third of his production workers can be shifted to any job on the shop floor. The cross-training has increased flexibility, the manager reported, and allowed the plant to run the equivalent of 3 1/2 shifts instead of 3. More shop-floor flexibility has enabled management to speed up special-order production and decrease worker and machine down-time – none of which would have been possible without the workers’ high level of basic skills.

Several managers did admit that employment levels in Germany would have declined even earlier if managers had not taken seriously social
commitments to their home region, and these managers planned to reduce domestic headcount via attrition rather than lay-offs or plant closings. However, despite anticipated decline in employees in Germany, these managers considered mass production a core capacity and a competitive advantage (interview notes). Though the MFA system of quotas on apparel imports expired in 2005, complicated rules of origin remained, still determined import duties, and compelled some customers to demand EU-produced inputs – another reason that apparel textile producers will maintain production at home (interview with GerT-5). Only one firm, a mass-producer of commodity consumer products, was planning on moving all production out of Germany (interview with GerT-6).

Though producers maintained committed to home production, most had experience or plans for sites abroad either through wholly-owned subsidiaries or joint ventures. A few of the largest firms in our sample established international production in the 1970s, seeking new markets as much as labor savings (interviews with GerT-1, GerT-4, GerT-5, and GerT-6). A second wave of firms began global production in the 1990s, establishing manufacturing bases in the former East Germany and other areas of Central and East Europe. Managers reported that initial productivity levels at these sites were abysmal,

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29 In another large, diversified textile firm, a recently hired buyer for its curtain division planned to carve a role akin to an Italian converter. The new employee would take orders from (mostly) German clients, and have curtains and other decorative fabrics produced to their specifications by lower-cost Asian producers, a function that managers felt (if it proved successful) could cannibalize rather than complement in house production. However, this firm planned to maintain production at home for less mature product markets, like technical textiles (GT-9).
and all required a serious investment of expat manager and technician time to achieve profitability (interviews with GerT-3, GerT--7, GerT--8). However, successful managers – particularly those producing for the apparel subsector – recognized that low-wage production cites would be crucial to long-term success in the industry, to take advantage of potential wage savings, and more importantly, to placate apparel customers who demanded co-located textile supply (interview notes). Evidence that wages were not the prime concern can be seen from the location of German textile FDI: after China, the high wage US, Spain, and (increasingly high wage) Czech Republic (see Figure 5.8).
One mill owner, an apparel supplier, contemplated setting up a site in the Asia to satisfy customers who wanted local supply for Asian sewing factories, and said that he was 100% certain he would have Asian production in place within five years. But this owner claimed that in order to match his current quality, even with the most up to date machinery, he'd have to send expat managers, paying them three times their home compensation. Foreign production made more sense in apparel, a much less capital-intensive good, than textiles, where he might need a ratio of one engineer to ten production workers (interview with GerT-2). This concern about skill was echoed both by firms who had successfully expanded overseas (after substantial costs in the
early years to raise productivity in the new location), and those struggling with unprofitable JVs in Asia (interview notes).

Some respondents cited relationships with Germany’s leading edge textile machinery makers as an advantage of home production. Germany textile machinery producers lead the world, claiming a 30% share of all exports, far above its nearest competitors Italy and Japan (TextileAsia.com download, July 2007). German textile firms often test prototypes of new machines, and modify them in-house for customized performance. According to Professor Peter Artz, head of a top German textiles engineering department, this relationship is mutually beneficial:

[Mills] know what they want and need, and they need to be in close contact with machine makers. First prototype installations have to be very close to the manufacturers. They run for a full year before the first sale. If we keep the machinery, the German industry will still be a major [textiles] exporter (interview notes).

Producing to the high end of the market, remaining highly capital intensive, and continuing to invest in the newest, most productive equipment would allow German textile production to beat low-wage imports (interview notes). Germany’s textile universities are also a major advantage. Heinrich Planck, another German textile engineering professor, explained that Clemson, the university with the top US textile program, “trains good managers, but they’re not technically well trained. They don’t know what can be done – they don’t have a feeling for the possibilities”, especially in technical textiles.

Away from Apparel: New Markets and Technical Textiles
The ‘feeling for the possibilities’ of textile production has allowed some German managers expand their product line toward new and growing markets. By 2003, only one-third of German textile output was destined for apparel (Beckman, 2003). According to fibretofashion.com, the share of advanced or technical textiles of all production in Germany was 45%, and trending upwards. The market for technical textiles, estimated at E60 billion, was the fastest growing branch of the textile industry, with average growth of 3.8% from 1985 to 2007 (fibretofashion.com download June 10, 2008). There is yet no clear and common definition for the category; ‘technical textiles’ included everything from filtration devices and inputs for new surgical equipment, to mass goods like the lining for the roof of a car and briefs for incontinence sufferers. Many of these products require high-end engineering and production skills. Given the surfeit of skills in the German production system, these new markets have been a natural draw for German textile producers facing bracing competition in the apparel sub-sector.

All of the large firms in our sample and four of the six small and medium sized firms counted at least some technical or medical textiles in their product range. Despite common rhetoric that textiles makers are now ‘chemists, not weavers’, moving into technical textiles has not been a panacea for German firms. Buyers of technical textiles are not easy clients: auto firms often demand expensive ISO 9000 qualification, require co-location in foreign production sites, and push hard on profit margins. Medical clients may be less

30 EC download, June 2, 2008: http://ec.europa.eu/enterprise/textile/techn_text.htm
price sensitive, but development costs for medical products tend to be high and volumes for non-commodity goods can be very low (interview notes). Moreover, as firms struggle to win apparel orders, many see technical textiles as a way to use excess capacity. These firms push down prices, even selling below cost, as they attempt to get a tow in the market (interview notes).

That said, technical textiles remained an attractive and growing market for many German firms. First, the market grew at a time when demand for EU-sourced textiles was shrinking. Auto companies, even though they can be difficult clients to work for, continued to increase in importance: one textile manager, whose division sold half its output to the apparel industry and half to autos, noted that in 2001, a Mercedes E class sedan required 3 meters of non-woven fabric; by 2003, the demand for each car had more than tripled (interview with GerT-9). Perhaps surprisingly, given the tough demands auto firms place on their suppliers, we found several small and mid-sized firms were also partnering with car companies (interview notes). Many of these products are co-developed, requiring a lot of communication between lead firms and suppliers, allowing for textile firms to gain new market savvy and technical know-how. In addition, several managers argued that since technical textile products were a relatively small part of the final good, and large amounts of production remained in the home economy, lead firm managers would be far less likely than apparel producers to take the risk of overseas supply (interview notes).
Moreover, development and production of these textiles takes advantage of German firms’ talented engineers and technicians. German firms also have a long tradition of larger than average investments in research and development than competitors (see chart X). One manager explained that while many advances in technical textiles come from fiber companies, “We have ideas too. If we have a patentable idea, we have a good enough relationship with DuPont to tell them about it” (interview GerT-10). The German firm, a small specialist producer, could perhaps patent their discovery in one country, but does not have the resources to patent its inventions worldwide. DuPont, German firm’s supplier of synthetic fiber, takes over the patent process, either buying or licensing the technology from its small German client. Continued focus on technology by successful firms is confirmed by macro statistics: as Figure 5.9 shows, R&D in the German textile industry dropped by only 13% between the years 2000 and 2005, despite a drop in number of enterprises by 25% and a decline in production of 16% during that same period.
Figure 5.9: Upgrading in the German Textile Industry, 2000-2005

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2005</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of enterprises</td>
<td>5057</td>
<td>3769</td>
<td>-25.48%</td>
</tr>
<tr>
<td>Total production value</td>
<td>15695.8</td>
<td>13140.5</td>
<td>-16.28%</td>
</tr>
<tr>
<td>Total Intramural R&amp;D</td>
<td>90.7</td>
<td>94.1</td>
<td>+3.75%</td>
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</tbody>
</table>


Though German firms reported no trouble hiring experienced engineers and technicians – given the downturn in the textiles, talent is available – several managers worried that they were unable to attract young people to the industry (interview notes). Prof. Planck of the Institute of Textile Technology and Process Engineering Denkendorf and Stuttgart University believed that public relations was an important part of his job:

We try to combat the perception of the textile industry as ‘dirty, dusty, old-fashioned.’ We need to show that [the textile industry] is innovative. At Stuttgart University, we tell young people that textiles is not just fashion but the technology is strong.

The industry’s backward image, Planck worried and others worried, threatened the long-term prospects the German technical textiles. Indeed, Planck reported that most of his graduate students were Turkish born and planned to return to Turkey after their studies.
Ironically, Robert Hassink (2007) found that textile’s backwards image may have helped the industry upgrade. In contrast to the shipbuilding industry, where plant closings were highly politicized, Hassink found that textile firms were allowed to restructure and upgrade without help, but also with limited interference from government. As one textiles manager explained:

Many local politicians dreamt about attracting so-called ‘future industries’ and had no understanding of textile interests ... Also state (Lander) policy had no interest in our industry during a long time . . . . An unprecedented change occurred from a wage-intensive production to highly capital-intensive production processes – and this with own efforts, without state subsidies, as we know them until today from other industries, particularly also in North Rhine-Westphalia (German textiles entrepreneur, quoted by Hassink 2007).

Indeed, even the union had largely given up on textile workers. The textile union was folded into IG Metal in 1998, where representatives were primarily engaged in negotiating ‘social packages’ for downsized workers (interview with IG Metal, 2003). Whether the slimmed-down, high-tech textiles industry will be able to reproduce the human capital it needs to continue diversified quality production of leading edge products remains to be seen.

**Conclusions/ Implications**

In this study of the globalization of the German textile and apparel industries, we have seen that the predominant skills profile in the home country does indeed define the initial range of production strategies chosen by successful firms. In adjusting to competition from a flood of low-wage imports, German firms leveraged technical know-how and highly skilled production workers and supervisors in upgrading production at home, and in maintaining
high-quality DQP-style production in low-wage sites. In apparel, where widespread outsourcing of production was common, Germany’s apprenticeship system and other skill institutions allowed firms to globalize production without a major loss of technical capacity, and to continue to compete on their workforce’s technical superiority despite dispersed assembly. In textiles, firms leaned on engineers and high-skilled line workers to refocus domestic production on higher value-added products, particularly technical and specialty textiles. This finding supports the assumption in the varieties of capitalism literature that skill profiles determine production strategies, and suggests that despite a severe restructuring, the industries in Germany were able to continue to compete by taking the high road. Though employment in both sectors contracted sharply, the jobs remaining in Germany were largely better jobs than those in competitor countries. However, this study has also suggested that success firms’ globalization strategies may have unintended consequences, including transfer of skills to supplier countries and host locations.

The dual system of training is widely credited with creating the conditions both for Germany’s high-skill, high-wage, high-export economy, and the political institutions that support it. In recent years, researchers have identified several threats to Germany’s skill building system: technological change demands workers with higher levels of abstract knowledge, the acquisition of which is more difficult for firms to support (Thelen, 2005); the increased cost of training has discouraged small and medium-sized firms
(Wagner, 1999); marginalized youth are often excluded from in-firm training
(Busemeyer, 2005); employers in Germany’s growing service sector have been
lackluster participants in the apprenticeship system (Culpepper, 2001 and
Culpepper and Thelen, 2008). I have argued here that producers’ changing
production strategies should be near the top of this list of threats.

The textile and apparel industries are clearly extreme examples of the
globalization of supply and the international division of labor, but
manufacturing firms in other sectors face similar pressures and incentives to
relocate or disintegrate production. Germany’s diversified quality production
system has long based on the learned-by-experienced skills of craft workers,
which provided German firms advantages even in the process of off-shoring.
However, the geographic disaggregation of production threatens not only
employment at home, but holistic skill building within industries and firms.
Whether Germany’s vaunted dual system can adjust to new realities while
maintaining incentives for high investment in skills remains to be seen.
New International Standards in Old Industrial Economies?
The Case of IT Skill Certificates

In the preceding chapters on globalization and the textile/apparel industries, we have seen how employers in the US, Germany, and Italy innovated in fundamentally different ways. US managers disaggregated production based on low wages and geographic flexibility. German producers sent manufacturing offshore too, but maintained an advantage in mid- to high-level markets through tight oversight of production by skilled technicians as well as through research and development. Italian manufacturers maintained competitiveness through upmarket design carefully linked to improvised, small scale innovation. Each of these strategies flowed from, and built on, existing workforce skills. In each case, traditional skill-building institutions were stretched, but patterns of globalization differed in ways traditional skill profiles could predict.

What has happened in industries where employers couldn't rely on existing workforce skills? Falling barriers to international trade have revolutionized production in old industries, but the flip side of globalization – a revolution in information technology – has created entirely new skill needs. In the 1980s, computers shifted from rare machines for a few to essential tools for the many. According to the World Internet Project, 31% of Italians, 46% of Germans, and 71% of Americans used the internet at work or at home.
Cross-National Internet Use Rates
(Data from Surveys Conducted between 1999 and 2001)

As the IT industry and perceptions of computer skills as central to economic success grew in the 1980s and 1990s, public demand for computer training grew. Low skilled workers felt globalization’s squeeze (Kruger, 1991, Katz and Murphy, 1992), and the idea of computers as the future of work permeated industrial economies.

In the US, President Bill Clinton argued for “a bridge to the 21st Century . . . where computers are as much a part of the classroom as blackboards”, and with support from conservative politicians like Republican Speaker of the House Newt Gingrich, helped fund “somewhere between $40 billion and $100 billion” for a program expand IT skills and put computers in classrooms (Oppenheimer, 1997). German policy makers held a similar view of the need for computer skills; in 1996, the federal government launched an “education offensive” to spur the installation of computers and internet into classrooms (Welling and Kubichek, 2000). In Italy, where computer use lagged peer countries, Center-Right leader Silvio Berlusconi placed computer skills at the center of his platform, arguing that Italian schools needed to de-emphasize ancient Greek in favor of “I tre I: inglese, informatica, ed impresa” (the three ‘I’s: English, Computer Science, and Business” (Mas, 2002).

Most of the debate and the subsequent public programs to increase computer skills focused on computer ‘end-users’, consumers who use installed software in computers at their jobs or at homes. Proponents of mass ‘end user’
training expected clear economic gain, but researchers have questioned the benefits of putting computers in schools. One professor of education at Stanford titled his book on the issue *Oversold and Underused* (Cuban, 2001). Economists have argued that high skill, high wage work leads to computer use rather than the other way around (Di Nardo and Pischke, 1996) and that increased computer use in an industry often increased skill demand on workers, but most of the new skill demands were not directly computer related (Levy and Murnane, 2004).

While the impact of widespread computer training for users remained cloudy, the need in these economies for talented *developers*, who create or customize information technology products, and competent *technicians*, who install and maintain the technology, was clear. Creating a skilled workforce of technicians was particularly important: IT products could be easily imported, but on-site installation and maintenance would prove more difficult to source internationally. The computer revolution of the past twenty years put cheap, user-friendly, and productivity-enhancing new technologies within the reach of firms in all advanced industrial economies. But without a sufficient number of skilled technicians to install and maintain the new machines these technologies were useless.

Incorporating training for computer technicians into traditional skill-building systems was a challenge for all of the countries in this study. This chapter investigates how institutions in the US, Italy, and Germany responded
to the demand for new skills. In the next section, I reprise the literature on skills for the global age, focusing on how old skill institutions have had trouble adapting to new demands for computer skills, in large part due to their internationally standard and proprietary nature. I then discuss the broader literature on international standards, focusing on scholars who have investigated (and questioned) the impact of these standards on domestic institutions and international institutional variation. I introduce information technology certificates and describe how they emerged as new, international credentials for technology workers. After that, I track the evolution of IT training in the US, in Germany, and in Italy, using Cisco networking technology as an example. I conclude with a discussion of the implications of this study of IT skills for general hypotheses about international standards and national institutions.

New Skills for the Global Age?

In previous chapters, I have argued that firms in Italy, the US, and Germany based their globalization strategies on the differing strengths of their domestic workforces. These economies had successfully absorbed new technologies and produced new skills for them throughout the industrial age, adapting them to local institutions. The rapid increase in international trade since 1980 pushed firms to double down, tailoring globalization strategies to leverage the skills (general, technical, or tacit) where they had a national advantage.
Education and training systems are highly national character (Gellner, 1983). International influences on domestic education systems are not new, but education and training institutions have been particularly resistant to international influence (Jacoby, 2000). As a result, examining response of skill-building institutions is a good test for the impact of new international standards on domestic institutions. The IT boom, which led to a near-simultaneous global demand for skills based on digital and international standards, provides a natural experiment.

Information technologies challenged domestic skill institutions in a new way. Managers in Italy, Germany, and the United States have adopted and adapted radical technological innovations throughout the industrial age. But the high barriers to entry in information technology, coupled with quick dissemination and a rapid rate of innovation, made IT different. At the turn of the century, typewriters became a staple in offices, and a standard layout for keyboards (QWERTY) was adopted. But the standard was ‘open’—no one owned the copywrite—and national firms (like IBM, Siemens, and Olivetti) were free to adopt and adapt the technology to their own markets. Cars were a disruptive technology, and late-entry countries (like Italy) fostered national champions (like Fiat) to compete (Donnelly et al, 2002). By the 1980s, barriers to trade were much lower, but high barriers to entry and the need for interoperability encouraged firms to adopt existing predominant—and proprietary—technology (Borrus and Zysman, 2000). The proprietary and
standard nature of IT technology ultimately shaped the institutional response to IT skill demand. In the following section, I look at the existing literature on the diffusion of international standards, and then turn to evolving international skill standards for IT.

International Standardization and Domestic Institutions

In the recent global age, international standards have exploded. From product specifications to labor rights to IT platforms, international standards proliferate, and in many cases, regulatory power has moved from the national arena to the supra-national level. Coordinated standards, like ISO technical specifications or international food safety guidelines, are reached via bargaining by interested parties in formal organizations. Market-based standards, like the QWERTY keyboard configuration, the Wintel computer specifications, or the listing requirements for the New York Stock exchange, are set unilaterally – often by for-profit actors – and adopted (or not) by customers, suppliers, and potential competitors. Coordinated and market-based international standards all ease trade among firms and across countries via greater transparency and lower transaction costs, but differ substantially in their origins.

Increasingly, these international standards have teeth: they shift power to those who define them, and threaten existing players who must pay the
switching costs to a new standard. Not only do these standards represent a shift away from national decision-making, in many cases creating international standards put regulatory power in private hands:

Many international standards emerge and operate within wholly private, market-based governance systems. Other standards setting processes involve formal institutions rather than market forces, but are still orchestrated by private actors. In still other cases, governments ratify and enforce privately created standards (Abbott and Snidal, 1-2).

A growing literature in international relations and international law investigates the increasing importance of international standards as a major shift in the location and process of regulation. Slaughter and Zaring (2007), reviewing the literature on international regulatory networks, cite case studies on standards for official corruption, airplane maintenance, tax codes, antitrust policy, food and drug safety and telecoms interoperability; they conclude that peer-to-peer contact between mid-level government officials and non-state actors have become “sources of codes of best practices and credible information” (220); indeed, such networks have “transformed global governance”(211). This new global system has produced technical regulations affecting up to 80 percent of trade, according to one OECD study (cited by Mattli and Buthe, 2005). Many international standards are difficult to enforce (most labor standards, for example, remain more aspirational than actual), but others are increasingly upheld by international tribunals and domestic courts. Signatories to the WTO, for example, must adopt recognized international technical standards; failure to do so may constitute an “unnecessary obstacle”
to trade and violate WTO law (ibid, 2). Buthe and Mattli argue, globalization and technology

have triggered a remarkable growth in the number of international and regional standards, even while the production of national specifications has declined. They have raised the economic and political salience of what were once considered merely ‘technical’ specifications (2005: 2).

Developing countries in particular are likely to be ‘standards takers’. Their producers might benefit from market transparency provided by coordinated international standards, but producing to such standards can be costly and price many developing country firms out of international markets (see Otsuki et al, 2000, also Ratanawaraha, 2006).

Along side this political science research on standards coordinated by formal institutions stands a growing literature in economics and management studies on market-based international standards. Here, individual firms (not employer organizations) propose standards and customers make the decisions. These standards battles are not new – by 1860, for example, seven different railroads gauges battled for dominance in the US, and more recently, in the 1970s and 1980s VHS videotapes won acceptance over Betamax (Shapiro and Varian, 1999). However, the explosion of digitally based electronics and telecoms inventions in the last two decades, Borrus and Zysman (1997) argue, has resulted in standards that are different in kind, not just degree. During this “Wintelsist” era:

The character of competition. . . . is a struggle over setting and evolving de facto product standards in the market. . . . Those constituent system
elements – from components and subsystems through operating and applications software – become separate and critical competitive markets (1).

Unlike coordinated standards (which produce open standards), or traditional market-based standards battles (which resulted in proprietary standards), the standards that fueled the advent of personal computing and information technology networks are ‘open-but-owned’ standards (ibid, 5). These standards are licensed by the developing firm to other vendors, who then create interoperable products. However, the standards creators own the technical definitions and remain free to change the platforms unilaterally. A variety of (mostly American) producers

own key technical specifications that have been accepted as de facto product standards in the market . . . . Given the customer’s investment in all the conforming products and in how to use them effectively, she will normally be unwilling to switch to competing standards unless they offer truly radical and compensatory improvements in price-performance-functionality. Switching will not occur, that is, unless it is even more costly to stay put (6).

As with standard-setting within international institutions, these new market-based standards are global in reach and the cost of deviating from them is high. Borrus and Zysman see the Wintelist world as an American creation, a product of US political economic regulations, including antitrust policy, intellectual property protection, and fluid labor markets. However, they suggest that the advent of digital international standards has changed the option set of producers everywhere: “Wintelism’ and its counterpart cross-national production networks have already significantly altered competition in the
electronics industry affecting which home-based companies have advantage and altering opportunities and strategic problems for large and small firms alike” (ibid, 12).

Much recent research highlights the winners and losers of standards battles. Less explored is the impact of these international standards on domestic institutions. In fact, Buthe and Mattli point out the ambiguous impact of international standards as a major research question. In their examination of the ISO, they find that the history and organization of pre-existing *domestic* institutions best predicts international standards outcomes, and, counter-intuitively, that American firms fared less well in coordinated standard-setting than their EU rivals. European domestic standards organizations, in place before the ISO began, made the difference, with their capacity to “guarantee timely information; broad-based, legitimate, and efficient preference aggregation, and effective representation of the national consensus” (41). Despite repeated ‘losses’, Buthe and Mattli find that US producers were slow to recognize their organizational disadvantage, and that international standard-setting had limited impact on US institutions. In fact, as they point out, their finding “raises the question: why has the most powerful state in the international system not changed the institutions or created competing institutions more conducive to US interests?”(48).

Likewise, Casper and Hancke find domestic institutions surprisingly resilient to the rise of international standardization. In a fascinating study of
how French and German firms instituted changes mandated by ISO 9000 quality assurances, the authors found that producers in both countries used the standards imperative to upgrade capabilities. However, despite major reorganization, firms in both Germany and France "tended to reproduce the previously existing architectures of authority and risk distribution"(9). French firms maintained a Taylorist organization, while their German counterparts continued to base production strategies on the high skill of their craft workers. In this example, Casper and Hancke show that international 'standardization' was actually compatible with a wide range of national variation, and that national production systems were surprisingly robust in face of seemingly 'best practice' modernization.

Do skill standards leave similar room for national adaptation? The common problem of training workers to exploit standard, proprietary technologies challenged the countries under study in different ways. In the United States, education and training institutions had evolved into a bifurcated system, producing highly trained, but generally- skilled professionals and large numbers of low skilled workers. Secondary schools tended to focus on academic work, not vocational skills, and university computer courses focused on theory rather than practical skills: indeed, formal technical training tended to be removed from real-world technology, and was often inefficient and ineffective (see chapter 2, also Larabee,1996; Lazonick, 2006; Bishop, 1994; and Grubb). In Germany, the well-developed apprenticeship system produced
large numbers of highly skilled craft workers. But perhaps its greatest weaknesses were keeping up with new technology in old professions, and adapting to a service economy (Wagner, 2001, and Culpepper, 2007). How could the system serve the rapidly changing IT field? And though the apprenticeship system provided a strong template, would the lack of existing labor stakeholders threatened to undermine the careful balance of workers, firms, and state that supported the apprenticeship system in other fields? Italy, where small and medium-sized firms were the locus of much skill building, faced a particular challenge. Adopting new technologies, much less teaching the skills to implement them, was difficult if not impossible for firms in traditional fields (Giuri et al, 2006). In the next section of this chapter, I analyze the rising demand for IT skills and introduce the international standards that arose to meet them.

**IT Skills Demands and New Standards**

Soon after the start of the IT boom in the 1980s, technology vendors and their client firms began to complain of a lack of technologically savvy workers in the labor force. The demand for IT workers in various industries was new, secular, and virtually simultaneous in advanced economies: in 2000, one study predicted a shortage of 1.7 million IT workers in Europe by 2003; a later
study forecasted a gap of 4 million IT professionals in the USA by 2012 (BBC, 2000, and Stevenson, 2006).31

Autodidacts met much of the early need for specialized IT workers in Germany, Italy, and the US. A second wave of techs was made up of employees sponsored by firms to learn at for-profit training centers. Both solutions suffered problems of scale: as perceived demand for skilled IT workers grew, the supply of self-trained computer engineers dried up and the capacity and willingness of firms to pay for training was exhausted. Tech industry analysts and representatives warned that failing to address the demand for IT skills could undermine the competitiveness of a country’s entire economy (interview notes, 2001; see also the American Electronics Association Competitiveness Report, 2000). IT vendors were often the earliest to ring the alarm bell: by the early 1990s, many technology firms complained that demand for their products was blocked by an insufficient number of skilled users. Companies were reluctant to purchase and install technologies without steady access to maintenance at reasonable rates. In addition, technology vendors faced skyrocketing service costs, as unskilled users wreaked havoc on new systems.

While business leaders and public officials decried insufficient skill-building for IT, some technology firms found a market-oriented solution. Novell, a producer of hardware and software for data networks, tackled this problem in

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31 Forecasts of skill demands are often biased. Many of the most-cited predictions were made by training providers, technology consulting firms, equipment manufacturers, and industry associations like the American Electronic Associations. That said, industry forecasts gained broad media coverage when released, and were not widely disputed. They served as the background for debates on training policy.
an innovative way. In 1988, at a time when the firm commanded a 90% share in the local area network (LAN) market, Novell developed a program to certify the skills of the workers who would install and maintain their products. The company produced a curriculum, training materials, and a series of exams to vouch for workers’ competence. Capital equipment firms have long included training as part of their sales packages, but the structure of Novell’s program was original. Both employees and firms were given incentives to invest time, effort, and money into certification: Customer firms with certified staff were eligible for warrantees on Novell products. Individuals who had passed the appropriate examinations earned the right to call themselves a “Certified Novell Engineer” (e.g., ‘Jane Doe, CNE’) or a “Certified Novell Administrator” (‘John Doe, CNA’). Because of Novell’s large market share, the new credential gave holders a potential advantage not just with their current employer but also in the broader IT labor market.

As recognition of the program grew, so did workers’ incentive to obtain the certificates. In addition, the growing number of Novell-trained IT workers in the labor market increased its brand profile and lowered the risks for client firms who wanted to install the new technology. Novell’s certification was so successful the program became a model, and hundreds of other technology companies and industry associations developed certification curricula and tests. As the numbers of certification programs grew, eventually, the administration of exams was outsourced to third-party specialist firms, like
Prometric and Vue. These testing firms, which also administered university entrance exams like the SAT and the GMAT, provided security for the exams and kept overhead costs down, encouraging the introduction of even more programs.

IT certifications had much in common with traditional credentials. They recognized the attainment of a specific skill set or expertise, and were portable, giving certificate holders some power on internal and external labor markets. But unlike most credentials, IT certifications had built-in expiration dates: workers had to recertify (i.e., pass a new examination) after a set period of time (usually two to five years) to prove that they had kept up with the latest technologies. And unlike traditional credentials, the most important IT certifications were issued by companies that aimed to sell their products to certified workers’ firms.

As IT boomed in the 1990s, ‘certs’ grew at an enormous rate. But it is very difficult to assess the number of certificate programs, much less the numbers of certificate holders: Sponsoring companies, who use the programs as evidence of a base of skilled workers in their sales pitches, held the information as proprietary (interview notes). However, we do have some indications that the programs became a central part of creating and assessing

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32 Some credentials, like the MD for doctors in the USA, require holders to participate in ongoing training to maintain status, but do not require holders to re-sit examinations.

33 A few industry associations, like CompTIA and the Linux Professional Institute, developed what were known as ‘vendor-neutral’ certification programs. While these programs had the advantage of sparing workers from being overly tied to one firm’s technology, they tended to be basic and were most valuable for entry-level workers (Interviews G-12, U-1, U-21).
IT job skills. By 1999, the testing firm Prometric announced that the testing firm had delivered more than 2.1 million certification exams for Novell alone (cited by Adelman, 1999, 22). Many IT professionals pursued multiple certificates. One estimate, by a US Department of Education analyst, put the number of IT certification holders at above 2.4 million individuals worldwide in early 2000 (Adelman, 2000, v). The numbers continued to grow rapidly: Cisco System announced in April, 2008 that it alone had awarded its one millionth certificate (see http://newsroom.cisco.com/dlls/2008/prod_040908d.html) and Microsoft reported in 2008 that 2,331,423 IT technicians had passed its certification exams (see http://www.microsoft.com/learning/mcp/certified.mspx).

Smaller firms also developed training and testing programs. According to Ed Tittel, an IT instructor and the author of several certification exam preparation books, 60-70% of technology firms with at least $100 million in annual sales developed certification programs (interview, March 2003). Training and certification programs themselves became revenue generators for many firms: by 2005, training and testing for IT certifications garnered $1.91 billion in revenue, according to one industry research study (IDC, 2006, 5). Table 6.1 lists the top ten certifications, or ‘certs’, in 2006, according to Certification Magazine.
Table 6.1: Top IT Certifications in 2006, Ranked by Certification Magazine

<table>
<thead>
<tr>
<th>Certification</th>
<th>Average Salary</th>
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<tbody>
<tr>
<td>1. ISC2 Information Systems Security Architect Professional (ISSAP)</td>
<td>$114.21</td>
</tr>
<tr>
<td>2. Brocade Certified SAN Manager (BSCM)</td>
<td>112.92</td>
</tr>
<tr>
<td>3. Brocade Certified SAN Designer (BSCD)</td>
<td>112.89</td>
</tr>
<tr>
<td>4. ISACA Certified Information Security Manager (CISM)</td>
<td>112.49</td>
</tr>
<tr>
<td>5. ISC@ Information Systems Security Management Professional (ISSMP)</td>
<td>111.28</td>
</tr>
<tr>
<td>6. Cisco CCIE</td>
<td>105.56</td>
</tr>
<tr>
<td>7. Oracle DBA OC</td>
<td>100.68</td>
</tr>
<tr>
<td>8. ISACA Certified Information Security Auditor (CISA)</td>
<td>99.04</td>
</tr>
<tr>
<td>9. Brocade Fabric Professional (BCFP)</td>
<td>98.02</td>
</tr>
<tr>
<td>10. Project Management Institute (PMP)</td>
<td>95.43</td>
</tr>
</tbody>
</table>

Source: Certification Magazine Annual Salary Survey
Download 3.20.07 www.certmag.com

Known in the industry by their acronyms – CAN, CCIE, LPE, etc. – these new credentials allowed for a variety of test preparation methods, from independent study, to for-profit coaching, to more traditional school-based learning, and fit well with the burgeoning IT job market. Certs provided for the quick, formal credentialing of experienced IT professionals and a clear path for the many workers transitioning into IT careers. The new credentials quickly gained traction in the labor market: in a study of 3,500 classified advertisements for entry and mid-level IT positions in 1998-99 in Washington, DC, Adelman found one out of eight mentioned an IT certificate as the preferred background for employment; a similar investigation of 300 listings in
March 2000 found one in seven sought candidates with valid IT certifications (2000, 8).

Not all were enamored with IT certifications or the workers who held them. Managers found the credentials a poor substitute for experience in a work setting. Exam security became a problem. “Brain dumps”, websites where testers would illegally post questions from the exams for future test takers, facilitated cheating despite security at test centers. The multiple-choice nature of most exams rewarded good test takers in an industry that traditionally valued hands-on experience. IT managers bemoaned ‘paper certs’, or programs that produced certified workers who could answer exam questions but couldn’t trouble shoot machines in the office environment (interviews G-IT1, G-IT11, US-IT3, US-IT13, see also Ranum, 2006).

Unions and some policy makers were also suspicious of certifications. None of the certification programs – whether operated by for-profit technology firms or organized by industry associations – disclosed such basic information as the number of candidates per year or the exam pass rate. Detailed data on the gender, age, or socio-economic background of certification candidates, if collected at all, remained proprietary; the programs thus escape the scrutiny faced by other credentialing organizations on issues of diversity and bias. Most IT certification programs provided limited or no recourse for individuals to challenge the results of expensive exams, as test questions were proprietary and secret. The vendor-specific nature of most certs meant that workers risked
investing in a particular technology that might prove to have a very short shelf life. Most importantly, even as a growing number of workers pursued certifications individually in hopes of entering the IT job market, IT certification authorities did not collect or release data on candidates’ post-certification employment outcomes. Critics charged this lack of data encouraged many job-seekers to over-invest in IT certifications that were of little value on the labor market (Jacobs and Grubb, 2005). IT certs did not inaugurate a fluid international labor market. Workers from developing countries with the most sought-after certs did not find doors flung open, and trainers acknowledged that basic education and culture trumped certification in hiring (interview with G-12).

Notwithstanding these criticisms, certifications grew in importance on the IT labor market. Though some research has found no significant difference in managers’ perceptions of IT skills of employees with certifications to those without (Cegielski et al, 2003), other studies showed a correlation between certification and higher salary (Global Knowledge, 2007). Anderson et al found that human resource managers in the US used certifications as a screening device in hiring tech employees, weighing certification about half as much as traditional education and job experience. Moreover, HR professionals viewed certifications as conferring substantial benefits on their organizations, and believed certified employees benefited from enhanced credibility and compensation, as well as access to promotion and further training and
certification (2004). In the US, IT certification may best be viewed as a proxy for training. In one recent survey, US tech workers cited “keeping up with skills” as their most common worry – nearly twice as many than cited outsourcing and 50% more than job security (Global Knowledge, 2007). For many, certification programs were a way to keep their skills up to date. Employers, particularly during the IT boom, used subsidized training and certification as a means to recruit and retain scarce workers. Many tech workers were willing to accept a lower salary from training-friendly firm in order to maintain access to the latest technology and training (interview with G-12; see also Certification Magazine Salary Survey, 2006).

Though certifications originated with US-based technology companies, they followed IT products to all corners of the globe. Because most certification programs refused to release even the number of certificate holders, much less their geographic distribution, it is assess the international reach of these credentials. Evidence suggests, however, that the programs had a global impact. A recent, non-random survey of IT professionals by Certification Magazine garnered responses from 35,573 tech professionals in 197 countries. 61% were based outside the US; 95 % held at least one IT certification (Wunder, 2007).\(^\text{34}\) Hard numbers are available for one particular certification, the Cisco Certified Internet Expert (CCIE). The CCIE is Cisco’s highest level program. Called the “PhD” of certificates, candidates must earn three entry-

\(^\text{34}\) Further breakdown of responses by country were unavailable.
and mid-level certificates before be allowed to sit the exam. The test originated as a two day, lab-based practical exam for a fee of $5000, and holders of this cert reported the highest compensation in surveys of IT certification holders (interview with Ger-IT 12). Table 6.2 indicates that the CCIE had a global impact. Though this certification is a rarified accomplishment, not a typical ‘cert’, its geographic distribution suggests that Cisco certifications were popular around the globe.

Certs originated in for-profit firms as a market-based solution to skills shortages, but the programs quickly began to shape public responses to IT training dilemmas. In the following sections, I turn to policy responses to the ‘skills gap’ in the US, Germany, and Italy.
### Table 6.2: Total of Worldwide Current CCIEs = 14,177

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IT Skills in the USA

As the IT job market began to heat up in the late 1980s, traditional sources of skilled computer workers were in decline. The number of engineering students at US universities dropped after 1985, and math and science departments drew fewer and fewer candidates. In order to install and run the latest technology, US firms sponsored computer training for their employees. Some of these employees were already in the tech field and need skills updating; others with non-tech backgrounds were hired and retrained (interview with U-IT2). This training was organized in a variety of ways: technology vendors trained workers at client firms, companies hired for-profit trainers to organize classes, and a good bit of upskilling was informal and on-the-job.

By the 1990s, however, employers began to complain of a severe shortage of trained technology workers. Many believed that traditional educational institutions – universities in particular – were too slow in responding to the market demand, and their curricula placed too much emphasis on theory over the practical skills employers sought. The American Electronics Association, for example, complained that US universities made it too hard for young people to study math, science, engineering, as evidenced by a 50% drop out rate in those subjects (interview, March 2001). Industry advocates warned that a lack of skilled US workers was pushing American firms to move jobs overseas,
hampering the country’s ability to reap the benefits of the technology boom in the present, and jeopardizing its competitiveness in the future (interviews with US-IT6, US-IT8, and US-IT11).

Despite an increasing amount of public attention to the issue, the “IT skills gap” prompted limited response at the federal level. Under the Clinton Administration, the Department of Education led a broad effort to create technologically up to date national skills standards. But the endeavor came to be viewed by business as captured by union interests, and lost industry backing. “Without business involvement, the National Skills Standards Board gave the impression that it would be a government driven initiative – that the government would be telling business what was needed. Business doesn’t like this,” said one technology training manager (interview with US-IT21). The NSSB, generally viewed as a failure, was dismantled by the Bush Administration (Jacobs and Grubb, 2005). Large-scale, targeted programs, like the proposed Technology Education and Training Act (TETA), failed to garner sufficient legislative support. TETA, which would have provided $1500 to $2000 in tax credits to small businesses for technology training, was considered too narrow by some politicians and too expensive by large business (interview with US-IT15, US-IT20). Technology firms and workers took advantage of the Employee Education Tax Credit, made permanent by the 107th Congress, which provided $5500 per worker for training. The largest users of this credit were IBM and the Communications Workers of America.
Veterans’ Administration education benefits were expanded to cover Microsoft, Sun, Cisco, and other technology training.

Overall, however, the impact of federal policy on IT training was limited. In fact, the federal policy with the largest impact on information technology labor markets dealt directly with immigration, not training. The H1B visa program enabled firms to import skilled workers on a temporary basis. US firms, with a long history of ‘buying’ rather than ‘making’ skills, lobbied hard for increases in the number of H1Bs available per year. At the height of the internet boom in the late 1990s, the H1B issue topped the industry’s policy priorities, with demands for longer-term investments in basic math and science education lagging far behind (interviews with US-IT 20, US IT-7). In 1998, business interests succeeded in doubling the annual number of new H1B visas to 120,000. Labor interests managed a small victory in the legislation, guaranteeing the application fees for H1Bs would be earmarked to train US citizens for jobs held by H1Bs (interview with US-IT 19). According to a Congressional Budget Office report, however, the resulting training programs were unsuccessful at producing workers who could substitute for the H1B holders (CBO, 2002).

Some American public institutions did play an important role in IT skills training: community colleges. Most community colleges offered academic courses that lead to a two-year associate’s degree, and act as feeder schools to four-year colleges and universities (see Grubb, 1996). But many (especially in
the South) were specifically chartered to train students for the local economy. These institutions had a long history of contract training for local firms (interview with US-IT 13). Students were as varied as programs: community colleges enrolled mid-career workers looking to enhance their skills, out-of-work job seekers, and recent high school graduates.

As IT labor markets tightened, these local, two-year tertiary schools added computer courses as an alternative to expensive, for-profit IT training companies. Community colleges targeted not only IT professionals in need of further training and skills updating, but also career-changers and new labor market entrants. Creating appropriate, up-to-date curricula for these new IT programs from scratch would have been far too expensive (if not impossible) for most of these local institutions, and most turned to industry-sponsored certification programs to solve this dilemma (interviews Us-IT12, Us-IT13, Us-IT3; see also Jacobs and Grubb, 2005). According to one community college certification instructor, students, particularly working adults, were drawn to the programs to “take advantage of the cost advantage of public training” (interview with US-IT3). Four-year universities generally shunned certification training, as academics looked down on the programs as atheoretical product training.

One Case in Detail: Cisco Certification and Networking Skills in the USA
Cisco Systems, founded in 1984 by a group of Stanford University computer scientists, grew to be the largest company in the internet protocol/networking technologies market. The firm produced the hardware that connected the internet, with a primary market strategy of selling its products to ‘resellers’ who then installed computer networks onsite for clients. In 2006, the firm employed over 38,000, and posted a $5.5 billion net income on global revenues of $28.5 billion (hooversonline, 2007). According to Peter Joyce, head of Cisco Networking Academies, the firm initiated its certification program as a quality control measure: “We generally don’t sell directly to end-users. . . . We needed to be sure that re-sellers were competent at installing and maintaining our systems.” Authorized dealers were required to employ a certain number of Cisco certified employees.

From their inception in 1993, Cisco’s certifications have been among the most valued in the industry. Cisco developed a three-tiered program, certifying ‘associates’, ‘professionals’, and ‘experts’. In 2003, the company announced that it had awarded its 500,000th certification; at any given time, a quarter of a million students are preparing for Cisco certification exams (interview notes, see also certcities.com, 2003). The expert exam was a lab-based practical: after candidates set up a complex network, the exam giver would sabotage the work and require the candidate to identify and fix the problems in a limited time. By the late 1990s, the Cisco Certified Internet Expert (CCIE) certificate was the most valued IT cert, and became considered the ‘PhD’ of IT professionals.
According to one international salary survey, CCIEs earned on average $107,000 in 2006 (Certification Magazine, Jan. 2007).

Initially, Cisco training was primarily sponsored by resellers, and took place at for-profit training firms (interviews with US-IT3, G-IT12, and G-IT3). Cisco facilitated entry into the field by authorizing ‘certified Cisco training partners’, who had to maintain a staff of teachers with up-to-date Cisco certifications and follow the official Cisco curricula. In the early to mid 1990s, most Cisco trainees were full-time employees sponsored by their companies. But the high price of commercial training – about $300-400 per day per seat in 2004, according to one IT trainer – led to demand for not-for-profit alternatives (interview with US IT-2). Calls for more economical training came from workers outside IT, who hoped to transition into the high tech labor market, and later, from employers, who became increasingly unwilling to foot large bills for training (interviews with US-IT 2, US-IT 3). According to a survey conducted in 2005, employer sponsorship of all types of IT certification training – the norm at the height of the late 1990s boom – dropped to 40%, with 40% of workers taking on the cost of the investment themselves, and the remaining 20% a joint investment by workers and firms (Margolis, 2006).

Eventually, Cisco was approached by secondary schools, for hardware and for training: “We weren’t interested in this market space. [School-based training] came through the back door,” Joyce said. In 1997, Cisco took the
curriculum for its basic certification, the CCNA, and put it on the web as part of a not-for-profit program. Initially, 64 schools agreed to teach the Cisco program. Growth of the program was astonishing, and the number of schools and training institutes who agreed to host Cisco Academies was a testament to the voracious demand for public IT training programs at the turn of the century: by 2005, the not-for-profit Cisco Network Academies boasted 10,372 training centers worldwide (Cisco.com, cited by Randall and Zirkle, 2005).

In the US, most Cisco Network Academies were hosted by high schools or community colleges. These CNA “partners” paid discounted rates to install Cisco equipment, and they promised to follow Cisco’s official curricula and send instructors for certification training. The programs proved wildly popular: in 2003, 141,000 American secondary students were studying at a Cisco Network Academy (cited in Randall and Zirkle, 296). But the network academies also drew criticism. As with other vendor-specific certification programs, some educators worried that Cisco Network Academy’s program gave an unfair branding advantage to a for-profit firm via public schools, and exposed students to risky, overly-specific training. But the most damaging was the charge that CNA training was ineffective. Thompson (2005), in a study of Cisco training in inner city schools in Chicago, found that only 1% of 1,788 high school students in the Cisco Network Academy took and passed the basic certification exam. Thompson suggested the curriculum was too difficult for high school, and better suited for post-secondary students (Thompson, quoted
in Randall and Zirkle, 2005:291). Other research on outcomes of high school and community college certification programs for Cisco, Microsoft, and Novell, found that only about 12% of high school students and 38% of community college participants passed any certification test (Haimson, 2003).

Rather than focus on this low pass rate, Cisco Network Academy officials emphasized the recognized value of certification for those students who did pass, and the importance of the structure of CNA’s industry/school partnerships. The network academy infrastructure provided public schools and not-for-profit trainers with access to hardware, but most importantly, to up-to-date technology curricula. “A big question on industrial training in the US has always been: How do you offer training in public sector without industry involvement? Cisco Academies do just that. With an internet connection, you can access Cisco content and training almost anywhere – jails, inner cities, reservations,” said Joyce. Though Cisco continued to refuse to publish the pass rates at Academies, leading to speculation that they remained disastrously low, the non-profit arm of the company did restructure the Academies program, adding a more basic-level program and entry-level certification (www.cisco.com/CNA). This change in structure was aimed at recalibrating the program to lower-skilled students, while maintaining ties to schools and training institutions together with a steady stream of Cisco trainees (www.assint.org).
**IT training in Germany**

Like US managers, German employers faced challenges in recruiting sufficiently skilled IT workers, but for different reasons. The German dual system, in which chambers of commerce, unions, and state officials coordinate training and skill certifications, has been often lauded, but not for its ability to respond quickly to new technologies and labor market demands (Wagner, 2001). The measured rate of change posed a particular problem in IT training, where technology cycles were short. In addition, the structure of the apprenticeship system, which required learners to work together with trained and experienced workers, didn’t necessarily fit with the evolving IT job market. At many small and medium-sized firms, information technology support could require just one IT worker; often, there was no ‘master’ on site for new workers. In Germany, where most training remained employer-based and employer-financed, IT posed an inherent challenge to the old model.

As in the US, German employers met early demand for IT skills with the help of for-profit trainers. Though some of these training firms were local, the demands – in both hardware and technology acumen – gave an advantage to global players. A few of the largest German training firms were acquired by US-based global players; others joined international training alliances. As one training firm manager explained, the IT boom stretched the ability of firms with large company clients to compete: “You have to centralize, you have to economize. Because you have to produce so many courses, it’s just not
profitable [to stay local]" (interview with G-IT10). On the other end of the scale, the arrival of international certification programs led to a sprouting of small, local training firms. An owner of a mid-sized training firm explained:

Ten or fifteen years ago . . . we had to develop courses on our own, and we spent a lot of time and money on course development. Most training organizations found it very convenient, extremely convenient, when [certification] programs arrived. It was nice, convenient, easy. Everybody, with knowledge of the industry or not, could set up a business – open an office, set up a fax, and become a ‘Microsoft Authorized Training Partner” (interview with G-IT1).

As in the US, most IT trainees followed standardized IT certification curricula, but fewer German workers sat for the certification exams (interview notes). German firms were far less willing than American firms to pay for workers’ exam fees, and according to our respondents, perhaps one in ten employees trained for a specific certification chose to sit the exam at his or her own expense (G-IT10, G-IT12). When firms did sponsor employee exams, vendor discounts for companies with certified employees on staff was the primary motivation (interviews with G-IT1, G-IT2, G-IT10, G-IT11, G-IT12). IG Metal, the union that represented many technology workers, viewed certs with particular suspicion: the high stakes testing programs allowed for no input from organized labor, no protections for individual test takers, and no lasting credentials (interview with G-IT7).

As demand for IT workers grew and projections of skills shortages ballooned, employers in Germany demanded both more state-sponsored
training and greater freedom to hire skilled workers from overseas. In February, 2000, Chancellor Gerhard Schroeder proposed a temporary immigration program, in effect much like the American H1B, called the ‘green card’, which would grant permission to up to 20,000 IT immigrants per year to work in Germany for up to five years. The program, initiated at the height of the dotcom boom, drew vehement opposition from labor unions and skeptical acceptance from left parties (Martin, 2001). By July 2003, only 14,876 permits had been issued, and the program was widely viewed as a failure (Green, 2007). The requirements to obtain the visa were high: workers had to have a contract with an employer for a minimum salary of €51,000 per year before applying. Employers gave varying responses for the lack of success. One analyst claimed that large employers had alternative mechanisms for international recruiting (Kolb, 2005). Others claimed that Germany was a less desirable location for migrants, particularly from South Asia, who often had other opportunities in English-speaking, more immigrant-friendly countries (interview notes; see also Zackaria, 2006).

If the German high-skilled immigrant policy had less impact than its US counter-part, its new government IT training programs made more of a mark. The social partners that traditionally coordinated training in Germany aimed to integrate IT occupations into the dual system, and by the late 1990s, the federal training authority (the BiBB), introduced four new IT apprenticeships

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35 Confusingly, in the US, a green card is a permanent residency permit, not temporary work permit.
streams. Launched in 1997, the new IT apprenticeship streams required three years of combined school-based instruction and on-the-job training, and were enthusiastically embraced by many students and firms (see Figure 6.3).

Figure 6.3: New apprenticeship training contracts for one of the four IT occupations

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<td>5</td>
<td>3</td>
</tr>
<tr>
<td>total</td>
<td>6,78</td>
<td>10,91</td>
<td>15,10</td>
<td>20,36</td>
<td>22,15</td>
<td>18,20</td>
<td>16,51</td>
<td>16,38</td>
<td>15,81</td>
</tr>
</tbody>
</table>


However, some critics charged that the new apprenticeships suffered the same shortcomings of well-established programs. "Our industry changes too quickly, and the curriculum is too stodgy" and difficult to update, said one employer (interview with G-IT1). In-class instruction covers many of the same technical skills as international certification programs, but is spread out over more time:
“they have re-invented the wheel.” The number of new IT apprentices peaked in 2001 at the height of the technology bubble. In 2005, IT apprenticeships accounted for 2.87% of all new training contracts.

The new apprenticeships, while generally considered successful (see Steedman and Wagner 2003), did not address a main problem for employers of IT personnel in Germany: how firms with small or peripheral IT departments could find, integrate, and train tech employees. BiBB coordinated a new credential, the IT Specialization, to fill this void. Resulting from negotiations between BiBB, Bitcom (the German IT employer association) and IG Metal, the Specialization credential attempted something new in Germany: a nationally-recognized credential that would provide a career track for vocational workers, including a gateway into university.

The specializations were introduced only in 2003. Assessment of learning for the specializations was largely based on portfolio presentations, not multiple choice tests, and judged by the Chambers of Commerce. Though this system was preferred by the union, which believed industry-sponsored IT certs would lead workers to overly narrow, short shelf-life training, some employers and trainers feared that the program could result in study of obsolete technologies. Early responses suggested that they were also viewed by suspicion by German universities, which did have a history of granting credit for non-university based learning, and without enthusiasm by IT workers...
(interviews with G-IT2 and G-IT4). Others complained that the new credential was overly domestic in focus:

There’s no interface with vendor cert. Not even one. That’s serious, because these vendor certifications are worldwide accepted and recognized. Those who own such certifications have a specific skill (interview with G-IT1).

In a 2006 report, the BiBB (Germany’s federal training authority) reported that the Specialist certifications had yet to prove their value in comparison with international industry-sponsored certs, which “still clearly dominate[d] the continuing training vocational training markets” (Ducke and Schapfel-Kaiser, 2006). Perhaps the “modest level of acceptance” of the Specialist credential, Diettrich et al. cite suggest, signals that the work-based, customized nature of the new certificate makes it too expensive and ineffective (Diettrich et al, 2005: 21). BiBB also seemed concerned with the potential for the apprenticeship and specialization curricula to grow old, and sponsored research on the US community college experience with international, industry-sponsored IT certs.

**Cisco in Germany**

While training authorities engaged unions and Chambers of Commerce in elaborate negotiations to create new, German IT credentials, international IT certifications entered the German market and had a major impact on IT training. Public institutions in Germany were wary of vendor-specific vocational training, but firms had fewer qualms. In the early 1990s, most IT training was sponsored by medium to large companies and conducted by for-
profit trainers, and this skill-building was expensive. Some German employers began to search for alternatives.

Cisco is one example of how international IT certificates circumvented the traditional German credentialing system. Throughout the 1990s, German firms bore the considerable cost of training their workers in networking technology; public institutions for such training didn’t exist, and individuals were unwilling or unable to finance their own network education. Cisco’s first not-for-profit academy in Germany was announced with great fanfare in 1999. The pilot program in Wiesbaden incorporated the Cisco Network Associate (CNA) curriculum into an existing apprenticeship program under the auspices of the local Chamber of Commerce. Chambers of Commerce in Germany have a monopoly on granting legally recognized vocational credentials, and the Chamber demanded several changes in the Cisco Academies program of curriculum and assessment. Launching the Wiesbaden program required prolonged and painful negotiation, said the head of Cisco Academies in Germany: “We talked for years, no one was happy, and we didn’t do it again.”

By 2001, when Cisco Network Academy rolled out its program across the country, it bypassed Germany’s Chambers of Commerce altogether. CNA presented its curriculum package to school administrators as an all or nothing deal. “We say, you do what you must with the Chamber. We’ll bring you closer to industry. We argue that [the CNA curriculum] is international, and generally recognized,” one CNA administrator said. “We don’t integrate [our
program with the apprenticeship system], that's the job of the local partner educators" (interview with Cisco Academies, Germany, 2004). As a result, Cisco certificates remained outside the scope of Germany’s legally-recognized credentials. The lack of legal recognition did not seem to dissuade trainees: by March, 2004, 30,000 students in Germany had studied in a Cisco Network Academy.36

One school that sidestepped the local Chamber, which we will call “E-Schule”, was in southern Baden Württemberg. According to teachers and administrators at E-Schule, the decision to host a Cisco Academy was contentious.

Cisco Network Academy managers contacted the local government in E-Schule. Government officials initially declined to participate in “product training”. However, local firms began to encourage E-Schule to offer Cisco training. One local employer, who eventually donated equipment in exchange for training for his workers, explained that his customers demanded industry certifications. Private training was expensive – up to E10,000 per certified worker – so a local Cisco Network Academy would be a big savings. Cisco also had allies in government. “We got the order from very high in the Education Ministry that we should try again” to start a Network Academy, said E-Schule one teacher. “Cisco has ‘bought’ lobbyists who know politics here very well.”

Despite pressure from industry and government, E-Schule was reluctant to commit to a program that might be mere product training, teachers said. Cisco argued that its curriculum was not Cisco-specific, that it focused on all vital aspects of IT networking. However, Cisco also demanded that instructors take this on faith, and initially refused to hand over curricular materials before the school signed a contract promising to implement the program in its entirety and without edits. CNA wanted to maintain control of the curriculum for quality reasons, mandating that two teachers obtain CCNA certification, and that all Academy teachers get twenty days of further CAN instructor education per year. German teachers described this as “arrogant”: “Cisco doesn’t trust the countries’ education systems. Their program is planned also for Ghana, for Kenya – there it is necessary to educate the trainers. Here, it’s different,” said one Cisco teacher at E-Schule.

Though opposition was significant, E-Schule and a dozen other training and education institutions in Germany joined Cisco Network Academies in 2001. After prolonged negotiations, Cisco had allowed two teachers to preview the course. The German instructors found that less than one third of the curriculum was Cisco-specific, an acceptable level for a company that held 80% of the networking market. Due to contracts with teachers’ unions, education officials could not force teachers to sit for certification exams. However, several members of the faculty at E-Schule were eager to join CNA. “We decided to hide behind Cisco Systems. We said the school can only get CNA status if we
have two instructors who will sign and agree to get a CCNA within two years,” said one teacher. In the future, though, teachers acknowledged it may be difficult for Cisco to enforce this requirement.

As in the USA, the number of CNA students who have become certified was not published. In E-Schule’s first two years as a CNA, teachers estimated that 25% of students became Cisco Certified Network Associates. However, teachers and administrators said that the greatest benefit of the program was the ties it fostered with industry. More and more local employers reported that they sought workers with industry certifications, and looked to E-Schule as a supplier of new workers. In addition, the school benefited from the tie to the certification vendor: “I was good IT trainer before, but we’ve learned a lot [by being a CNA]. It’s changed how we are training,” said one teacher.

Though the alliance with Cisco has been a success, administrators at E-Schule continued to scrutinize their programs for the scent of ‘product training’. They rejected Microsoft certification classes out of hand as too specific, and negotiation with Sun Systems ended when E-Schule decided the vendor wanted to charge too much for the Sun curricula. However, teachers and administrators continued to believe that smart adoption of industry certifications could enhance their IT training program.

**IT training in Italy**
In Italy, demand for IT equipment and the skills to run it lagged behind the US and Germany. The Italian economy was dominated by small and medium-sized enterprises, many family-owned and dependent on firm-grown skills. Such firms were ill equipped to adopt and implement radical new technologies. Firms with employees with low levels of formal education were least likely to invest in IT (Giuri et al, 2006), and workers in Italy’s productive industrial districts were less likely to pursue formal education than residents of the economically depressed South. Quartaro (2008) reported that “diffusion of ICT in Italy still appears to be lagging, especially with respect to the US and the UK” (32). Alone among G7 countries, Italy had no substantial domestic software industry. Its relative share of software revenue declined between 1992 and 2001 (Vickery, 2001; Carmel and Tijas, 2005), and Italy’s high tech export share remained far below competitor countries (see Table 6.4).

Though ICT uptake was relatively slow, Scholarios et al (undated) reported that Italy was the fourth largest ICT market in Europe, after Germany, the UK, and France, with a growth rate of 12% per year. As demand for computer engineers and technicians grew in the 1990s, autodidacts dominated the labor market. Computer science, as taught by Italian universities, emphasized theory over practice (interview notes). At this time, international IT certification programs began to impact Italian careers. According to Domenico Martini, a former president of the Italian Programmers’ Association, highly skilled computer technicians would follow the curricula for international IT
certs without sitting for the exams. Exams were difficult and costly, and independent consultants and technicians were so in demand during the period that few needed external validation of their skills (interview notes).
Table 6.4: Trade in High Tech Industries: Export Market Share in %

<table>
<thead>
<tr>
<th></th>
<th>1996</th>
<th>1999</th>
<th>2002</th>
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</thead>
<tbody>
<tr>
<td><strong>Aerospace</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>16.71</td>
<td>14.26</td>
<td>13.55</td>
</tr>
<tr>
<td>Germany</td>
<td>10.71</td>
<td>12.67</td>
<td>13.73</td>
</tr>
<tr>
<td>Italy</td>
<td>2.70</td>
<td>2.38</td>
<td>2.95</td>
</tr>
<tr>
<td>UK</td>
<td>12.87</td>
<td>11.85</td>
<td>17.09</td>
</tr>
<tr>
<td>US</td>
<td>41.02</td>
<td>43.60</td>
<td>36.37</td>
</tr>
<tr>
<td>Japan</td>
<td>1.39</td>
<td>1.76</td>
<td>1.35</td>
</tr>
<tr>
<td><strong>Electronic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>5.18</td>
<td>5.43</td>
<td>4.77</td>
</tr>
<tr>
<td>Germany</td>
<td>7.84</td>
<td>7.34</td>
<td>8.75</td>
</tr>
<tr>
<td>Italy</td>
<td>2.42</td>
<td>1.83</td>
<td>1.92</td>
</tr>
<tr>
<td>UK</td>
<td>7.72</td>
<td>6.72</td>
<td>8.52</td>
</tr>
<tr>
<td>US</td>
<td>19.24</td>
<td>23.69</td>
<td>20.95</td>
</tr>
<tr>
<td>Japan</td>
<td>25.33</td>
<td>18.76</td>
<td>17.64</td>
</tr>
<tr>
<td><strong>Office Machinery and Computers</strong></td>
<td></td>
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<tr>
<td>France</td>
<td>5.68</td>
<td>4.85</td>
<td>3.65</td>
</tr>
<tr>
<td>Germany</td>
<td>6.98</td>
<td>6.84</td>
<td>8.09</td>
</tr>
<tr>
<td>Italy</td>
<td>2.80</td>
<td>1.64</td>
<td>1.27</td>
</tr>
<tr>
<td>UK</td>
<td>10.83</td>
<td>10.29</td>
<td>8.59</td>
</tr>
<tr>
<td>US</td>
<td>22.96</td>
<td>27.07</td>
<td>20.22</td>
</tr>
<tr>
<td>Japan</td>
<td>20.29</td>
<td>15.69</td>
<td>13.08</td>
</tr>
<tr>
<td><strong>Pharmaceutical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>9.89</td>
<td>10.55</td>
<td>9.60</td>
</tr>
<tr>
<td>Germany</td>
<td>14.84</td>
<td>15.13</td>
<td>10.84</td>
</tr>
<tr>
<td>Italy</td>
<td>6.17</td>
<td>5.73</td>
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<tr>
<td>UK</td>
<td>11.42</td>
<td>9.98</td>
<td>9.17</td>
</tr>
<tr>
<td>US</td>
<td>10.63</td>
<td>11.98</td>
<td>10.52</td>
</tr>
<tr>
<td>Japan</td>
<td>3.53</td>
<td>3.03</td>
<td>2.28</td>
</tr>
<tr>
<td><strong>Instruments</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>5.64</td>
<td>5.15</td>
<td>5.35</td>
</tr>
<tr>
<td>Germany</td>
<td>15.05</td>
<td>14.11</td>
<td>14.55</td>
</tr>
<tr>
<td>Italy</td>
<td>4.17</td>
<td>3.34</td>
<td>3.44</td>
</tr>
<tr>
<td>UK</td>
<td>7.42</td>
<td>6.85</td>
<td>6.60</td>
</tr>
<tr>
<td>US</td>
<td>22.87</td>
<td>25.84</td>
<td>25.33</td>
</tr>
<tr>
<td>Japan</td>
<td>16.74</td>
<td>14.90</td>
<td>13.54</td>
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</tbody>
</table>

Source: Doci et al (2005: 33 from OECD data)
However, as in Germany and the US, too few self-taught enthusiasts entered the IT labor market. From the later 1990s, industry analysts were bemoaning an Italian IT skills shortage and predicting an even more dangerous shortfall in the future (see Figure 6.5, also Camussone, 2003). A lack of skilled technicians, argued Microsoft, IDC, and later Cisco, was a major bottleneck in Italian IT adoption and its ensuing productivity increases (ibid). These analyses were hardly unbiased, but they helped fuel popular and government perceptions that a lack of IT skills was holding back the Italian economy. A later, highly publicized analysis by Bocconi University economist Pierfranco Camussone argued that deficit of computer skills was costing the Italian economy 16 days per worker per year in lost productivity, to the tune of €15 billion (2003).
Figure 6.5: Networking Skills Gap Projections, 2005 and 2008

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>3,692</td>
<td>14,800</td>
<td>6.1</td>
<td>10,072</td>
<td>40,300</td>
<td>11.7</td>
</tr>
<tr>
<td>Germany</td>
<td>5,281</td>
<td>21,100</td>
<td>6.1</td>
<td>21,956</td>
<td>87,800</td>
<td>17.5</td>
</tr>
<tr>
<td>Italy</td>
<td>2,581</td>
<td>10,300</td>
<td>7.1</td>
<td>5207</td>
<td>20,800</td>
<td>9.8</td>
</tr>
<tr>
<td>UK</td>
<td>4,839</td>
<td>19,400</td>
<td>7.0</td>
<td>9,890</td>
<td>39,500</td>
<td>9.3</td>
</tr>
</tbody>
</table>

*Source: adapted from Kolding and Kroa, 2005, from IDC 2005.*
Where others saw a skills shortage, many for-profit trainers saw a market. Private IT training did not answer all of businesses’ concerns. The cost of IT training at for-profit centers was high: by 2000, for-profit trainers were charging $300 for low-level user training, and much more for technical instruction. Qualified trainers were hard to come by. In the 1990s, hoping to encourage training more broadly, Sun ran a program of free courses for prospective trainers. When too many ‘scholarship’ graduates turned their backs on teaching in favor of more lucrative consulting work, Sun canceled the upfront scholarships and instituted a (much less popular) rebate program instead (interview notes). During the height of the boom, experienced systems administrators could change jobs “daily” (Interview with I-IT 1).

In Italy, where job tenure was among the longest in Europe and training traditionally took place inside the firm (Estevez-Abe et al, 2000), this labor market tumult made many employers nervous about investing in IT and investing in IT employees. “Even large firms with a history of in-house training like Fiat don’t do a lot of IT training,” said one Italian training sales manager (Interview with Firm I-IT 4). This manager believed that Italy’s IT skills shortage fueled aggressive outsourcing to foreign IT service providers, and lead to an under-investment in IT more broadly. In addition, despite a white hot labor market, few workers were willing to pay the cost of their own training. As one training manager said, self-sponsored students in Italy were “not so
frequent. Usually we have the mind that the state or the company pays” (Interview with Firm I-IT 12).

In contrast to the US and Germany, where high-skilled immigration was viewed as a partial solution to the IT skills gap by industry and right parties, in Italy, importing skilled workers did not become a major political issue or policy proposal. During the internet bubble, some in the Italian IT industry argued that their country had little hope of importing needed skills: “Indians don’t want to come here. They’d rather go to America, where they can speak English,” explained one respondent (I-IT 6). The share of both skilled and unskilled employees in the Italian workforce was far below that in Germany and the US (see Figure 6.6).
Figure 6.6: Foreign and foreign-born workers in the highly skilled workforce

A. Share of foreign-born in highly-skilled employment, latest available year

B. Share of non-nationals in highly-skilled employment, European countries, 1998


Based on data from the Eurostat Labour Force Survey.

Policy Responses

As the technology boom grew in the late 1990s, Italy’s governing class grew nervous about the country’s apparent also-ran technology status. A policy focus on IT skills coincided with a broad government reorganization of training and education institutions. Early in the decade, in an attempt to restructure government-sponsored training and make it more responsive to local economic conditions, Law 236 shifted responsibility for vocational training to Italy’s regional governments. By 1999, Silvio Berlusconi, then prime minister, decreed that “the development of the Information Society is a major goal of the Italian Government”, and put himself at the head of his newly-formed ‘Information Society Forum’ (EATT, 2002: 12). Berlusconi’s first government argued that public training needed to respond more directly to markets and further decentralized vocational training, adding occupational training for school-aged students (under 19) to the regions’ responsibilities:

Legislative Decree 112/98 completed the transfer to the regions of the responsibilities for vocational training. In particular, the regions were entrusted with ‘all the functions and administrative tasks in this field’, leaving the State in charge of international relations, guidelines, and coordination and identification of the standard of vocational training qualifications and the minimum requirements for the accreditation of training bodies (ISFOL, 2000: 18).

As the Italian education system had long been among the world’s most nationally centralized and bureaucratic (see Chapter Two, also Moscati, 1996),
this devolution of authority was a major change and allowed for significant
reform and experimentation. According to one trainer, whose institute ran
courses funded in full by the region of Lombardy and the EU Social Fund, the
private provision of new training institutions freed them from many restrictions
– instead of following national programs and timetables, they merely had to
offer courses that would win funding under a competitive bidding system. In
Lombardy, the regional government set a target to increase the share of
information technology training to 10% by 2000, and began to approve funding
for new IT programs at a rapid rate (interview notes). An infusion of funding for
vocational training from the EU Social Fund also helped the growth of regional
vocational training institutions through 2006 (ISFOL, 12).

EU funds and regional authorization gave many non-profits the financial
resources to enter the IT skills market, but did not provide the new trainers
with qualified teachers or curricula. Given the high barriers to entry in IT
training, international certification programs, with their off-the-shelf lessons
and assessments, made it possible for new and non-specialist centers to offer
IT training. As one trainer at a non-profit institution said: “Of course, if you
teach standard courses like Java, Sun, or Cisco, you have more material ready
for the teachers, but you also have less flexibility in organizing the duration of
the course. You have to meet some conditions that the company sponsoring
the course demands” (Interview with ITI-12). At other institutions, training
directors also reported that certification-issuing companies hemmed their
flexibility, restricting course offerings to evening hours and limiting the number of students trained in order to avoid non-profit competition with their for-profit corporate training clients.

At most institutions, teachers and training directors found these restrictions to be minor compared with the opportunities offered by certification programs. In addition to the instant curricula cert programs provided, the certifications themselves were a draw for students. Though many certifications were new to Italy and not well-known even within industry, some, like the Linux Red Hat program, made hiring managers “jump from their chairs”, said one trainer (interview with Firm ITI-4). A manager at a for-profit firm cited Cisco certifications as “well regarded and sought after” on the labor market (interview with I-IT 8). The president of the Italian Association of Programmers described certifications as important for workers targeting large firms as employers, but more of a ‘password’ for serious professionals in the industry than an entry-level requirement.

Though new regional oversight of vocational training encouraged a variety of experiments and innovations in IT certification at the local level, a national-level policy actually had the greatest impact on IT training in Italy. In 2002, the Committee of Ministers for the Information Society mandated certification of computer literacy for all public sector employees (Oglioloro, 2004). En masse, public sector employees and university students began to pursue an entry-level computer certification (designed for computer end-users,
not programmers or technicians) called the European Computer Drivers’ License, or ECDL (see Figure 6.7). The ECDL was sponsored by a Brussels-based European non-profit consortium, CEPIS, and available in the Italian language. One for-profit training manager argued that schools adopted ECDL because it had a well-defined curriculum with a standard measurement at the end (interview with I-IT 12). Other analysts stressed economic incentives from the government:

The success achieved by ECDL must also be attributed to its support on behalf of governmental Institutions (Ministry of Education, Ministry of Technology, the National Council of University Chancellors) which, by accrediting “academic credit points” to the certification at the university level and by putting in place economic incentives to obtain it, have contributed to spreading the culture of informatics certifications to this segment of the population. . . . . in Italy the assessment of ICT competences is indispensable for civil servants wishing to take part in examinations and competitions in the Public Administration sector (Sala, undated, 4).
Figure 6.7: ECDL Certification in Italy, 2000-2005

![Graph showing ECDL certification trend in Italy from 2000 to June 2005.]

Source: Sala (undated): 2.

Figure 6.8: Impact of Public Sector Labor Market Incentives on IT User Certification

![Bar chart showing the distribution of ECDL certificates between the public and private sector for 2001 and 2003 graduates.]

Figure 2: Variation in the distribution of ECDL certificates between the public and private sector
According to Scarabottolo, the advent of IT certs complemented a broader agenda of university reform in Italy, known as the Bologna process, which aimed to integrate Italian tertiary education with EU norms via the adoption of a credit system. The ECDL was a low-level, non-technical certification, disproportionately valuable on the public-sector labor market (see figure 6.8). But the Italian government’s promotion of ECDL – a program developed by an international, non-government association – was novel, and paved the way for the adoption of EUCIP, a higher-level, professional IT certification also sponsored by the Council of European Professional Informatics Societies (CEPIS). In 2004, ten Italian universities launched a new program, mapping the core curriculum from the EUCIP certification onto the computer engineering degree program. Initial EUCIP certification results were disappointing: Scarabottolo reported a 35.7% pass rate on the section of the exam that required the greatest comfort in English, compared with a 70% pass rate on more technical sections (2007). However, several observers predicted that EUCIP certification would grow in importance and become a legal requirement for government employed computer professionals (interview notes). To do so would, in effect, outsource the national definition and certification of legal professional licensing to an international actor.

Cisco Academies in Italy
Since the IT boom coincided with Italy’s decentralization and deregulation of vocational education, private IT certificates encountered less resistance from entrenched training interests. Entrepreneurial non-profit trainers found links to proprietary IT cert programs, like the Cisco Academies program, a major advantage in readying grant applications and winning funding (interview notes). Though many of the earliest Cisco Academies in Italy were hosted by less-structured vocational training centers, over time, Cisco’s program gained acceptance in traditional schools as well: by 2007, 53% of the 274 Academies were located in more traditional secondary schools (see Figure 6.9). Though the English-medium exams put off many students and instructors, the Cisco Networking Academy head in Italy envisioned a prominent role for Cisco Networking Academy “at all levels of the education system” (Lepore, 8).
Figure 6.9: Distribution of Cisco Network Academies in Italy, 2007

Source: Lepore, 2007: 5.
To further integrate into the national system, in 2005, Cisco placed administration of the Network Academies in Italy under a newly-formed national non-profit organization, called Assint (see www.assint.org). Though the main focus of Assint continued to be the management and expansion of Cisco Networking Academies in Italy, the new non-profit also launched an Italian-language blog for C.N.A.s and sponsored forums to match newly trained workers with employers. Assint also adopted and promoted the Europe-sponsored EUCIP program as its basic, vendor-neutral certification, in place of the US-based CompTia exam. Due to EUCIP’s growing support in Italy and by developing EUCIP support materials in the Italian language, Assint’s head Lepore believed that taking a lead in EUCIP training would “enlarge the potential demand for Cisco courses, and increase the number of [Cisco] academies and students” (2007: 24). Assint’s public/private partnership, which aimed for “wide promotion on the regional level to all schools” (8), was a new model for the integration of private actors and proprietary curricula into Italy’s public education and training institutions.

Conclusions

The striking conformity of institutional adaptation in the area of IT skills contrasts sharply with the variation of skills and strategies we saw in the textile and apparel industries.
Clearly, important differences in skills institutions remained. In the US, the number of programs and the number certified workers expanded rapidly. Employers often viewed training and testing as a form of remuneration or a retention cost rather than as a long-term investment, and when IT bubble burst, many firms balked at footing the high bills for training. As more workers began to shoulder much of the cost and the risk of training and certification individually, public training programs responded by offering IT certification training at low rates. Though these public institutions took advantage of certification programs as a way to offer more industry-relevant training than they often were able to provide, they did not require certification authorities (be they for-profit vendors or not-for-profit industry associations) to verify positive labor-market outcomes for trainees. The result – a system that puts most of the cost and risk of training on individuals, with some state subsidy – mirrors traditional skill investments in the US. But the integral involvement of American technology companies in training was novel (see Thelen, 2005). Technology firms’ involvement was a boon for small, public training programs – they could access up-to-date technology and information, which was far from the norm in US vocational training. But it also gave private firms a lot of power. They defined skills sets, and certified worker skills, with virtually no accountability.

German employers, in contrast, were initially suspicious of external certifications that might make their workers targets of poaching; they tended to
sponsor worker training, but not testing. And unlike American workers, few German workers were willing to make a financial investment in IT certifications. Rather than adopt certifications based on international high-stakes tests, German training authorities attempted to create a new system with a few innovations, but many of the same incentives as the traditional dual system. The limited relevance of these new institutions, compounded by the growing relevance of international IT certifications, reflects the continued challenges of updating a strong apprenticeship system in the absence of existing labor stakeholders. Culpepper (2007) argued that the growth of the service sector, and the disappointments of the apprenticeship system in serving it, posed the greatest threat to Germany’s dual system. The case of IT skills suggests that the lack of labor input in important (though not legally recognized) credentials may be a turning point.

In IT, Italy is an example of a ‘standards taker’. Given Italy’s institutional thinness in IT skills development, the advent of international skills standards and credentialing programs gave instructors an inexpensive, effective template to get up to speed quickly. Unlike in Germany, where initial resistance to certificates by public trainers was considerable, Italian trainers and policy makers embraced the programs enthusiastically. Indeed, the extent of the willingness of educators to outsource the development of curricula, standards, and mechanisms of assessment in domestic institutions is surprising,
particularly given that Italy has given legal weight to some of the internationally-developed certifications.

Despite differences in distributing the costs and risks in investing in IT skills, internationally standard IT certifications forced convergence in an important area: defining skill sets. This impact is particularly clear in cases like Cisco, where a for-profit vendor pushed internationally standard definition and certification of skills via discounts to resellers and an international charitable endeavor. But even when IT training did not result in testing and formal certification, as was often the case in Germany, the widespread adoption of certification program curricula meant a de facto internationally standard definition of job roles.

Though this development clearly falls short of the hard convergence of many early globalization theorists, it's important. Much of the success of the dual system in producing robustly skilled industrial workers can be attributed to a balance of firm, union, and government power in deciding which skills to teach and test. The advent of international certification programs and the widespread adoption of their curricula circumvented this bargaining, particularly undercutting the power of organized labor and local governments. In fact, German firms have begun to embrace certification programs. In recent years, SAP, the German enterprise software firm, expanded its in-house certification program to outside consultants and end-users, even sponsoring Cisco Network Academy-style partnerships with universities. Siemens, when
asked by Chinese authorities to develop a certification program in electromechanic engineering, initially mapped the Chinese program on its German apprenticeship curriculum. When Siemens managers realized that they did not have to include all the elements of the German program needed to satisfy its social partners at home, they were elated. They stopped using the apprenticeship program as a model and adopted an IT certification model instead (interview notes, 2005). Industry-defined skill sets are novel in the US, too.

Given the heft of the IT industry in industrial economies and the impact of IT in other sectors, a major change like international skill standardization would demand attention even if it remained isolated to the technology sector. Indeed, the standard and codified nature of the IT industry is unusual, and firms in other industries seem to have less incentive to invest in similar programs. But the certificate model may ultimately have an impact on the broader world of skill building. Certification programs have drawn imitators outside of IT: the Project Management Professional certification attempts to define and test the skills of project managers, particularly management skills and other non-technical, ‘soft’ skills, and has certified over 300,000 managers worldwide in industries ranging from health care to construction, as well as IT (PMI, 2008). Moreover, as the Italian case suggests, once a skill system accepts a certificate program in one area, familiarity with the process could lower resistance to international programs in other areas. In Italy, the
broadest adoption of certificates was for state-employed end-users of technology. Now acculturated to the certificate process, these workers could be less resistant to similar programs aiming to increase time management skills, for example. The potential international actors to impact domestic education and to define workforce skills – while by no means certain or even likely – is at least more plausible given the success of IT certs.

In addition to the convergence on a single skill set, the rise of IT certification programs underscores the growing importance of international, often for-profit actors. In IT, high barriers to entry (both for developing technologies and training for them) meant that the same players dominated globally. Certification programs, with their built-in guards against teaching outdated technology, solved perennial problems in the US (teaching skills too removed from industry), Germany (failing to respond quickly to market changes) and Italy (weakness in training for non-local technologies). These training systems also added new dilemmas, by pushing additional risk on workers, and cost onto the state, while requiring limited accountability from certifying authorities. International technology firms and not-for-profit certification authorities gained power at the expense of certain domestic actors, but also provided new tools for policy entrepreneurs and reformers. Whether, after successful engagement with international actors on IT training, education and training institutions will be more open to international influences in other areas remains to be seen.
Chapter Seven: Conclusions

The introduction of this dissertation explained that globalization has encouraged a common response in political rhetoric in advanced industrial economies: to compete in a world of increased trade and competition from developing countries, politicians and managers seem to agree, businesses will have to employ highly skilled workers, and governments will need to do more to help organize and finance skill provision. In Italy, Germany, and the United States, skill building politics and policies have focused on reforming formal education, and increasing standards for literacy and math, in order to prepare workers for the 'knowledge economy'. But in an era where India and China are no longer reservoirs for cheap, unskilled labor, but also alternatives for higher-skilled ‘mass’ production and services, will raising the floor for general education do enough to maintain rich countries’ productivity advantages?

Some social scientists suggest that improving general education, as measured by standardizable outcomes, will be an insufficient skill strategy for advanced economies. Maskell and Malmberg argue, rather, for strategies rooted in tacit skills, transferred via personal relationships. Unlike standard academic training, tacit skills are location specific, and therefore, sticky:

. . . . the more easily codifiable (tradeable) knowledge can be accessed, the more crucial does tacit knowledge become for sustaining or enhancing the competitive position of the firm. . . . . The fundamental exchange inability of this type of knowledge increases its importance as the internationalization of markets proceeds (1999, 172).
As we have seen in the textile/apparel chapters of this dissertation, location-specific tacit skills can provide a basis for competitiveness on international markets (see also Nonaka and Takeuchi, 1995; Saxenian, 2003:13; Senker, 1995; Streeck, 1988; Locke, 1995; Lane and Probert, 2006).

But globalization-induced changes in production processes have also undermined the (sometimes less formal) institutions that have historically encouraged the transfer of tacit skills. Indeed, as I will argue in this chapter, the potential erosion of mechanisms for tacit skill production may pose a risk to the production functions that firms in high wage countries aim to continue in-house and at home, including innovation, research and development, conception of new products, and design. In addition, lack of attention to possibilities for tacit skill transfer is particularly worrisome for workers at the low end of the skills distribution. These workers, whether disadvantaged by background or disinclined by personality, have more difficulty succeeding via traditional academically-oriented educational structures (Pfeffer, 2007, Muller and Karle, 1993, Sparkes, 1999, Kozol, 1992). A skills policy focused primarily on classroom-based academic training threatens both to neglect innovation and to leave disadvantaged workers behind. In this conclusion, I argue that improving classroom-based education and training – while clearly necessary if countries hope to remain competitive on global markets – may not be sufficient. Tacit skill development deserves more attention from leaders concerned about globalization and national competitiveness.
This chapter is organized as follows: first, I summarize evidence from each of the country cases on how globalization has contributed to the erosion of institutions that provide tacit-skill building opportunities, and the potential impact of that erosion on innovation in each country. Next, I discuss the policy responses to this challenge and find a mismatch between employers’ reliance on tacit skills and the emphasis of current reforms on formal education. I then present alternative models for skill building in the global era, including the new, firm-sponsored IT certificates highlighted in Chapter Six. I conclude with a discussion of the implications of this dissertation for understanding of the role of skills in advanced economies and for public policy.

Institutions and tacit skills

During the postwar years, each of the economies examined in this dissertation developed and depended on institutions to foster the transfer of tacit skills. In Italy, the industrial district system of networked production was encouraged and reinforced by public policies that favored small and medium-sized firms (Lazerson, 1995). These districts served as a social and business environment that encouraged trust, often based in social ties, entrepreneurship, and learning (within and across firms) (Brusco, 1992). The system of learning institutions in Italy was largely informal, but it encouraged a
workforce with high levels of tacit skills, including deep understanding of production and of markets.

In Germany, a highly institutionalized apprenticeship system also produced workers high in tacit skills. The dual system integrated young workers into the firm, with special status as learners. In addition to theoretical, classroom-based instruction, apprentices gained hands on experience in all areas of production. Most emerged with detailed knowledge not just of a specific step in production, but also with a broad understanding of their industry.

In the United States, the Fordist production system was specifically designed to employ semi-skilled and unskilled workers; most production jobs required little advanced training or broad understanding. But vertical production did allow for motivated workers and supervisors on the shop floor to observe, and learn about, the broad arc of production. More importantly, managers – whose university educations were geared toward theoretical knowledge and general problem solving skills – were usually able observe integrated production, from product conception to marketing, often within their organizations. Moreover, managers often benefited from company-sponsored training that complemented their on-the-job experiences (Lynch, 1992).

But as globalization forced changes in production structures in all these countries, institutions that facilitated tacit-skill transfer were impacted too. In the following sections, I discuss each case in turn.
In Germany, we found that textile and apparel firms leveraged the strong technical background of their workers to manage high quality, outsourced production in Central and East Europe. Though total employment dropped in both sectors, the jobs that remained in Germany were generally more highly skilled and better paid jobs than those that remained in competitor countries. Managers who shifted production abroad routinely credited the success of the new ventures to oversight by experienced German managers and technicians (see also Lane and Probert, 2005 and Faust, 2005).

However, while skilled German technicians and managers managed to forge a means of survival for their rich-country-based firms in face of low wage competition, they did so in part by transferring some of their valuable skills and technical knowledge to foreign workers. Most German firms with foreign production sites or suppliers kept German managers on site (in residence or via frequent visits), to teach Central European managers and workers how to produce to German quality standards (interview notes). Production employment in Germany contracted sharply in these sectors, and though the share of trainees remained constant through the downsizing (Lane and Probert, 2005), the total number of incoming apprentices plummeted. At the same time, textile and apparel firms had an increasingly difficult time attracting junior engineers. One prestigious textile engineering institute reported that none of
its advanced students was German, and its most promising doctoral candidates were all Turkish (interview notes).

As the oversight tasks long the province of German technicians and managers are gradually overtaken by Central European workers, the impact of this skill shift on long-term German firms’ competitiveness in the industry remains unclear. Without a strong rising class of apprenticeship-trained future managers and techs, is a high quality/close supplier oversight strategy feasible in the future? In our interviews, several managers expressed concern that a lack of home production, even on a small scale, might threaten know-how. Other researchers tracked the same concern: one manager, for example, worried about his firm’s transfer of production to foreign low wage suppliers: “You have to have a certain amount of own manufacturing capacities to know what’s going on regarding delivery times, deadlines, prices, calculation, and know-how. We have been losing know-how . . . because we did not have any high volume manufacturing site any more” (quoted in Faust, 2005:32). These managers are concerned with losing tacit skills – knowledge built and reinforced through lived experience rather than formal schooling. Chapter Five suggested that despite German firms’ longstanding advantage in production and quality control, continued offshoring of production could lead to the atrophy of tacit skills. In the future, as production know-how migrates out of German firms and to their low wage suppliers, German companies could concentrate on functions for which the German system still supports creation
of codified and tacit skills, such as design and marketing. Retail managers praised Germany’s training programs for store buyers, for example (interview notes).

However, to abandon the close supervision of production would be to forfeit a traditional advantage over other advanced economy competitors; indeed, it would mean giving up the diversified quality production model. Since the dual system has been long held to be the cornerstone of Germany’s diversified quality production (DQP) system (see Streeck, 1988, and Sosckice, 1989), fundamental changes in skill building – at home and in supplier locations – raise questions about the long term sustainability of the craft-based model. Though the textile and apparel industries have been clearly been much more affected than most German industries, other industries have also increased outsourcing, and, as we will discuss in greater detail below, have begun to voice discontent with the dual system of training.

Italy

Though Italy’s informal skill institutions differ substantially from Germany’s highly regulated dual system, the advent of cross border production poses similar risks. In industrial districts, workers absorbed skills largely through informal means: within family firms, by working with suppliers and competitors, and via social interaction in worker and employer associations. In the resulting environments, rich in tacit understanding of production and
markets, transaction costs were low, innovation high, and high wages did not undermine competitiveness (Bruno and Righi, 1989; Bianchi et al, 2001; Belussi, 2002).

In Italy, apparel and textile producers faced the same challenge from low-wage producers with different strategies: rather than exporting skills out to low cost manufacturing sites, as Germany did, Italian managers more often tried to bring lower cost inputs in to the Italian production system. Chapter Four found German firms often maintained close relationships with their suppliers; Italian firms preferred to own them altogether. Large firms faced with the prospect of losing local suppliers key to their flexible production bought them, establishing a trend toward vertically integrated production in place of the traditional disaggregated (but district-based) system.

Chapter Four showed that Italy’s textile and apparel firms pursued these globalization strategies to complement their workers’ high levels of tacit skills. Recent changes in Italian industry structure (both patterns of globalization that rest on close ties to overseas suppliers and vertical integration of previously disaggregated production) were new solutions to an old coordination problem – how to build and share tacit knowledge. Via these strategies, the Italian textile and apparel sectors managed to survive in face of low wage competition through the 1990s. Indeed, Italian employment in the sectors was not decimated to the same degree as in competitor countries like Germany and the US (see graph on page 173). However, Italian firms’ recent struggles suggest
that these strategies may not guarantee long term success. Moreover, the structural changes in production designed to preserve tacit-based transactions in the near term may not work in stimulating ongoing tacit skill creation.

When large firms absorb key suppliers, resulting in a vertical production model rather than networked production, there may be fewer opportunities for interaction across organizations. Traditionally, entrepreneurs – a key feature of industrial district production – were encouraged to branch out on their own, and offered technical advice, startup capital, and production orders by their employers with (interview notes, see also Becattini, 1990). If vertical production (rather than networked production) becomes the norm, the industrial district social system could change profoundly, limiting flexibility, reducing inter-firm mobility, and thus providing fewer opportunities for tacit skill acquisition.

The impression of textile and apparel districts as moribund – a view reported by managers from Como to Prato – also discourages talented young workers from entering the industries. As in Germany, Italian employers reported that recruiting new labor market entrants suitable to be trained for supervisory positions, particularly in manufacturing, had become more difficult. Indeed, Sistema Moda Italia, the largest employer association, instituted a small-scale recruitment program to attract young workers into the industry to train for mid-level, supervisory positions (interview notes). The situation has been exacerbated by Italian demographic realities: in some districts,
manufacturing jobs have become the province of immigrant labor (Fioretti, 2001, Nadau 2007). The social distance between Italian managers and immigrants in the industry could also restrict opportunities for tacit knowledge transfer. Some of these problems are particularly acute in the textile and apparel industries. But the apparent unraveling of networked production in Italian textiles and apparel does provoke questions about the stability of skill building in other industrial districts.

In addition to the challenge to maintaining tacit skills given evolving structures, Italian firms face the challenge of over-reliance on tacit skills. As I argued in chapter four, the same properties of tacit knowledge that provide tacit systems with an advantage in a global economy – that the creation of tacit skills requires co-location of producers, suppliers, and customers (or marketers), and often a common culture as well – are a disadvantage to producers trying to take advantage of non-local technology and the opportunities of disaggregated production. As Rullani writes, “The local actors need to transform their cognitive ‘engine’ that has served them so well up to now. . . . This opening up to distance relationships is perhaps more painful for local networks than for the other forms of organization,” (2003, 13, 15). That Italy’s formal education sector has long been seen as a laggard and particularly removed from the market (Barbagli, 1984; Di Pietro, 2008), ratchets up this challenge.
Unlike the tacit-intense production systems in Germany and Italy, US-style Fordism provided fewer opportunities for lower-skilled workers to pick up tacit skills and industry knowledge. And at the same time that low skilled jobs faced greater threats from low wage competitors, disaggregated production exacerbated the lack of skill building opportunities for those at the bottom of the distribution. As Fitzgerald (2006) argues in her study of US career ladders, the wholesale offshoring of mid-level functions has not only reduced employers’ demand for low skilled labor, but also turned many of the jobs that remain into dead-end positions. Before global production, motivated entry level workers could observe the arc of production within the firm: now, disaggregated production strategies limit those opportunities. In addition, work reorganization has resulted in a structural problem for low skilled workers:

Enabling people to move up from entry-level jobs is not just a matter of education and training them. Often there is no pathway for low-wage workers to advance through a progression of more responsible and better-paid jobs as they gain skills and experience, for the simple reason that there are no more intermediary jobs for them to advance into. In many industries the middle rungs of what ought to be or used to be a career ladder are simply missing (Fitzgerald: 2).

The Fordist production system was specifically designed to reduce the role of tacit knowledge in production, and to free producers from a dependence on skilled production workers (Thelen, 2004). Chapter Three explained the US textile and apparel industries excelled at the system for much of the postwar period. Indeed, US manufacturers’ success with Fordist production at home
primed them for outsourcing and off-shoring to low wage, low skill economies. One Italian manager, after spending a few months at a North Carolina textile factory, concluded that US firms were “used to dealing with stupid people” (interview notes). Rather than rely on skilled loom operators to oversee small batch production of various styles and colors of fabric, managers blocked out five days of production of a single color and style: American loom operators lacked the skill to change production efficiently, so only large production runs were efficient. Similarly, US apparel producers were geared toward executing large orders of basic and medium quality goods, based on clear specifications. This skill set, which spelled doom for unskilled production workers as globalization opened the country to low cost imports, opened doors for US managers who saw opportunities to exploit low wage environments abroad.

In the 1980s and 1990s, scholars and managers looked to Europe (and Japan), hoping that emulating tacit-intense production techniques would save US jobs. Experiments aimed at increasing the skill level and productivity of apparel workers met with limited success. GDIC, a New York-based industry/labor collaborative designed to find opportunities for upskilling and productivity increases in local apparel factories, tried to coach firms to implement cross-training and product diversification. Managers reported that maintaining their specialization was more profitable (sewing only skirts, for example, rather than aiming to be a one-stop shop) and workers earned higher wages (via piece rates) through specialization. In the end, GDIC found, firms
wanted help building higher level business skills, including how to find and manage credit, rather than production skills. Even American Apparel, a firm that advertises its wares proudly as “Sweatshop Free” and as “Made in America” has downsized its production workforce despite double digit growth, citing productivity gains from a $15 million investment in new machinery (Chang, LA Times, Dec. 18, 2008).

Fashion’s demand for the latest products immediately, together with low levels of regulation that allow for “sweated” labor unseen in social democracies like Germany, seems to suggest that US-based apparel production is not about to disappear altogether. But an increase of production skills no longer promises to be a magic bullet, either for individual workers (whose career prospects might be better served by focusing on general management skills) or for firms (who must compete with low wage producers who are also constantly upgrading their capacities). And as more and more firms report that their foreign suppliers perform higher value-added steps in production (sample making and quality control, for example) that used to be the purview of the home firms, US apparel and textile companies seem poised for a further erosion in these capabilities.

Instead of manufacturing excellence, successful US firms stress the skill of their designers in creating market-relevant products and their managers in overseeing complex supply chains, marketing brands, and organizing distribution networks. These functions, particularly fashion design, remain
interactive and highly subjective processes, and doing them well depends on tacit knowledge. LA-based designers of high end denims wanted to see the fabric as it came out of the wash, and approve the detailing and finishing themselves. Long distance and disaggregated production not only risk quality control, they risk cutting off the designers from inspiration and a true understanding of production (interview notes). As garment assembly, and increasingly, detailed design and quality control continue to migrate to lower wage economies, the impact for American firms of an ongoing loss in tacit skills relating to textile and apparel production remains unclear.

**Losing Production → Losing Tacit Skills → Losing Edge and Innovation?**

What are the implications of the erosion we see in tacit skill building opportunities? I discuss each of the countries under study in turn, drawing illustrations from the textile and apparel sectors as well as looking to implications for the broader economy.

In Germany, the apprenticeship system has long been considered the backbone of the country’s successful diversified quality production (DQP) model. Indeed, even as textile manufacturers expanded outside German borders and apparel producers outsourced virtually all their garment assembly, the technical prowess of German managers allowed home firms to compete internationally in high end markets, while maintaining relatively high levels of high-skilled employment at headquarters (see Chapter Five). But both the
transfer of skills to overseas suppliers and the absolute decline in the number of trainees suggests this cross-border incarnation of diversified quality production may not be sustainable. German apparel firms retained an advantage in medium to high end subsectors, emphasizing fit and quality, often for middle-aged, higher income consumers (Lane and Probert, 2005). As sample-making follows production of entire collections overseas, can designers maintain an edge in fit? As fewer Germans oversee quality directly, can German firms make sure that their now-capable partners don’t choose to supply competitors instead?

In textiles, firms that set up Central and East European plants saw rapid improvement in efficiency in the new sites during the 1990s. Managers decided to focus production at German plants on higher-end markets, including technical textiles developed in conjunction with customers in the auto and medical sectors (interview notes). But intense domestic competition limited profitability in these sub-sectors. At the same time, the textile industry seemed to have trouble attracting new talent – particularly the engineers on whom the technical textile strategy was based (interview notes).

Low barriers to entry in apparel and textiles, together with domestic labor regulations that made production within Germany particularly costly, made the threat of low wage competition acute for these industries. However, some of the trends we observed in these sectors may suggest danger for German manufacturing more broadly. The textiles and apparel industries
seem to illustrate systemic problems in Germany’s dual system of skill
building: rising costs for employers, declining participation among the most
talented labor market entrants, and increasing government responsibility for
and oversight of training.

While German employers remain publicly committed to the dual system,
many complain about rising training costs and poor quality recruits (Wagner,
2000). Unions, not firms, are now the most vocal supporters of
apprenticeships (Thelen, 2004). Even large manufacturers, traditionally
suppliers of the most prestigious apprenticeship slots and the backbone of the
system, have pulled back from the dual system (Greinert, 2005 and interview
notes). That firms have begun to view training as a social/political necessity
rather than a business investment is troubling for the long term balance of
incentives in the system. The German state has pushed hard on industry to
maintain levels of training, but nonetheless has been forced to expand
classroom-based training for those who could not find apprenticeship places
(Busemeyer, 2006). These state-run, classroom-based programs lack the ties
to industry and the opportunities for real world production experience that are
at the heart of the dual system’s ability to generate tacit skills. The classes
count as training places in national statistics, but serve more as holding pens
for disadvantaged and marginalized youth, rarely leading to employment
(Busemeyer, 2006). If firms are abandoning the dual system, so too are
talented youth: ever greater numbers of German school-leavers see a
university degree, not an apprentice certificate, as the key to a better future (Ertl, 2005). As Finegold argues, as the brightest young Germans increasingly view higher education rather than apprenticeship as the path to a bright future, “there is a risk that firms will change their career structures, limiting access to technical and managerial positions to those who have a degree and thus making apprenticeships a less attractive option” (Finegold, 1999:412).

As firms pulled back from the vocational system (Wagner, 2001; Busemeyer, 2006, and interview notes), have these employers relied less on experience-based skills? Service firms have long counted on Germany’s Fachoschulen, or technical colleges, as training and recruiting centers for labor market entrants; more recently, firms in other sectors have looked to Fachoschulen for new hires as well (Ertl, 2005). German firms that switch to hiring graduates instead of apprentices may indeed get high quality recruits without the costs and burdens of running an apprenticeship program – but could also find themselves pushed into onerous, unanticipated, on-the-job training, at unknown cost. They may find that the new, more broadly skilled workforce closely matches the skill demands of global production, or that these workers lack the tacit-heavy craft skills that have long formed the base of their firms’ ‘core competences’. German firms, as well as highly educated young workers, are well positioned to explore new strategies. The large numbers of young workers who are shut out of the apprenticeship system and fail to gain a degree may fare less well.
In Italy, where industrial district production depends even more heavily on tacit knowledge, the threats to tacit knowledge transfer pose the greatest challenges. Though Italian textile and apparel manufacturers were able to maintain much higher levels of production in the home country than their US or German competitors through the 1990s, Italian firms have struggled in the current decade (see chart, page 147). As discussed in Chapter Four, large numbers of immigrants – low-skilled production workers for the most part, but also some entrepreneurs from the developing world and highly talented designers from advanced economies – have joined the industry, diluting the social homogeneity that traditionally fostered trust and fueled learning across firms (Costa, 2005; also Horyn, 2001, and Moore, 2003).

Overall, the number of foreign designers in Italy is small, but the fact that some firms have looked outside the fashion districts for design – one of the few talents that is often cited as the core competence of the Italian industry – is telling. Moreover, there is little evidence that either district training institutions or regional universities have facilitated the integration of these migrants, be they high- or low-skilled. Alberti found managers in Como believed the local university “to be mis-positioned in the local education system and still far from satisfying the local training demand” (2006: 13).

Fashion historian Valerie Steele credits Italy’s designers’ success to their close relationships with the innovative and high-quality domestic textile industry (2005). While selective off-shoring puts that relationship at risk, the
trend toward vertical integration in the Italian fashion chain seems to be an attempt to secure this traditional advantage. However, the medium to long term consequences of a ‘fashion system’ based on a few large firms within less dynamic local districts remains unclear. Traditionally, industrial districts produced the skilled workforce responsible for Italy’s incremental innovations in the industry. The challenge remains as to whether the Italian system can be flexible enough to identify and foster the skills needed to thrive under these new conditions.

In the US, quality production has not traditionally been at the heart of firms’ competitiveness. Apparel firms tended to compete on design and distribution, textile firms were (too) long content to produce large, low to medium-quality goods. However, local production remains key for some US apparel designers (interview notes). As we saw in Chapter Three, design, particularly fashion design, remains an interactive and highly subjective process. LA-based designers of high end denims wanted to see the fabric as it came out of the wash, and approve the detailing and finishing themselves. Long distance and disaggregated production not only risk quality control, they risk cutting off the designers from inspiration and a true understanding of production (interview notes).

Only one US manager in our sample could even conceive of outsourcing design to Asia; most considered design to be their firms’ core competency. However, few managers seemed to have anticipated or fully considered how
disaggregation might impact design over the medium to long term. Francisco Costa of Calvin Klein found that designing his couture collection required local, and iterated, sample making (Horyn, 2006). Though one would expect couture to require craft and art, lower down on the quality scale, managers reported diminished technical skills (specifically in knowledge of fabric, and technology of production) in younger sourcing managers. Industry buyers, they said, were no longer confident in assessing a fabric’s “hand” -- a tacit skill if there ever was one!

How will diminishing production-related tacit skills impact US apparel firms? As yet, US firms maintain advantages in design over producers in low wage countries (interview notes). Given the large cultural component in fashion design (a tacit skill which low wage producers have serious trouble acquiring), designers at home seem safe. In addition, US firms report a strong edge in other tacit skills, especially the tacit aspects of marketing, as well as general management skills, like supply chain management. Though US firms are laggards in training for production workers, American companies have long invested disproportionately in ongoing training for managers and executives (Kletzer and Koch, 2004). At this point, however, it is difficult to predict whether a continued decline in domestic production, and the erosion of tacit knowledge that accompanies it, will hem the ability of American firms to create exciting new products.
In other US industries, divorcing design and R&D from production has not seemed to diminish firms’ capacity to innovate. As Saxenian has found, the IT sector’s fluid labor markets and vibrant professional organizations have encouraged tacit knowledge building and transfer within professional networks (1996; see also Defillipi and Arthur, 1996). In the electronics sector, Apple outsources all manufacturing, but thrives at conceiving innovative products, assuring high quality from suppliers, designing effective marketing campaigns, and providing after-sales service to end users (NYT, Jan, 12, 2009). Google’s strategy for its phone is not to produce hardware itself or even outsource production of its designs, but rather to provide open specifications to manufacturing firms and concentrate its own energy on software and service (in this case, service to advertisers). In electronics, the sector where codification of specifications is perhaps the most advanced, managers worried about the impact of outsourcing production on intellectual property and innovative capabilities, but many firms seemed able to be able to take advantage of low cost manufacturing without losing tacit skills related to design and service (Sturgeon, 2003, Berger, 2005:295).

Political Debates and Policy Responses: Compensate with Superior General Skills?

While opportunities to develop tacit skills at work seem to be on the wane in all three advanced economies, academic education and classroom-
based training are on the rise. Indeed, as we have discussed, policy debates on skill building focused on increasing general skills and academic attainment, often with standardized tests as a prod and check, as the means to high-wage national success. The OECD, a powerful voice in upskilling debates, encouraged international benchmarking based on standardized test results as the means to high-wage national success (see OECD 1998). As Martens and Liebfried (2007) argue, with its PISA system of international testing and comparison, the OECD established education policy internationally as a political field in a way which no other institution has so far achieved. It has broken down education systems into manageable figures, which allow 'best practices' to be shown in addition to deficits. In this way, the OECD has succeeded in making all knowledge-orientated industrial nations clear how central this topic is (2).

Many supporters of standards and testing as tools for educational reform are careful to warn that these tools are far from a cure all, and that bad tests, or too many tests, can do more harm than good (Levy and Murnane, 2005:147-8; Ravitch, 2002). Nonetheless, as the introduction to this dissertation argued, political debates and reforms in skill building since 1990 in the United States, Germany, and Italy have focused predominantly on market-oriented but classroom-based models. Proponents of these reforms, especially the business lobbies we profiled in Chapter One, have pushed for reforms that will hold education and training institutions accountable for student success through establishing clear standards and producing comparable outcome measures.
(i.e., test results). Can increases in non-work based training and academic education counterbalance decreased opportunities for company-based skill building?

According to the OECD, young people are pursuing post-secondary degrees in ever greater numbers (see Figure 1). From Italy to India, an explosion of university attendance is reshaping assumptions about skills institutions and labor markets the world over. Widespread access to tertiary education could produce a broad pool of workers with general, high-level problem solving skills. In the US, access to and investment in university education has been credited with creating a large number of managers and engineers open to radical innovations (Estevez-Abe et al, 2001). Once in workforce, people with high levels of expert thinking and complex communication skills are poised to absorb tacit knowledge about specific industries more quickly than workers without these skills. The US tradition of sponsoring training for already highly-skilled managers (Lynch, 1992) has been a successful system for leveraging high general abilities with industry- or firm-specific knowledge.

As Levy and Murnane (2005) argue, under the new division of labor, workers with skills in expert thinking (“solving problems for which there are no rules-based solutions”) and complex communication (“interacting with other humans to acquire information, to explain it, or to persuade others of its implication for action” will be well placed to compete in the global economy (47-
48). When done well, formal education boosts these skills. Indeed, workers with high levels of formal education have managed better during the current era of globalization than their less schooled countrymen. In the USA, university graduates continue to gain in wages over non-graduates (Katz and Murphy, 1991, Murnane et al 1995, Autor et al 2008). In Germany, the returns for education remained “remarkably stable” during the period from 1974-1997 (Lauer and Stiener, 2000), but workers with higher credentials maintained their advantage in a worsening labor market (Lauer, 2002, see graph). In Italy, formal education, particularly in the South, had an inverse relationship to employment during much of the postwar period (Barbagli, 1988). However, Bertola and Garibaldi (2003) reported that though educated young people continue to have a difficult time begin integrated into the economy, and 25-34 year olds with university degrees were as likely to be unemployed as those in their cohort without secondary diplomas, prospects for workers in the 35-64 age group were significantly improved by formal education (see table).
Figure 7.1

Changes in real expenditure on educational institutions in tertiary education
Percentage change 1995-2004

Source: OECD Factbook 2008, page 199
## Italian Unemployment by Age, Region, and Educational Attainment

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Highest Degree</th>
<th>North West</th>
<th>North East</th>
<th>Centre</th>
<th>South</th>
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<td>9.8</td>
<td>27.3</td>
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<td>3.2</td>
<td>8.3</td>
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<td>10.5</td>
<td>24.7</td>
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<td>5.8</td>
<td>14.5</td>
<td>35.6</td>
</tr>
<tr>
<td></td>
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<td>4.3</td>
<td>10.6</td>
<td>26.8</td>
</tr>
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<td>2</td>
<td>2.3</td>
</tr>
<tr>
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<td>2</td>
<td>3</td>
<td>6.3</td>
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<tr>
<td></td>
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<td>2.5</td>
<td>2.4</td>
<td>3.6</td>
<td>9.9</td>
</tr>
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<td></td>
<td>Secondary Degree</td>
<td>3.6</td>
<td>2.7</td>
<td>4.7</td>
<td>12.3</td>
</tr>
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<td>2.9</td>
<td>5.8</td>
<td>16.3</td>
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<tr>
<td></td>
<td>Total</td>
<td>2.7</td>
<td>2.4</td>
<td>3.9</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>University Degree and Phd</td>
<td>2.7</td>
<td>3.7</td>
<td>5.6</td>
<td>9.7</td>
</tr>
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<td>2.7</td>
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<td>14.4</td>
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<tr>
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<td>2.7</td>
<td>5.2</td>
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<td>3.1</td>
<td>6.6</td>
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<td>3.1</td>
<td>6.4</td>
<td>18.6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.5</td>
<td>3</td>
<td>6</td>
<td>15.3</td>
</tr>
</tbody>
</table>

Source: Bertola and Garibaldi (2002:27) from ISTAT data.
Figure 7.3
German Unemployment Rates by Education Level, 1991-1999

Despite this good news about highly skilled workers, political calls of ‘college for all’ or ‘training for the unemployed’ may promise more than they deliver. University education entails considerable tuition and lost wage costs, increasing the burden of risk that individual workers must bear. Though structural changes have decreased the percentage of college dropouts in some European countries, dropout rates remain high in the EU and in the US, particularly among the socio-economically disadvantaged (Naeve, 2003). Because richer students are more likely to pursue tertiary education to start with and much more likely to finish it, public policies that invest in university training at the expense of basic education and vocational training disadvantage less privileged students (Finegold et al, 1999). While university enrollment is on the rise, most workers in all these countries do not have university degrees. Skill building policy based on the assumption that all people are willing and able to succeed in higher education is not based in current reality.

Moreover, even if the assumption that a much greater share of young people can and will succeed at universities, it is not entirely clear that most post-secondary academic education is currently designed to increase the ‘expert thinking’ or ‘complex communication’ skills, particularly for non-traditional students. As Fitzgerald notes, the US community college system – though more accessible to workers from various backgrounds than universities that confer four-year degrees, has not been subject to accountability standards as mandatory education, and ‘there are many unanswered questions about
what [community colleges] do well” (2006:201). In Italy, recent reform has helped bring down drop-out rates (by adding a first step, three year degree) and introduce a few more market-relevant programs, but overall the tertiary system remains highly academic rather than job related; workers motivated by hands-on or situational learning may have a hard time in this environment (Bratti, 2006). In Germany, expansion of the fachoschulen looks promising, but many of these programs are also quite academic in focus with limited contacts to the market. Incentives at universities, even less prestigious universities, are geared toward the academy more than the market: success is mainly measured by the numbers of degrees conferred, not careers enhanced.

Employers have lobbied to higher standards in formal education, but empirical evidence suggests that employers may overestimate the academic skill content of entry level jobs on the micro level (Rosenbaum and Binder, 1997, Regini, 1997), and overestimate the impact of formal education on economic growth on the macro level (Wolf, 2003).

Non-university job training programs also pose problems. In the US, empirical studies suggest that the largest training workforce skills investment program, the Jobs Training Partnership Act, was near complete failure (Bovard, 1989, Muhlhausen, 2005). One study of the even more generously funded Trade Adjustment Assistance for redundant tech workers found workers who had participated in training were less likely to be employed after six months than workers who received no training (Lazonick, 2006). In Germany, school-
based training programs have become holding pens for disadvantaged and marginalized youth, rarely leading to employment (Busemeyer, 2006). Market-oriented skills programs, like the programs that gave grants to the long term unemployed to pursue computer training at the height of the technology bubble, were widely regarded as expensive failures (interview notes, see also Hipp and Warner, 2007).

Even if existing tertiary institutions and continuing training programs can be redefined to help increase expert thinking and complex communication, all classroom-based programs have one thing in common: limited or no exposure to the workplace. The dual system in Germany and the Italian networked production system both leveraged co-location and relationships in the workplace to create skills—especially tacit skills—that classroom-oriented training programs have trouble fostering. In their current incarnations, many classroom-based skill building programs seem ineffective at raising either general thinking and communication skills, or in facilitating the transfer of tacit knowledge about particular industries.

Though smarter program design could make classroom training programs more effective at teaching some general skills (see Levy and Murnane, 1996), finding ways to transfer market-oriented tacit knowledge from outside of the marketplace may prove more challenging. And as I detailed above, even when lower-skilled workers do find jobs, the new realities of today's disaggregated manufacturing and services industries allow for fewer
opportunities to observe and understand markets and production. Workers may have trouble absorbing tacit skills they cannot observe firsthand.

**New Model for Employer Participation?**

Tacit skills are acquired via relationships and experience, and effectively building skills relevant to the market seems to require relationships with employers. According to Peter Joyce, head of Cisco Academies worldwide have argued that direct business involvement is the best predictor of successful training (interview notes). At a time when firms when the disaggregation of production gives firms less incentive to train and workers fewer opportunities for learning on the job, certification could be a new and promising model for the deep involvement of businesses in skill building. Are certificates indeed a good model? Can such programs be expanded outside of the information technology sector?

From a public policy perspective, IT certificate programs have a lot going for them. For firms, limited infrastructure costs and revenue potential (via student fees), as well as the marketing benefit of having workers trained and certified in implementing a firm’s products make the programs a sound investment. Not only do firms have an incentive to establish programs, they have continuing incentives update them and monitor their quality. Certification programs are also flexible and scalable, making technology training economically feasible even far from high tech centers. Technology
allows for quick dissemination of new knowledge even to remote areas, and standard curricula free over-burdened, and often under-informed teachers from creating an up-to-date curriculum on their own.

Though IT certificates seem naturally suited for information technology and telecommunications fields, the model seems ripe for expansion to related sectors as well. CAD (computer aided design) programs, used by designers and apparel manufacturers, sponsor ‘certs’, and the model could adopted by manufacturers of diagnostic medical equipment. One growing certification program, the Project Managers’ Institute certification, assesses supervisory rather than technical competence (PMI Institute download).

But the ‘certificate’ model of employer involvement in skill building also has significant drawbacks. First, the new model shifts much of the cost onto the state, which often subsidizes training. Individual workers who are not sponsored by their firms (and now make up the vast majority of certificate earners) pay too – often in tuition, and always in lost wages. Though firms will suffer some reputation effects if their programs produce incompetent workers, it is the workers themselves who bear most of the risk that a given program will focus on relevant and enduring skills.

Second, since certificate programs are proprietary and not subject to regulation by the state (a significant attraction for firm involvement, as we saw in Chapter Six), sponsoring companies are free from obligation to verify that their programs are in workers’ long term interests – or even that their exams
are fairly administered and non-discriminatory (Adelman, 2000). Companies refuse to release basic data on the programs, including pass rates, and do not track longer-term assessments of the market value of the credentials. This exacerbates information problems typical in human capital investment decisions. As Jacobs and Grubb charge, this model risks that workers and governments spend too much on “training for now” rather than invest in skills that enable workers to weather changes in the economy throughout their working lives (2005).

Third, though the certificate model does insure up-to-date technical curricula, it provides no mechanism for up to date labor market information: in a study of US community colleges, Grubb and Jacobs found that schools based decisions on whether to offer certificate training based on “student demand – the willingness of individuals to pay for courses, rather than employer demand for individuals with these certificates” (141). Some certificate programs can be overly narrow in scope, a particular risk in the fast moving technology field (interview notes). Fourth, the expiration dates built in to many IT certificates, which do ensure that current certificate holders are up to date in a particular technology, lock workers in, demanding continued time and investment rather than expand skills to other, perhaps more market relevant, areas.

In sum, the certificate model risks creating a pool of workers with discrete codified knowledge, but without the tacit skills necessary to employ
that knowledge productively in the workplace. Indeed, the certificate system produced thousands of ‘paper certs’ – techies who can pass a multiple choice test but lacked hands-on experience and failed on the job: that is, workers who lacked tacit skills to understand how things run in the workplace, much less a broader view of how goods or services are produced in their firms, and their role in the process (Adelman, 1999). IT certificates sidestep one big obstacle for classroom-based training – teaching outdated technologies – but often stumble into another: failing to put knowledge into the context of the workplace. By and large, these programs do a good job teaching what the technologies do and what to do to run them, but not why the technologies are integral to enterprises or how they increase firms’ productivity.

IT vendors control the technologies, and have the most information about the direction of future technologies; their involvement in training really is crucial. When well-designed IT certs were incorporated into strong skill-building programs (like E-Schule, as profiled in Chapter Six), vendors’ input proved to be a fantastic resource. By bending some of the Cisco’s rules and overlooking a few government regulations, E-Schule (a state-run technical school that became one of the first Cisco Academies in Germany) managed to harness the benefits of the certificate program to the broader training designed for apprentice computer technicians.

Rather than work around industry-sponsored certificates, as the German government certifications attempted to do, perhaps future skill building policy
might use them as a starting point, creating incentives for initial business involvement in skill building. Successful extension of the IT model would require upgrading many certification programs to enhance hands-on training, and embedding them within broader programs to ensure opportunities for tacit learning about other aspects of production and about local labor markets. Perhaps, for example, in order to qualify for public training subsidies, vendors could be required to give discounts to customers who hired trainees as interns for a nominal wage or school credit. However, given the general pullback of employers from training, and the fragmented nature of global production, increasing employer involvement in training seems a difficult challenge.

**Globalization, Skills, and National Institutions**

Are some political economies better poised to integrate employer participation into skill building policy in the global production era? A decade ago, Carnoy (1999) argued that coordinated market economies like Germany, with well-articulated institutions for direct employer involvement in training, and creating incentives for all social partners to continue high investments in skill building, would adapt their workforces more easily to the new reality. Lam (2000) stressed that coordinated economies and networked economies were better able to enhance tacit skills, both the variety ‘embodied’ in production workers and the type of non-articulated cognitive skill that is ‘embedded’ in innovative production systems. While Anglo-American style
economies “display a strong bias toward academic education and attach little social status and economic credibility to practical skills”, countries like Germany and Japan value and invest in practical experience, enabling them to “organize work in a more cooperative and decentralized manner, conducive to the transmission and mobilization of tacit knowledge” (Lam, 2000: 502). Less hierarchical models of production would better harness workers’ talents for what Lundvall and Borras termed the ‘learning economy’ (1997).

But coordinated training systems haven’t fared as well under globalized production as these analysts hoped. Challenges to supporting institutions, including threats to lifetime employment in Japan and the diminishing power of industrial unions in Germany, have altered the incentives of firms and workers, including incentives to invest in training with long time horizons (Nakata and Miyazaki, 2007; Doellgast and Greer, 2007). In Italy, disaggregation itself threatens the networked skill building system; if certain steps in production leave industrial districts altogether, the skills associated with those steps may be lost, along with them, some potential for innovation that has historically derived from the interplay of explicit and tacit knowledge across the production chain.

As pieces of the production relocate to low wage areas, the risk of ‘hollowing out’ of skill building institutions grows (see Streeck and Thelen, 2004, also Wagner, 2001, and Busemeyer, 2006). The textile and apparel sectors in Germany are a good example of this phenomenon. In addition, a
legacy of ‘thick’ skill institutions can inhibit reform: Martin and Knudsen (2007) find that policy reforms to increase skill in the service sector were markedly similar in the liberal market economy of Britain and the coordinated economy of Denmark – defying the predictions of the Varieties of Capitalism literature that would predict distinct strategies – and that the British efforts to increase skills at the low end of the workforce were actually more successful. Rather than be able to incorporate more workers into an already non-hierarchical, non-academic training system, Martin and Knudsen found that workers in retail might have been “forgoing training altogether because the training hurdle is too high”; and that “countries that are most efficacious in training industrial workers may have difficulty making the transition to the skills needs of low-end service workers” (23).

The relative success of the UK in upskilling retail workers notwithstanding, liberal market economies appear to be doing little better for low skilled and disadvantaged workers. In the US, a legacy of distrust between unions and employers continues to stymie efforts at direct, large scale business involvement in vocational education and training. Despite widespread employer support for training initiatives in the early 1990s, including Goals 2000 the School to Work Opportunities Partnership Act (Martin, 2000: 202-205), business support for key programs evaporated after Republicans elected to Congress in 2004 cut funding and federal authority. Clinton’s National Skills Standards Board came to be viewed by business as captured by union
interests, lost industry backing, and was dismantled by the Bush administration (Grubb and Jacobs, 2005).

For fostering tacit knowledge in higher skilled workers, the US picture seems brighter. Silicon Valley’s technology cluster defined the prototype of a ‘learning region’, where regional training institutes and universities, local networks of skilled workers and professionals, appropriate infrastructure, and forward-looking companies harness their collective capacities for innovation (Florida, 1994; Saxenian, 1996). But global competition and geographically disaggregated production has put stress on this model, too. Local professional networks remain vibrant, but are no longer strictly local: Saxenian (2002) ethnic networks enable high-skilled immigrants to build careers and businesses that span continents and help Silicon Valley firms leverage the advantages of bridging local and low-wage sites. While Saxenian finds that “high skill immigration makes everyone better off”, some evidence suggests that the disaggregated production fostered by return migration may undermine innovation in the US. Berger (2005) notes that spending on R&D by several key technology firms trended downward after 2000, and many firms cut the range of their in-house research as well:

Fragmentation of production seems to discourage wide-ranging research by any one company, with no compensating mechanism kicking in to build public support for the activities that firms are shedding (2005: 294).
The flexibility of liberal market systems does seem to allow for policy experiments at the local level. While Fitzgerald (2006) argues that the US system of job training for low skilled workers supports advancement “only marginally” (183), she also finds several examples of public/private partnerships that re-build career ladders and provide opportunity for low wage workers. Large employers and firms in non-tradeable sectors, like healthcare, are most likely to be convinced that investments in skills could be profitable.

**Implications**

While managers, politicians, and trainers continue to call for better and more training and education as an answer to globalization, research on skill building offers limited support for the strategy. Finegold et al (1999) argue that the significant minority in the workforce, particularly of populations socially and/or economically disadvantaged, will not benefit even from well-funded, well-organized training programs; any long term skill building strategies will have to be complemented by public employment programs (234). Other analysts of globalization and skills policies also worry that an education and training focus will be insufficient to ensure either social peace or economic competitiveness. As one recent summary of the literature on globalization, unemployment, and inequality concluded, “Education is important in limiting the costs and reducing the incidence of dislocation, but it is no panacea” (Lawrence, 2008:71).
Active labor market policies and 'make work' jobs could be important for economic equality (and for political and economic stability in a prolonged downturn).

These strategies should also be considered as an opportunity for on-the-job training and socialization, i.e., the opportunity for disadvantaged workers to learn the tacit skills that could provide a bridge to the private labor market. Denmark’s reforms in the 1990s, which limited passive unemployment benefits but created new programs “to involve private employers to the fullest extent possible, by encouraging firm-based training (as most training had previously been provided by the state)” as well as providing subsidies of up to 50% for hiring the unemployed and permanent subsidies for employing the disabled are a good example (Martin and Thelen, 2007: 24). Active labor market policies, if possible, should leverage the work experience gained on the job with relevant training, including remedial academic skills and social/communication skills that empirical research suggests firms find lacking in entry-level employees (Rosenbaum and Binder, 1997, Regini, 1999, Levy and Murnane, 2006).

This dissertation has shown how employers in the US, Germany, and Italy have become more dependent on highly skilled workers to compete on the global market. At the same time, the process of globalization allows or even encourages firms to disengage from domestic training institutions (if only, in the German case, because the firms no longer employ large numbers of
domestic production workers and therefore take on limited numbers of new apprentices).

Instead of increased engagement with traditional skill building structures, more often than not, employers have become more vocal in a new arena -- debates on public education reform. Chapter One explained how business lobbies have encouraged the adoption of tougher academic standards, to be verified by standardized test outcomes. For high wage countries to compete in the global economy, better schools producing more academically skilled students is a necessary step. But they may be only one step. Creating the skills to give advanced economies a durable advantage in world markets will require rethinking institutions that foster relationships in the market, and within those relationships, creating incentives for firms and individuals to invest in tacit knowledge.
Appendix A: About the US Textile/Apparel Sample

Firms selected for semi-structured interviews were chosen to represent different phases of the textile/apparel production chain. A small subset of the firms included, 8 out of the total 22, were selected at random from the ReferenceUSA database of American businesses and NAICS codes for primary businesses. These firms were all in the Los Angeles metropolitan statistical area, and were approached via letter and telephone for interview appointments. Response rates were low, less than 10%. The rest of the firms in the sample were selected non-randomly. In non-random selection, we targeted market leaders as well as smaller firms well-connected to industry associations. The majority of participating firms were located in major textiles or fashion regions. In textiles, we included a few technical textile producers and industrial fabric manufacturers to round out a focus on apparel component suppliers.

Data from firm visits was augmented via in-person interviews with twelve different secondary associations. National and international statistics on trade and employment, and a broad survey of the secondary literature also were consulted.
<table>
<thead>
<tr>
<th>Firm Code</th>
<th>Region</th>
<th>Turnover</th>
<th>Ownership</th>
<th>Employment</th>
<th>Product Market</th>
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<td>Listed</td>
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<td>Range</td>
</tr>
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<td>US-A2</td>
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<td>Small</td>
<td>Family</td>
<td>Sole</td>
<td>Consulting</td>
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<tr>
<td>US-A3</td>
<td>North</td>
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<td>Public</td>
<td>Large</td>
<td>Low, middle, high</td>
</tr>
<tr>
<td>US-A4</td>
<td>LA</td>
<td>Small-Medium</td>
<td>Family</td>
<td>40</td>
<td>Low -middle</td>
</tr>
<tr>
<td>US-A5</td>
<td>LA</td>
<td>Medium</td>
<td>Listed</td>
<td>80</td>
<td>Middle/ High</td>
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<tr>
<td>US-A6</td>
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<td>private</td>
<td>50 (at headquarters) 500 including retail</td>
<td>Mid-high end</td>
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<td>Private</td>
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<tr>
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<td>Public</td>
<td>Large</td>
<td>Mid-high end</td>
</tr>
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<td>Private</td>
<td>200</td>
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<td>Private</td>
<td>Medium</td>
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<td>Public</td>
<td>Large</td>
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<td>Range</td>
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<td>Listed</td>
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<td>Sportswear – low/ Middle</td>
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<td>Family</td>
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<td>Large</td>
<td>Spinning Firms</td>
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341
## Textile Interviews in the US Sample

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<td>Small</td>
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<td>Knit fabric</td>
</tr>
<tr>
<td>US-T5</td>
<td>North</td>
<td>Small</td>
<td>Family</td>
<td>Small</td>
<td>Wovens</td>
</tr>
<tr>
<td>US-T6</td>
<td>LA</td>
<td>medium</td>
<td>Private</td>
<td>60</td>
<td>Knit fabrics (converters)</td>
</tr>
<tr>
<td>US-T7</td>
<td>South</td>
<td>Medium</td>
<td>Family</td>
<td>350</td>
<td>Woven fabric</td>
</tr>
<tr>
<td>US-T8</td>
<td>South</td>
<td>Large</td>
<td>Listed/</td>
<td>Large</td>
<td>Non-woven, industrial</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Family Controlled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US-T9</td>
<td>North</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td>Employer Association (Wovens)</td>
</tr>
<tr>
<td>US-T10</td>
<td>North</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td>Employer Association (Tech). Technical Textiles</td>
</tr>
<tr>
<td>US-T11</td>
<td>South</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td>Machinery</td>
</tr>
<tr>
<td>US-T12</td>
<td>South</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td>Raw Materials</td>
</tr>
<tr>
<td>US-T13</td>
<td>South</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td>Textiles</td>
</tr>
<tr>
<td>US-T14</td>
<td>South</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td>Spinning</td>
</tr>
<tr>
<td>US-T15</td>
<td>South</td>
<td>Secondary association</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B: About the Italian Textile/Apparel Sample

As with the US case, firms selected for semi-structured interviews were chosen to represent different phases of the textile/apparel production chain. A small subset of the firms included, 7 out of the total 39, were selected at random from the Kompass Business Directory (Kompass: 2000). A total of 50 firms, located in the Biella textile district and the Milan fashion districts, were approached via letter and telephone for interview appointments. Response rates were low - 14%. To augment the randomly selected sample, we selected additional interview subjects non-randomly. Non-random selection criteria privileged market leaders as well as smaller firms well-connected to industry associations.

In textiles, we included a few technical textile producers and industrial fabric manufacturers to round out a focus on apparel component suppliers. Though a division of labor between firms has been a key defining characteristic of Italian industrial districts, and several of the sampled firms did specialize in one or two production steps, most companies spanned several stages of production (see table 3 below). However, many firms outsourced a portion or production, even for those steps that they conducted in house. Firm I-TR, for example, a wool company in Prato, continued to weave its own fabric at the time of our interview, but had already begun to import some greige fabric for finishing in its Italian mill in the mid 1990s.

In fashion, supporting interviews of non-cloth accessory firms complemented our emphasis on garment makers. Our sample of garment firms included eight firms producing some goods to be sold at a low price point, and sixteen firms where a medium price point goods made up a portion of production.

The total number of firms interviewed was 39. 23% of these firms had over 1000 employees and are world leaders in their areas, and 10% of the firms in the sample employed between 500 and 999 workers. But the traditional importance of small and medium-sized enterprises in Italian industrial districts demanded that we include a significant number of SMEs in the sample, too. 13% of the firms included had between 50 and 249 employees, and 18% had 49 or fewer. For 10% of firms in the sample, the number of employees was unreported. As employment at these firms could not be determined via public data sources, it is highly likely that they too are small to medium sized enterprises.

Data from firm visits was augmented via in-person interviews with secondary associations in Italy (nine in total), national and international statistics on trade and employment, and a broad survey of the secondary literature.
### Textile Production Function

<table>
<thead>
<tr>
<th>Function</th>
<th># Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Product Definition and Design</td>
<td>15</td>
</tr>
<tr>
<td>2. Detailed Design / Component Sourcing and Supply</td>
<td>17</td>
</tr>
<tr>
<td>3. Spinning</td>
<td>14</td>
</tr>
<tr>
<td>4. Weaving</td>
<td>15</td>
</tr>
<tr>
<td>5. Finishing (inc. dying and printing)</td>
<td>16</td>
</tr>
<tr>
<td>6. Marketing/Sales</td>
<td>16</td>
</tr>
</tbody>
</table>

### Apparel Production Function

<table>
<thead>
<tr>
<th>Function</th>
<th># Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Product Concept/ Design</td>
<td>15</td>
</tr>
<tr>
<td>2. Detailed Design (Sample Making), Component Sourcing and Supply</td>
<td>19</td>
</tr>
<tr>
<td>3. Cutting /Sewing / Trim (*for accessories, mass production)</td>
<td>15</td>
</tr>
<tr>
<td>4. Logistics (through the value chain)</td>
<td>13</td>
</tr>
<tr>
<td>5. Marketing (to end consumer)</td>
<td>13</td>
</tr>
<tr>
<td>6. Retail</td>
<td>7</td>
</tr>
</tbody>
</table>

*Includes firms that perform ANY percent of this step on the value chain in-house. E.G., an apparel firm that has a small sewing department, mostly for sample making and replenishment, is included in the total for A3.
## Product Profiles for Firms in the Italian Textile/ Apparel Sample

<table>
<thead>
<tr>
<th>Firm Code</th>
<th>Steps Performed In-house</th>
<th>Major Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A</td>
<td>A1,A2,A3,A4,A5,A6</td>
<td>Luxury apparel</td>
</tr>
<tr>
<td>2. B</td>
<td>T2</td>
<td>Textile machinery</td>
</tr>
<tr>
<td>3. C</td>
<td>A2, A3</td>
<td>T-shirts</td>
</tr>
<tr>
<td>4. D</td>
<td>A1,A2,A3,A4,A5,A6</td>
<td>Mid-market apparel</td>
</tr>
<tr>
<td>5. E</td>
<td>T3</td>
<td>Yarns for apparel and industrial fabrics</td>
</tr>
<tr>
<td>6. F</td>
<td>T1,T2,T3,T4,T5,T6</td>
<td>Silk</td>
</tr>
<tr>
<td>7. G</td>
<td>T1,T2,T3,T4,T5,T6</td>
<td>Technical / medical textiles</td>
</tr>
<tr>
<td>8. H</td>
<td>A1,A2,A3,A4,A5</td>
<td>Hosiery</td>
</tr>
<tr>
<td>9. I</td>
<td>T1,T2,T3,T4,T5,T6, A1,A2,A3,A4,A5,A6</td>
<td>Luxury textiles and branded apparel</td>
</tr>
<tr>
<td>10. J</td>
<td>A1,A2,A3,A4,A5</td>
<td>Uniforms, sportswear supplier</td>
</tr>
<tr>
<td>11. K</td>
<td>A2, A3</td>
<td>Piece dying for sportswear</td>
</tr>
<tr>
<td>12. L</td>
<td>T2</td>
<td>Interlining</td>
</tr>
<tr>
<td>13. M</td>
<td>T3</td>
<td>Yarn</td>
</tr>
<tr>
<td>14. N</td>
<td>T3</td>
<td>Yarn (cashmere)</td>
</tr>
<tr>
<td>15. O</td>
<td>A1,A2,A3,A4,A5,A6</td>
<td>Footwear</td>
</tr>
<tr>
<td>16. P</td>
<td>A1,A2,A3,A4,A5</td>
<td>Apparel contractor, own-brand sportswear producer</td>
</tr>
<tr>
<td>17. Q</td>
<td>T1,T2,T4,T5,T6</td>
<td>Textile machinery, industrial textiles</td>
</tr>
<tr>
<td>18. R</td>
<td>T1,T2,T4,T5,T6</td>
<td>Wool</td>
</tr>
<tr>
<td>19. S</td>
<td>A1,A2,A5,A6</td>
<td>Sportswear, shoes</td>
</tr>
<tr>
<td>20. T</td>
<td>A1,A2,A3,A4,A5,A6</td>
<td>Fashion eyewear</td>
</tr>
<tr>
<td>21. U</td>
<td>T1,T2,T4,T5,T6, A1,A2</td>
<td>Shirting fabric, apparel converter</td>
</tr>
<tr>
<td>22. V</td>
<td>A1,A2,A3</td>
<td>Knit apparel</td>
</tr>
<tr>
<td>23. W</td>
<td>T1,T2,T5,T6, A1,A2,A3</td>
<td>Silk printing, silk accessories</td>
</tr>
<tr>
<td>24. X</td>
<td>T1,T2,T4,T5,T6, A1,A2,A3,A4,A5,A6</td>
<td>Textiles and branded apparel</td>
</tr>
<tr>
<td>25. Y</td>
<td>T3</td>
<td>Yarn spinning</td>
</tr>
<tr>
<td>26. Z</td>
<td>T1,T2,T3,T4,T5,T6</td>
<td>Synthetic fibers</td>
</tr>
<tr>
<td>27. AA</td>
<td>A1,A2,A3,A4,A5</td>
<td>Fashion eyewear</td>
</tr>
<tr>
<td>28. AB</td>
<td>T1,T2,T3,T4,T5,T6</td>
<td>Silk, yarn-dyed and printed</td>
</tr>
<tr>
<td>Firm Code</td>
<td>Steps Performed In-house</td>
<td>Major Product</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>29. AC</td>
<td>T3</td>
<td>Synthetic fiber spinning</td>
</tr>
<tr>
<td>30. AD</td>
<td>A1, A2, A3, A4, A5</td>
<td>Sports shoes, sports cloths</td>
</tr>
<tr>
<td>31. AE</td>
<td>T3, T4, T5</td>
<td>Greige cloth</td>
</tr>
<tr>
<td>32. AF</td>
<td>A2</td>
<td>Apparel components (trim)</td>
</tr>
<tr>
<td>33. AG</td>
<td>T1, T2, T3, T4, T5, T6</td>
<td>Silk thread dealer, silk textile maker</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Firm Code</th>
<th>Steps Performed In-house</th>
<th>Major Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. AG</td>
<td>T6</td>
<td>Sales agent</td>
</tr>
<tr>
<td>35. AH</td>
<td>A1, A2, A3, A4, A5</td>
<td>Casual apparel</td>
</tr>
<tr>
<td>36. AJ</td>
<td>T2, A4</td>
<td>Apparel textiles</td>
</tr>
<tr>
<td>37. AK</td>
<td>A4, A5</td>
<td>Uniforms, industrial apparel</td>
</tr>
<tr>
<td>38. AL</td>
<td>T1, T2, T3, T4, T5, T6</td>
<td>Technical textiles (interlining)</td>
</tr>
<tr>
<td>39. AM</td>
<td>T1, T2, T4, T5, T6, A1, A2</td>
<td>Cotton weaving and printing, accessories production</td>
</tr>
</tbody>
</table>

*shaded firms were interviewed at foreign locations*
Appendix C: About the German Textile/Apparel Sample

With collaborators from the Judge Institute at Cambridge University, textile and apparel firms in Germany were selected for semi-structured interviews based on a variety of criteria. In all, 29 interviews were conducted. For the apparel sector, the Cambridge/MIT study targeted Germany’s major players in the industry using Klartext rankings. Multiple solicitations yielded interviews with 14 firms, a response rate of 43% for clothing companies and 31% for retailers (Lane and Probert, 37). This rate is high for the industry (Steedman and Wagner, 1989). The product range of these firms – with few low price producers represented – reflects the up-market character of the German clothing industry, which has long focused on quality. The bulk of apparel interviews were conducted by our Cambridge University collaborators and the data analysis here is based on interview transcripts as well as background research on the firms.

To target industry-leading textile firms, which made up half our sample, we looked to a list compiled by Gesamt Textil. Of the top ten German firms identified by their employer organization, five participated in the study. We broadened the sample, eventually including six smaller firms. These smaller firms were not chosen randomly, but rather to reflect the geographic and product-market diversity in the German textile industry. As we saw in Italy, many of these German textile firms conducted more than one step of production in-house. In contrast to the Italian and American samples, almost all of the German firms were active in more than one sub-sector of the textiles industry. This product market diversification was found not only in the large firms (where greater access to capital might predict it), but in medium and smaller firms as well. I conducted these interviews on-site, in person, and recorded them. Analysis is based on the tapes of the interviews and on my own copious notes.

In addition to our visits to firms, we conducted five interviews with secondary associations, including employer groups, unions, and research/training institutes in Germany.
### Apparel Firms in the German Sample

<table>
<thead>
<tr>
<th>Turnover</th>
<th>Employment</th>
<th>Ownership</th>
<th>Product Market</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ger A1</td>
<td>Large</td>
<td>Listed</td>
<td>Middle</td>
<td>High</td>
</tr>
<tr>
<td>Ger A2</td>
<td>Small</td>
<td>Private</td>
<td>Middle</td>
<td>High</td>
</tr>
<tr>
<td>Ger A3</td>
<td>Very large</td>
<td>Listed</td>
<td>Middle</td>
<td>High</td>
</tr>
<tr>
<td>Ger A4</td>
<td>Very large</td>
<td>Family</td>
<td>Middle</td>
<td>High</td>
</tr>
<tr>
<td>Ger A5</td>
<td>Medium</td>
<td>Family</td>
<td>Middle</td>
<td>Medium</td>
</tr>
<tr>
<td>Ger A6</td>
<td>Small</td>
<td>Family</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Ger A7</td>
<td>Small</td>
<td>Family</td>
<td>Low-</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>middle</td>
<td></td>
</tr>
<tr>
<td>Ger A8</td>
<td>Small</td>
<td>Family</td>
<td>Middle</td>
<td>Medium</td>
</tr>
<tr>
<td>Ger A9</td>
<td>Very</td>
<td>Family</td>
<td>Middle</td>
<td>Medium</td>
</tr>
<tr>
<td>Ger A10</td>
<td>Medium</td>
<td>Family</td>
<td>Middle</td>
<td>Medium</td>
</tr>
<tr>
<td>Ger A11</td>
<td>Small</td>
<td>Family</td>
<td>Middle</td>
<td>Medium</td>
</tr>
<tr>
<td>Ger A12</td>
<td>Small</td>
<td>Family</td>
<td>Low</td>
<td>None</td>
</tr>
<tr>
<td>Ger A13</td>
<td>Small</td>
<td>Family</td>
<td>High-</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Middle</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** This table is based on data for the apparel companies compiled by Lane and Probert (2006, 37). Lane and Probert’s table has been adapted and expanded by the author to include textile firms.
<table>
<thead>
<tr>
<th></th>
<th>Turnover</th>
<th>Employment</th>
<th>Ownership</th>
<th>Product Range / Market</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ger T1</td>
<td>Medium</td>
<td>Large</td>
<td>Family</td>
<td>Thread</td>
<td>16% (non EU)</td>
</tr>
<tr>
<td>Ger T2</td>
<td>n/a</td>
<td>Small</td>
<td>Private</td>
<td>Tech. tex; auto Knit apparel fabric (80%), tech tex (20%)</td>
<td>Significant 80% (non EU)</td>
</tr>
<tr>
<td>Ger T3</td>
<td>n/a</td>
<td>Medium</td>
<td>Family</td>
<td>Apparel (13%), Auto (42%), Other ind. (21%), Consumer/med (16%)</td>
<td>High</td>
</tr>
<tr>
<td>Ger T4</td>
<td>Large</td>
<td>Large</td>
<td>Family (listed)</td>
<td>Apparel (13%), Auto (42%), Other ind. (21%), Consumer/med (16%)</td>
<td>High</td>
</tr>
<tr>
<td>Ger T5</td>
<td>Large</td>
<td>Large</td>
<td>Listed</td>
<td>Consumer (62%), Medical (38%)</td>
<td>High</td>
</tr>
<tr>
<td>Ger T6</td>
<td>Medium</td>
<td>Large</td>
<td>Listed, Family controlled</td>
<td>Knit/apparel</td>
<td>10% outside Germany</td>
</tr>
<tr>
<td>Ger T7</td>
<td>n/a</td>
<td>Medium</td>
<td>Family</td>
<td>Home, outdoor</td>
<td>65% outside Germany</td>
</tr>
<tr>
<td>Ger T8</td>
<td>Small</td>
<td>Large</td>
<td>Family</td>
<td>Apparel (65%), Home (17.5%) Technical (17.5%)</td>
<td>60%, but mostly in the EU</td>
</tr>
<tr>
<td>Ger T9</td>
<td>Large</td>
<td>Large</td>
<td>Listed, but family controlled</td>
<td>Home, auto, apparel</td>
<td>33% outside EU</td>
</tr>
<tr>
<td>Ger T10</td>
<td>Small</td>
<td>Small</td>
<td>Family</td>
<td>Tech. textiles for special/industrial apparel</td>
<td>5% outside EU</td>
</tr>
<tr>
<td>Ger T11</td>
<td>n/a</td>
<td>Medium</td>
<td>Family</td>
<td>Apparel (70%), home (20%), industrial (10%)</td>
<td>15% outside EU</td>
</tr>
</tbody>
</table>

Source: This table is based on data for the apparel companies compiled by Lane and Probert (2006, 37). Lane and Probert’s table has been adapted and expanded by the author to include textile firms.
## Appendix D: List of Interviews for Chapter Six

<table>
<thead>
<tr>
<th>Identification Code</th>
<th>Informant</th>
<th>Location of Interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-IT1</td>
<td>For-Profit Trainer (small firm)</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT2</td>
<td>Industry Association/ Certification Program</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT3</td>
<td>Not-for-Profit trainer (Public technical school)</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT4</td>
<td>Policy Maker</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT5</td>
<td>Policy maker</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT6</td>
<td>Testing Firm</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT7</td>
<td>Union</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT8</td>
<td>Technology Vendor</td>
<td>Germany</td>
</tr>
<tr>
<td>G-IT9</td>
<td>Vendor (German office of US-based firm)</td>
<td>Germany (US firm)</td>
</tr>
<tr>
<td>G-IT10</td>
<td>Large, For-Profit Training Firm (German office of US-based firm)</td>
<td>Germany (US firm)</td>
</tr>
<tr>
<td>G-IT11</td>
<td>Large, For-Profit Training Firm (German office of US-based firm)</td>
<td>Germany (US firm)</td>
</tr>
<tr>
<td>G-IT12</td>
<td>Small/Medium Sized For-Profit Training Firm</td>
<td>Germany/USA</td>
</tr>
<tr>
<td>I-IT1</td>
<td>Medium, For Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT2</td>
<td>Non-Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT3</td>
<td>Industry Association</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT4</td>
<td>Non-Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT5</td>
<td>Italian HQ of Technology Vendor</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT6</td>
<td>For Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT7</td>
<td>For Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT8</td>
<td>Non-Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT9</td>
<td>Non-Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT10</td>
<td>University IT Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT11</td>
<td>Non-Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>I-IT12</td>
<td>Non-Profit Trainer</td>
<td>Italy</td>
</tr>
<tr>
<td>US-IT1</td>
<td>Consultant/ Research Firm</td>
<td>USA</td>
</tr>
<tr>
<td>US-IT2</td>
<td>Small/Medium-Sized For-Profit Training Firm</td>
<td>USA</td>
</tr>
<tr>
<td>US-IT3</td>
<td>Consultant, Not-For-Profit Trainer</td>
<td>USA</td>
</tr>
<tr>
<td>US-IT4</td>
<td>Large, For-Profit Training Firm</td>
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References


Alluli, Giorgio. 2001. Vocational Education and Training in Italy. European Centre for the Development of Vocational Training, Thessaloniki (Greece), and Istituto per lo Sviluppo della Formazione Professionale dei Lavoratori, Rome (Italy).


Dougherty, Carter. 2005. “Retooling the knowledge factory; german industry goes to the source for its high-tech future work force”. The International Herald Tribune (July 9, 2005).


Jobert, Annette, Catherine Marry, Lucie Tanguy, and Helen Rainbird, eds. Education and work in great britain, germany and italy. Routledge.


National Center on Education and the Economy (U.S.). Commission on the Skills of the American Workforce. 1990. America’s choice : High skills or low wages! : The report of the commission on the skills of the American workforce,


Williamson, Hugh. 2003." Germany goes back to basics over education". FT.Com August 23.

