SKILL NEEDS AND TRAINING STRATEGIES IN THE WISCONSIN METALWORKING INDUSTRY

Executive Summary

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[1] Rogers and Streeck were principal investigators on this study. Parker, whose contribution was invaluable, was the lead research assistant and administrative coordinator. Smith helped throughout the project, and worked closely with Parker near its close in drafting portions of the final report. Harvey, Mangan, Summers, and Tidjani helped in interviewing and provided other research assistance. Funding was provided by the La Follette Institute of Public Affairs, University of Wisconsin-Madison.

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1. Introduction: Training and Competitiveness

Issues of workforce skill and training have moved to the center of the American competitiveness debate, in particular debate on reviving American competitiveness in manufacturing. The motivations for this discussion are familiar. In sharp contrast to a generation ago, almost all U.S. manufacturing firms, including those oriented primarily to the domestic market, now face direct competition from Western Europe and the Pacific Rim. Competitors from these areas are often more successful than U.S. firms in exploiting the potential of new microelectronic technology to produce a flexible range of "best price" quality products. Their success is registered in continued declines in the U.S. share of virtually all major world markets in manufactures, in particular high-value-added manufactures -- from quality steel and autos to specialty chemicals, computers, and machine tools.

What is new in American discussions is the recognition that the success of foreign firms -- particularly firms operating in high-wage environments -- owes heavily to their development and use of the skills of front-line production workers deployed in "high-performance" forms of work organization. Characterized by flat management hierarchies and increased assignment of production authority to a high and broadly skilled production workforce, such forms contrast sharply with the essentially "Taylorist"[2] model of work organization that remains dominant in the U.S. From widening and deepening the responsibilities of front-line workers, the new forms of work organization yield a variety of competitive advantages. These include increased flexibility in meeting shifting product demand, shorter design-production cycles, increased capacity to monitor quality and material flow during the production process, faster diffusion and better exploitation of new technology, and decreased downtime for maintenance and retooling.

Wider foreign adoption of such high-performance forms of work organization owes to many factors. Key among them, however, are the elementary, secondary, and vocational training systems on which foreign competitors draw. These systems do a better job than the U.S. in assuring basic levels of competence throughout the school population, in easing the transition from school to work, and in upgrading the skills of current (or "incumbent") workers. In achieving these effects, foreign training systems both support and encourage the new forms of work organization, which rely on a high and broad base of skills in the front-

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[2] By this we mean a form of work organization featuring narrowly defined jobs for front-line workers, rigid work rules, sharp separation of design and execution functions, and heavy commitments to specialized administrative staff and managerial supervision. See Taylor 1911.

line working population.

It is therefore not surprising that, as the market position of U.S. manufacturing has continued to decline, U.S. discussion of the need to improve manufacturing has increasingly turned to the need to reform American education and training institutions. First focused on deficiencies in the K-12 system, national debate has long since expanded to include problems in the American system of school-to-work transition and the inadequacy of firm-based training. The U.S. has first had to learn that chronically high dropout rates from high school, and barely literate high school graduates, carry economic as well as social costs. It is now learning that it provides the least job-placement and training support for non-college-bound high school graduates, and the lowest level of firm-based training for production workers, in the advanced industrial world. The failure of the present training system to assure even basic skills and skill upgrading means that it provides little support for even modest changes in work organization (e.g., widespread introduction of statistical process control (SPC)), let alone the more ambitious restructuring of entire production systems now common among U.S. rivals.

Until recently, however, national discussion of the supply and demand for workforce skills has been confused by market fables of predictably and inevitably rising skill requirements. Typical was the influential *Workforce 2000* report (Johnston and Packer 1987). It argued that changes in technology and product markets, enforced through "best practice" competition from such competitors as Germany and Japan, would inevitably lead to increased demand from American firms for highly-skilled workers. Coupled with a slowdown in the growth rate of new labor market entrants, and shifts in the composition of those entrants toward traditionally low-skilled populations, this was projected to produce a major "skills gap" in the U.S. The demand for highly trained workers would greatly outstrip their supply.

As subsequent commentators have made clear, however, the *Workforce 2000* projections of sharply increased demand for higher skills are not supported by available evidence. Using the same data relied on in that report (Bureau of Labor Statistics projections of change in occupational structure), for example, other analysts have found that growth in the demand for skilled workers should actually *slow* in the next decade, not increase. (Mishel and Teixeira 1990)[3] And available survey evidence from employers shows only negligible

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[3] We note here that such projections of change in occupational structure are themselves prone to error, and in any case do not measure changes in skill requirements within occupations. An example of both problems is provided by earlier projections on the need for highly skilled metalworkers (e.g., tool and die makers and machinists), made in light of then new CNC (computer numerically controlled) machining technology. CNC automation of metal-cutting operations was originally predicted to result in declining demand for machining skills. These predictions were based on calculations of the labor input required by the new equipment per piece of traditional machining products. But CNC machinery can also be used to cut profiles that conventional machine-tools cannot, and to change such profiles permanently and instantly in response to more specific customer demands. If used in this way, CNC may increase rather than reduce skill needs. Today, as indicated below, advanced machining skills are in high demand. That they are also in short supply is a result, also

concern about increased skill requirements. Thus, while many firms report the need to assure that all workers have baseline competencies in "basic skills," only 5 percent of those surveyed by the recent Commission on the Skills of the American Workforce (CSAW) think education or skill requirements are increasing significantly.

A recent comprehensive report on skill needs and training by the Office of Technology Assessment confirms the picture of slow U.S. response to competitive pressures. While the report found that many U.S. firms, predominantly market-leading large firms, are experimenting with high-performance work organization and demanding significantly higher skills from their workforce, it also concluded that "few of [such] trends... have as yet penetrated very deeply into U.S. industry" (OTA 1990:102). In fact, *rather than investing in training, most American firms have tended to withdraw from high-end markets.* And those that remain in technology-intensive areas of manufacturing tend to respond to their human capital needs by acquiring larger forces of engineers (operating, in the American way, far from the shopfloor), rather than upgrading their blue-collar workforce. This has questionable results for the desired productive flexibility of their operations.

Far from there being an inevitable market logic leading U.S. firms to sharply increase skill demands through high-performance work organization, it appears that most American firms are not significantly increasing their skill requirements for front-line production workers. This is so even as they are confronted with the superior performance of competitors who, with a higher skills base among such workers, are operating more successfully in the high-value-added ends of product markets. Most American firms are instead responding to competitive pressure by moving downstream, to lower-value-added markets. And virtually all firms are failing to exploit the potential of the new technology to decentralize production authority. More commonly, at higher or lower ends of markets, they are exploiting its potential to centralize that authority further.

This response is superficially comforting, and deeply troubling. On the one hand, it gives rise to less tension between the skills employers demand and the outputs of the current training system. That is the "good news." On the other, it carries a large social cost -- the atrophy of leading manufacturing sectors, falling incomes for the bulk of the working population, and rising income inequalities between the lucky few with advanced training and the vast majority with little or none. As CSAW co-chair and former Secretary of Labor Bill Brock said upon releasing the CSAW report, "The good news is that there is no skills gap. That's also the bad news."

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documented below, of decisions by employers to abolish their apprenticeship programs in the early 1980s. These decisions, presumably, were partly based on the assumption that new technology had made such skills redundant.

2. Project Design

It is in this context that the present study was undertaken. We wanted to determine how and why employers make the decisions they do about their requisite skill level and training strategy. In addition to determining the elements of employer choice, we wished to see how the framework of that choice might be altered to promote skill upgrading, and pursuit of a high-wage high-productivity route to competitiveness in Wisconsin metalworking.

A premise of our study is that firm decisions about their skill needs and training strategies are indeed *decisions*. They do not simply follow changes in world product markets or available technology, both of which are importantly indeterminate with regard to the forms of work organization adopted by firms. Still less can they be assumed to record optimal adjustments to new competition or shifting technology frontiers -- neither for society at large, nor even for the individual firm. Rather, decisions about skill needs and training strategy are bounded strategic decisions. They reflect strategic *choices* firms make about where they wish to position themselves in product markets, how they wish to use technology, what form of work organization they favor, and what level of wages they are prepared to pay. These decisions are *organizationally embedded.* They are influenced by existing product market orientation, technology use, management style, and human resource strategy, none of which responds frictionlessly to new circumstances. They are made under conditions of *high uncertainty* -- marked by volatile markets, open and rapidly changing technology, much experimentation with different forms work organization, and profound changes in the role of unions and collective bargaining. And they are made within -- and as comparative research amply demonstrates, influenced by -- an *institutional context*. The system of industrial relations, the structure and performance of the public education and vocational training system, the linkages between the public and private sectors, and the linkages and different modes of cooperation among firms themselves, among other features of the institutional landscape, all affect the calculus of individual firms.

Recognizing all this, we put equal emphasis on exploring the strategic choices of individual firms (the "micro" level of analysis) and the conditions that firms face in the political economy at large (the "macro" level).

In focusing on Wisconsin metalworking, finally, we deliberately chose a sector that represented something close to "best practice" in Wisconsin manufacturing, that was central to Wisconsin's manufacturing base, and that displayed fully the pressures of international competition and technological change just discussed. Considered as a whole, Wisconsin metalworking industries are:

A leading employer in Wisconsin: Wisconsin metalworking employs 279,000 persons. This is 50 percent of all manufacturing employment in Wisconsin, and nearly 15 percent of total employment in the state.

A target of international competition: Even as U.S. export performance has improved, imports have increased as a percentage of domestic shipments in virtually all metalworking industries. In many industries of particular importance to Wisconsin -- including machine tools, papermaking machinery, farm machinery, and mining machinery -- imports now claim more than 30 percent of the domestic market.

Undergoing substantial restructuring: During the first half of the 1980s Wisconsin manufacturing lost 45,000 jobs, most of them in metalworking. By 1989, metalworking employment had recovered to 1977 levels, but it now has a different, leaner face. There are more firms, with fewer workers per firm, and significantly higher levels of technology.

A site of manufacturing leadership for the state: Wisconsin leads the nation in the production of small engines, outboard motors, power cranes, shovel hoists, and other types of mining and construction equipment. It is a leading producer of papermaking, packaging, printing, and food processing machinery, and it ranks third in the nation in the manufacture of metal-cutting machine tools. Wisconsin metalworking claims 70 percent of export related state employment in manufacturing, and its products dominate within total state exports.

A site of widespread introduction of new production technologies: New microelectronic technology has changed the face of metalworking world-wide, and within the U.S. Wisconsin metalworking is among the leaders in its application. For example, Wisconsin's non-electrical machinery industry, the dominant industry within Wisconsin metalworking, leads all other Great Lakes states in the introduction of CNC (computer numerically controlled) metal-cutting machines, NC (numerically controlled) machines, CAD (computer-aided-design), CAE (computer-aided-engineering), and robots.

Within the universe of metalworking, we sampled firms within nine industries: foundries (Standard Industrial Classification (SIC) 332), engines and turbines (351), farm machinery (352), construction and related equipment (353), metalworking machinery (354), general industry machinery (356), miscellaneous industrial and commercial machinery (359), electrical industrial apparatus (362), and motor vehicles (371). These industries were chosen as areas of concentration because of their importance to the state, and their high incidence of machining. The latter was important given our particular interest in examining the dynamics of skill definition and training decisions in the context of rapid technological change, which can be used to support a variety of forms of work organization. Within these industries, in turn, the same interest led us to focus particularly on the metalworking machinery industry.

To better appreciate the "ecology" of common aspects of the institutional environment of firms, we limited our final selection of firms to those operating in the center of Wisconsin metalworking, specifically in the southeastern counties of Milwaukee, Waukesha, Racine, Washington, Ozaukee, and Kenosha.

In the end, 24 Wisconsin metalworking firms were selected for intensive, semi-struc-

tured interviews on their skill needs and training practices.[4] These interviews -- usually conducted with production or personnel managers or CEOs – explored firm skill definitions and training decisions in the context of the respondent firm's product market strategy, recent experience with restructuring, and relations with unions, business associations, and government agencies.[5] One half of the firms were unionized, and the sample was equally divided between small, medium-sized, and large firms.[6] All firms used advanced CNC machining technology or were about to introduce it. Special emphasis was placed on firms' perceived skill needs in the machining area, where alternative possibilities of organizing and dividing work and their general implications for skill formation are relatively well known from previous research.[7]

[Figure 1 about here]

Interviews at the firm level confirmed the wide variety and fluidity of firm perceptions of emerging skills needs in metalworking. They also pointed to the need to better understand the institutional environment in which firms acted and upon which they had to rely in order to satisfy their skill requirements. A second wave of interviews was therefore added, covering union representatives, business associations, state officials, and vocational educators.

Supplemented with public documents, industry press, and secondary materials, these interviews provided the basic data for our study.

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[4] As should be evident from this description of the selection process, in pursuing the question of how firms make determinations about skill needs and skilling strategies we did not select objects of study on the basis of statistical representativeness, but on the basis of their promise to illuminate the contours of the determination we wished to investigate. Skill needs are established by decisions made under high technological, economic, and institutional uncertainty. Given this, traditional methods of survey research, useful as they may otherwise be, are bound to produce unreliable results, due to the artificial concreteness and pseudo-accuracy of responses to standardized questionnaire items. Rather than "freezing" a firm's perception of its skill needs at a given point in time and pressing it into countable, standardized classifications, the research method adopted for the present project tried to capture the links between firms' thinking about skills and their market position, production strategies, work organization, and institutionally conditioned capacities to act on their perceived skill needs.

[5] A copy of the interview instrument is provided in our final report.

[6] "Small" was defined as less than 49 employees; "medium" as 50-249 employees; and "large" as 250 or more employees.

[7] Essentially these choices reduce to using the new technology to centralize control of production, or using to decentralize authority over production decisions. See discussion below.

3. Findings

3.1 The Absence of "Best Practice"

One general picture that emerges from the research is that there is very little industry convergence on a single "best practice." Even where firms were operating in equivalent product markets, using equivalent technologies, they commonly organized their production in quite different ways. This lack of convergence suggests the difficulty with simple market analyses of industry restructuring. Between general competitive pressures and specific firm response there are simply too many intervening factors -- variation in firm financial structure and access to capital, and in industrial relations patterns being two that were commonly cited by our respondents -- to predict quick emergence of a single best practice. Uncertainty about the future direction of product markets, and about the ability of the firm to withstand the pressures of restructuring needed to service them, contributes to variation in response. This uncertainty, finally, was underscored by the fact that all our respondent firms saw themselves acting essentially alone, unable to count on the cooperation of rivals and unable individually to alter the content of their external labor market. This last factor, as might be imagined, is of particular significance in choosing the "appropriate" level of skills needed for the firm.

As a consequence of such variation, uncertainty, and isolation, while almost all respondent firms were found to be making some adjustments to the new competitive environment, their strategic moves are often half-hearted, and internal adjustments to new strategies are missing, lagging, or inconsistent.[8] Thus, for example, while all respondents cited greater customer demands for quality, shorter delivery schedules, and increased variation in product, and most were experimenting with some version of SPC, "just in time" (JIT) inventory control, and greater worker involvement, very few had either engaged in or envisioned wholesale reorganization of their production operation toward decentralized automation and competence.

In brief, our firms showed wide variation, but inclined heavily as a group toward traditional production practices.

3.2 Adaptive Preferences: The Interaction of Skills and Strategy

In an important sense, what skills a firm "needs" depends on what kind of firm it aspires to be, and in particular what sort of *work organization* it wishes to promote to service *chosen* product markets. In turn, the aspirations of firms regarding skills are affected by the

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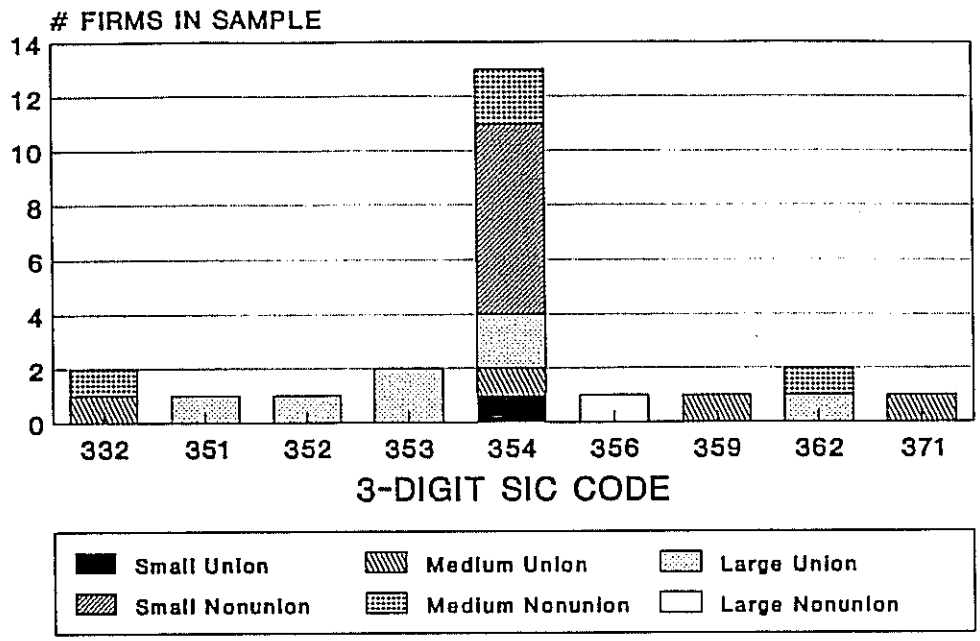
[8] This is not to diminish the very considerable investments in new machinery that many of our respondent firms have made. Typically, however, such investment has not gone hand-in-hand with comparable investments in training and new forms of work organization.

Figure 1

Distribution of Interviewed Firms



6 Counties, 9 SICs, 24 Firms,
8883 Employees

many uncertainties just considered, and by assessments of the cost of procuring the work skills needed for different forms of work organization, either on the external market or through internal training. Given a low skill environment, a firm may rationally choose to concentrate on low-skill forms of work organization; given that choice, in turn, its perceived "needs" for skills will be low. Many firm managers in our sample showed highly adaptive preferences. Asked if they had skill needs, they answered "no." Asked if they would change their production strategy if they had a more highly trained workforce available, they answered "yes." Asked if they would prefer the hypothetical strategy to the one they were now pursuing, they again answered "yes," but typically dismissed the hypothetical as a dream.[9] In effect, firm managers told us -- quite reasonably -- that they were adapting their product strategy, and strategy of work organization, to a low-skill environment.

In the metalworking machining sector, shopfloor programming of CNC machines is a good proxy for high-performance, decentralized competence forms of work organization. Table 1 summarizes the future goals and present realities in this area for the 24 firms ("F") we examined. It shows that the goals for decentralized programming are extremely modest. Among small, mid-sized, and large firms (excluding precision job shops), the desired state of affairs is one in which most programming is centralized, but shopfloor workers have some discretion to edit pre-given programs. The reality, at present, is that most shopfloor workers are excluded from even minor editing tasks.[10]

Precision job shops offer a partial exception to this generalization. From the interviews it became apparent that they, generally undercapitalized and operating in the more specialized product markets that are increasingly the norm, could not *afford* to be as hierarchical as larger firms.

[Table 1 about here]

Goals on work organization in turn determine the intensity of firm training effort. All but one of the large firms in our sample reported that they chiefly relied on "poaching" (not infrequently from their own suppliers) to obtain skilled workers. After the enormous

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[9] This sort of exchange, repeated in many of our interviews, shows the limits of standardized, short-answer, mail questionnaires as a technique for gathering information about firm preferences.

[10] Note that the desire for more decentralization appears greater among large firms than medium-sized and small ones. If true, this might be interpreted as a function of those firms' greater capital budgets, size, and involvement in international markets. Large firms have invested heavily in recent years in the new equipment needed to underwrite high-performance production, and now need the equipment to pay off. Their sheer size alerts them forcefully to the undersupply of skilled labor. And their competition in international markets reminds them forcefully of international "best practice."

Table 1

Control of Technology, Definition of Skills, and Training Strategies of Firms

Firm	Programming Goals	Programming Implementation	Apprentice	Learning Center	Custom Training
Group A: Large Firms					
F-11	2	1	X	Advanced	X
F-08	2	1	X		X
F-12	2	1	X		X
F-02	2	1			X
F-04	1	1		Basic	X
F-07	1	1			X
F-17	0	0			X
F-20	0	0			X
Group B: Small and Mid-Size Firms					
F-09	0	1			
F-13	2	2			
F-14	2	1			X
F-22	1	0			X
F-16	1	0		Basic	X
F-10	1	0		Basic	
F-05	0	0			
Group C: Precision Job Shops					
F-15	4	4	X		
F-21	4	4	X		
F-03	4	3	X		
F-06	3	2	X		
F-18	2	1	X		
F-19	2	2	X		
F-23	2	2	X		
F-01	1	1	X		
F-24	1	1	X		

Note: The codes used in columns one and two refer to the extent to which management wanted programming tasks are decentralized, and the extent to which this was already accomplished. The codes signify the following: 4=extremely decentralized cases in which are widely responsible for both programming and editing; 3=moderately decentralized cases in which workers are primarily responsible for editing; 2=slightly decentralized cases in which a small proportion of workers have been upgraded to technicians who work closely with workers, or small proportion of workers have been upgrade to work closely with engineers; 1=moderatel centralized cases in which production workers are somewhat involved in editing; 0=highl centralized cases in which workers are primarily excluded from programming and editing.

downsizings of the early 1980s, this strategy was supplemented by hiring back formerly laid-off employees. During the early 1980s, all the large firms disbanded their apprenticeship programs. More recently, in response to the general tightening of labor markets and the migration or retirement of former employees, a few of the large firms have revived their apprenticeship programs, albeit on a much diminished scale. What other in-plant training is done is usually sporadic, and highly customized.

Small and medium-sized firms -- whose wage and benefit schedules do not permit much poaching -- feel they cannot afford apprentices, and do not even engage in significant customized training. Precision job shops feel they cannot afford to purchase training "off the shelf" from outside vendors, but also cannot afford not to have apprentices. To maintain themselves in advanced specialized machining, they need a steady supply of highly skilled workers. Apprenticeship offers them one way of providing such, even as most apprentices are hired away upon completion of their training.[11]

Another way of looking at these data is provided in Table 2, which matches firm "interest" in high performance work organization against their "resources"[12] to implement it. In quadrant A (low resources and low interest) are our small and medium sized firms, without much capital, pursuing essentially low-skill low-performance strategies. Quadrant B (low resources but high interest) are the job shops, operating on very thin margins, but in some of the more advanced reaches of product markets, along with one large firm with serious cash-flow problems. Quadrants C and D are populated by large firms.

[Table 2 about here]

3.3 Common Features

Despite such variation across respondent firms, and not withstanding their strongly adaptive preferences, four generalizations about their perceived skill may be entered.

First, all firms, irrespective of their strategy, find *the present K-12 system deficient* in producing job entrants with the "basic skills" they need. The most clearly cognitive

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[11] As one tool-and-die shop owner told us, "we're lucky to hold onto one-third of them after graduation [from apprenticeship]." Still, this shop, which was unexceptional in this regard, attempted to bring in one new apprentice each year. In a staff of 35, this yielded on average of about 10 percent of the workforce being in some stage of apprenticeship training.

[12] "Resources" are here understood broadly, as a composite measure of the firm's financial reserves, stability of market position, presently available physical and human capital, and likely access to additional capital.

Table 2

Interests and Resources:
Firm Propensity to Implement Decentralized
Competence Production Strategies

	Low Interests	High Interests
Low Resources	(A) F-5 F-10 F-09 F-16 F-14 F-22 F-13	(B) F-24 F-19 F-01 F-23 F-18 F-06 F-15 F-21 F-03 F-02
High Resources	(C) F-20 F-17 F-07 F-04	(D) F-12 F-11 F-08

component of these basic skills, and the most easily measured, amounts to roughly 8th-9th grade reading and mathematics competencies.[13] In addition, however, firms sought a range of traits that are almost inextricably both cognitive and attitudinal. These included "problem solving" capacity, the "ability to work well with others," having "organizational sense," and good "work habits" and "work attitude." Assuming dissatisfaction with the K-12 system is real, it is not clear if this is a function of a change in the requirements of firms, or a change in the effectiveness of that system (along with families) to meet essentially unchanging firm needs. Of course, there is enough reason to expect that both have occurred. Whatever the source of this particular "mismatch," it is worth stressing that, unlike the technical competencies that support them, the more general extra-functional skills employers widely seek -- for example, the ability to cooperate (including the ability to hear as well as listen), to communicate, to gather and act on information in solving particular problems, to appreciate organization context -- are generally not taught in any systematic way in schools, and very likely can be taught there only up to a (probably low) limit.

Second, many firms reported *problems implementing even modest changes in production technique and work organization* due to the atrophy of such "basic skills" among their present workers, as well as problems in finding inside candidates for movement into more highly skilled positions. Among other initiatives, the Workplace Learning Centers established in some 40 firms in the state, including several in our sample, appear to be helpful in addressing this problem of in-plant training in broad skill areas and their workplace application (e.g., blueprint reading, computer "literacy"), and in a few cases have begun featuring significantly more advanced instruction. In general, however, the desirability -- if not the achievability -- of additional workplace-centered training for present workers was acknowledged.

Third, most firms detect *significant shortages of workers in the skilled manufacturing trades*. While the lack of new entrants to the trades did not trouble firms through the downsizing of the 1980s, they are now concerned about a rapidly aging skilled workforce. The average machinist, for example, is now close to 50, and many of the firms we spoke with expected to see fifty percent or more of their skilled blue-collar workforce go into retirement within the next decade. In considering how to meet the resulting replacement needs, the wholesale abandonment of industrial apprenticeship in the early 1980s appears as a major mistake. Never operating at nearly the level obtained in the German "dual" system,

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[13] This should not be taken as a low estimate. The most comprehensive investigation of reading and mathematics competencies among young adults (aged 21-25), the National Assessment of Educational Progress, found only 80 percent equalled or exceeded average 8th grade reading performance, and only 62 percent 11th grade performance. Only half those whose education ended with high school could combine reading and elementary arithmetic skills to the point of reading a menu, calculating the cost of specified meal, and determine the change from a given amount. Only 38 percent could calculate a percentage of the meal's cost, or tip. See Kirsch and Jungeblut 1989; OTA 1990:158-60.

Wisconsin industrial apprenticeship declined, in the 1980s, to its lowest recorded level (records going back to 1922). Effectively, a generation of skilled manufacturing workers has been lost.

[Figure 2 about here]

Fourth, while none of our firms foresaw major departures in their choice of work organization or accompanying training strategy in the absence of like action by others, all felt that the *present system of educational and vocational training in Wisconsin,* including their own levels of in-plant training, was *not optimal for future growth* in the industry.

4. Analysis: The Importance of Institutions

The basic picture to emerge from our interviews, then, is of an industry behaving not unlike most American industries. The firms we interviewed are subject to familiar pressures to upgrade or renew their skill base. These pressures come from: (1) the premium today's markets place on product quality and diversity; (2) the possibility of using new micro-electronic technology to increase product quality, variety, and complexity while reducing retooling time; (3) the advantages of a work organization of decentralized competence for a quality-competitive, flexible manufacturing strategy. But most American firms -- most of those examined in this study included -- have generally not made the changes in work organization, and the related commitments to training, needed to compete in today's more advanced and lucrative markets.

What appears to explain this choice is the institutional environment in which firms operate -- an environment that gives rise to classic problems of collective action among Wisconsin metalworking firms. These problems are essentially of two kinds. There are problems of *coordination,* in which parties with convergent interests fail to act on those interests because of failures of information. And there are problems of *cooperation,* in which what is good for all parties is economically irrational for any one of them acting alone.

On coordination problems, not a great deal needs to be said. Suffice it to observe that the average level of knowledge among our respondents' about such things as: (1) each other's training activities; (2) examples, drawn from within their own industry, of more ambitious training policies elsewhere in the U.S.; (3) training curricula and activities of their competitors from other countries; or even (4) the range of public training opportunities presently existing in this state (through, for example, the VTAE) was low. Thus, while virtually all firm managers knew that some firms had a reputation for training more than others, and knew that their foreign competitors trained far more than they, and certainly knew that the VTAE existed, virtually none appeared to know, in *detail,* the range of

existing alternative practices or opportunities available to them. Despite a fair degree of informal associative action in the sector, it appears, for example, that firms within it have never, as a group, collectively discussed their training needs, assessed their degree of commonality, or voiced their common concerns with the present state of public training. Nor, despite many moves in the direction of more cooperative labor relations, does there appear to be any stable, institutionalized arrangement, cutting across firms, for ongoing dialogue between managers and employees (organized or not). In the training area, we conclude that significant losses -- understood as losses in the competitive capacities of the metalworking sector -- are accruing even from these basic failures of communication among firms, between management and labor, and between the private sector and the state.

The cooperation problems are more pointed. Two are most important.

First there is the problem of cooperation between managers and labor. Much that is obvious can be said here, and was confirmed by our interviews. For example, it is obvious that the various job control practices that help define the American tradition of "adversarial" industrial relations complicate joint address of skill and training issues. Tensions between seniority, narrow job classifications and their attendant "costs of movement" (the chief means by which unions traditionally sought to regulate the internal labor market) and "pay-for-productivity-and-flexibility" (the preferred management scheme for rewarding and assigning work) are all too clear. Also clear, however, is that guarantees of job security can often be traded for flexibility, and that, at least in securely unionized establishments, both management and labor recognize more clearly than a decade ago that they need each other's cooperation to prosper.[14]

What is perhaps less clear is that areas of contention other than job control figure prominently in the skills equation. The most important of these is compensation itself. In choosing between low and high end product markets ("price" versus "quality" competition[15]), a low or high performance form of work organization, and a low or high ambition in training strategy, a firm is also typically choosing between low or high wages. It has become commonplace to speak of a "high-wage, high-productivity" economy, and to speak of the sorts of skills needed to underwrite such. What is less commonly observed is that, while high productivity and wages depend on high skills, the provision of high skills, as a practical matter, typically depends on high wages. Where the price of labor is high, firms

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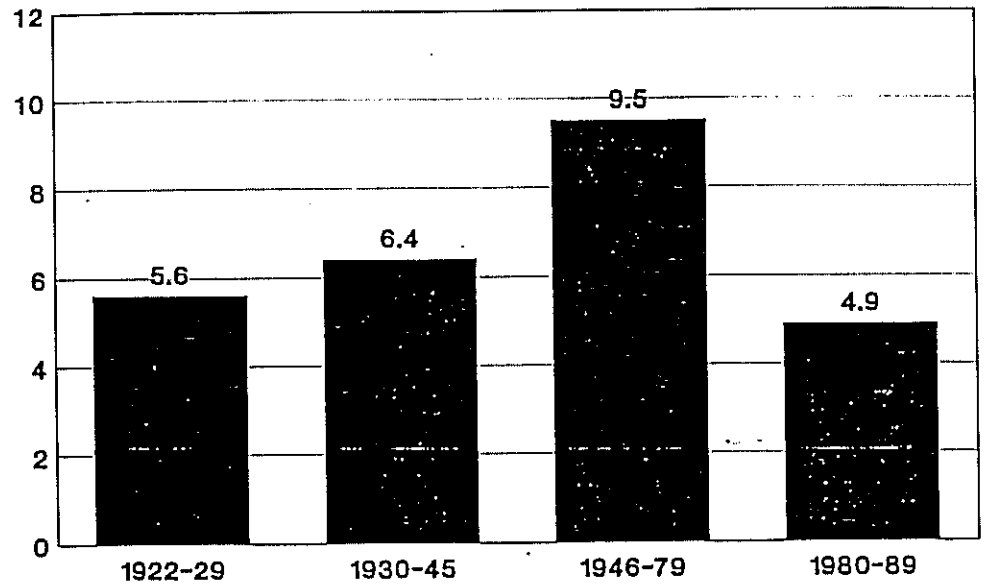
[14] In the training area, we note that organized labor has taken the lead on a number of projects. Among them are the Milwaukee HIRE (Help in Refinding Employment) center and other dislocated worker projects, and the workplace learning centers now established in 40 firms, union and non-union.

[15] Both price and competition are here in quotes because, of course, price competition exists in all markets, and quality concerns are never absent. Still, the distinction between a competitive strategy that seeks to compete chiefly at the price end of consumer calculation versus the quality end makes sense. Consumers are often prepared to pay a premium for a "quality" good. A firm makes a decision to compete for that premium or not.

Figure 2

The Decline of Industrial Apprenticeship

Average Annual Completions Per 10,000 Wisconsin Manufacturing Workers



Bureau of Apprenticeship Standards

have an incentive to increase the productivity of labor. Where the price of labor is low or falling, that incentive is less pointed. In the firms that we examined, the real price of labor appears to have been stagnant for years.[16] This operates as a major drag on employer incentives to upgrade worker skills.

What makes this a cooperation problem is that, while it clearly is in no firm's interest to pay its workers more, the fact that labor markets have become relatively unregulated and low-wage in recent years -- through outright deregulation, the decline of pattern bargaining, and the related decline of unionization -- is by no means an unambiguous good for economy-wide, or sector-wide, productivity improvement.

The second sort of cooperation problem concerns the relations of firms to one another. Again, this has the hallmarks of the classic "prisoners' dilemma" or "free rider" problem. While all firms would be better off with a well-trained workforce from which to draw -- and in particular a workforce with broad skills -- it makes little sense for any individual firm to train workers in anything but narrow, firm-specific tasks if workers can move between employers and there is no assurance that other firms will also train. Our respondents made clear that in Wisconsin metalworking, the reality and perception of the "poaching" threat is real. Firms are reluctant to make additional investments in training, *on their own,* since they fear other firms will reap the benefit without incurring the cost. Moreover, it appears quite possible that shifts in the sorts of skills on which employers now place the highest premium -- from occupationally specific skills to the more general ability to learn skills -- have made this problem worse. The more general the skill, the more real the threat of its transportation to another firm.

The only solution to this problem is some mechanism assuring that all firms, or a very large portion of firms, train at the same time. Unions were once such a mechanism, and it is no coincidence that the fortunes of apprenticeship in the industry closely follow the fortunes of unions. Alternatively, or in conjunction with unions, employer associations or the state can provide the enforcement against free-riders, and the incentive to train, which is now lacking.

To summarize: Wisconsin metalworking firms are generally not making those changes in work organization and training strategies needed to position themselves at the higher end of emerging product markets. Increasingly, firms themselves recognize the limits of present strategy, and the deficiency of current training efforts. Most immediately, however, their

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[16] Since 1980, the Consumer Price Index has increased by more than 50 percent. At most of the leading firms in our sample, wages have been essentially frozen since the early 1980s, implying an enormous drop in take-home pay. Nationally, total compensation has nevertheless drifted slightly upward, as a result of increased health care premiums. We do not have precise data on total compensation packages for the metalworking sector, but there is no reason to think this sector is leading U.S. trends. This leads us to the conclusion that the total price of labor in that sector has essentially stagnated over the past decade.

perceived skill needs -- and in particular their willingness to act on those needs -- reflect prior decisions about what sort of firm they "want" to be. These decisions, in turn, are powerfully shaped by the institutional environment of individual firms. Given a general lack of coordination and cooperation among firms, between business and labor, and between the private and public sectors, Wisconsin metalworking firms are making the decision to underinvest in training. This decision appears rational, from the standpoint of the individual firm. But that does not make it rational for the industry as a whole, let alone for the communities it supports, or the broader Wisconsin regional economy of which it is a part. Indeed, most available evidence -- drawn from the "best practice" of some U.S. firms, and a host of foreign rivals -- suggests that the general level of investment in training in Wisconsin metalworking is significantly below optimal levels. Over time, it will hurt that industry, and the Wisconsin economy.

5. Implications for Policy

This analysis carries at least three implications for public policy in the skills area.

5.1 The Need for a Public Strategy on Training

Current employer preferences on training, while instructive for public policy, should not govern that policy. If employer skill demands and training practices reflect strategic choices about work organization and product market, made in light of existing skill levels, training programs, and the broader institutional environment just considered, simply following those preferences in the provision of training runs the risk of a vicious circularity. Given a certain environment, firms may choose a low-skill strategy. Responding to that by providing only low skills serves to confirm that choice, along with all of its unhappy consequences.

Public vocational training policy thus should not simply adapt to the "given" skill needs of the private sector. Instead, and together with regional economic policy and efforts a technology transfer, vocational training policy should itself be understood strategically. It should be used to encourage firms to move towards more high-performance forms of work organization and to try to compete in the more demanding but also potentially more profitable markets for high-value-added, quality-competitive products. Such a move is recommended economically, and clarity on it as a goal is essential to the success of intermediate efforts to mount a more ambitious training effort. Unless employers are actually adopting high-performance decentralized-competence forms of work organization, their demands for advanced skills will be modest, and limited to only small fractions of the workforce. The generation of skills in such an environment runs the risk of "pushing on a string."

If there is little reason to believe that advanced training will emerge spontaneously in

the absence of some public encouragement, there is certainly no reason to believe that broad and standardized training profiles will emerge without such encouragement. Broad training, as already noted, is the sort of training that firms are *least* likely to provide, even if it is the sort of training that they in fact *most* need. Public policy should take clear cognizance of this fact. It should resist pressures to expend training dollars on higher and higher degrees of "customized" training, and defend its programmatic integrity and purpose -- to provide training of broad and manifest *general* benefit.

Among other things, this implies the need for general, and generally enforced, training curricula. Again, the analysis here recommends adoption of an *organizational* perspective on skill definition and incentives -- that is, a perspective that sees skill needs and incentives to training as closely tied to patterns of work organization -- rather than a specific task or occupational perspective. From this perspective, the futility of provoking serious change in training strategies merely through a succession of "refresher" courses and customized training exercises should be manifest. Instead of such "band-aid" remedies for training deficiencies, policy should stress measures that provoke the changes in work organization that will in turn provoke demand for and utilization of advanced skills. As already mentioned, this requires better integration of training policy and other aspects of economic development policy (e.g., technology diffusion). At a minimum, however, it requires pushing for and defending broader definitions of occupational skill profiles.

5.2 The Need for Workplace Learning and Continuous Skill Upgrading

Even in the present context, but especially given a commitment to moving toward high-performance work organization, the importance of providing a variety of opportunities for learning at the workplace is manifest. So too is the need to devise programs and reward structures that encourage a workplace culture of continuous skill upgrading. This is true for both future workers and present workers.

Beginning with labor market entrants, there are clear problems with the present K-12 system. In providing essential cognitive competencies, we believe the best way to address this is through the establishment of uniform standards of basic competence, expected of all school-aged youth by the time of their completion of mandatory schooling. The recent recommendation of national competence standards, and "certificates of initial mastery" for those who meet them (CSAW 1990), should be adopted in Wisconsin. Such adoption should ideally be coupled with strong discouragement of employment of youth who have not achieved such basic competence levels.

In addition to such cognitive competence, employers seek competencies that are not now generally taught in schools, and that are best acquired in the "real world" context of actual work settings. To meet this need, and to provide better school-to-work transition, we recommend serious investigation (meaning, at a minimum, demonstration projects) of youth apprenticeship programs, coupled with an amply supported "tech-prep" option for advanced

technical training among those youth not intending to go on to college.

In making this recommendation, three clarifications are immediately in order. First, what is most important in the design of such programs is the welfare of the participants. They should have clear and enforceable protections regarding the conditions of work, the amount and kind of actual training (as against unstructured "work experience") that they receive on the job, and clear and enforceable standards on the integration of work-based training and school instruction. Second, such programs fail unless they are shown to yield, in fact, greater opportunities for meaningful and rewarding work. In addition to preparing students better for the world of work, a range of initiatives are needed to encourage employers to provide incentives for student performance at the secondary level. If this does not take the form (as it almost surely cannot, on any comprehensive scale) of guaranteeing jobs at the end of specified training regimens, it can at least take the form of explicitly incorporating training performance into employer hiring practices, and otherwise better integrating training programs and job placement services. Third, increased investment in opportunities for non-college-bound youth should clearly not be a guise for increased "tracking" of disadvantaged youth. Such programs should be coupled with a series of options and encouragements to move to higher levels of training. A young adult thinking about his or her future should have a menu of options, ladders, guarantees, and challenges which extend from acquisition of the most basic to the most advanced skills.

In addition to youth apprenticeship and other programs geared to younger workers, we recommend a revival and extension of industrial apprenticeship. Again, its decline now stands out in explaining the industry's current scarcity of highly skilled metalworkers .

For incumbent workers, much of what was said of labor market entrants can again be said. Through workplace learning centers, better structured on-the-job instruction, clearer links to existing school training curricula, and other efforts and programs, the goal should be to establish a practice of much more nearly continuous training and skill upgrading.

As observed above, the major problem with training, perhaps particularly applicable in the case of incumbent workers, are problems of "free-riding." Firms hesitate to train because of their fear that other firms will reap the benefits without contributing to the costs. This problem admits of many solutions, including the development of essentially private enforcement mechanisms (unions, employer associations) against free-riders. Even in the presence of such associative action, however, and especially in the case, as in Wisconsin, where such associations are weak, there is an important role for public authority to set the tone for regional training policies. The most direct way to induce firms to provide more training for incumbent workers is to tax firms that do not train. For example, a "pay or play" tax levy, in which a firm would have a presumptive tax (set at, for example, 1 percent of total payroll) for training, subject to offset by the cost of actual training performed, is a good way of encouraging generalized training without punishing those exemplary employers who now make significant training efforts. We recommend that Wisconsin adopt such a

training levy.

5.3 The Need for Private Associative Action

As important as it is for public officials to exercise leadership in training policy, it is equally important for them to recognize the limits of their role, and the overwhelming importance of coupling public efforts with private ones. Indeed, as suggested at many points, the chief aim of public policy should be to secure an environment in which greater private efforts in the training area are encouraged (to the point that they are "spontaneously" forthcoming from private actors), and in which private actors take on central responsibility for the actual design, provision, and funding of training efforts.

Successful training regimes are marked by a creative tension between different arenas of training (e.g., school and work), phases of career training (e.g., basic skills, initial occupational training, continuous upgrading), and authorities on the content and provision of training (i.e., public and private authorities). In all these areas, it is essential that private actors, as well as public ones, achieve much higher degrees of clarity than they have at present on their *collective* training needs, and much higher degrees of *collective* organization in acting on those needs. It will, for example, be impossible to address the need for greater experiential learning, of the sort that is now demanded, without better coordination within the private sector. And it will surely not be possible to encourage widespread innovation in work organization, of the sort necessary to create the demand for and fully exploit a more ambitious training effort, without such coordination.

Our last recommendation, then, is that the Wisconsin metalworking industry, or some significant portion of it, get itself organized on the training question. Specifically, we recommend the formation of a "Metalworking Skills Consortium," including as many firms and unions in the industry as possible, to consider mounting a *sectoral* training effort. Such consideration might begin with assessment of potential industry-wide gains from cooperation on the training issue, and frank discussion of present barriers (between and among firms and labor) to such cooperation. To focus this discussion, we recommend consideration of specific problems and possibilities of concerted action in three areas: (a) school-to-work transition (with special consideration of youth apprenticeship as one possible model); (b) industrial apprenticeship; (c) in-plant and other training for incumbent workers (with special attention to the Workplace Learning centers as one possible model). We further recommend that the state support this effort, primarily through technical assistance. Finally, we stress that these recommendations aim to suggest a starting point for discussion and action, not a conclusion. Over time, we would hope that the consortium would address a range of industry problems affected by training efforts (e.g., issues of technology diffusion).[17]

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[17] The report on which this executive summary is based was reviewed at a conference held in Madison on October 27, 1990. Conference participants included representatives of industry, labor, and the state with interests in the metalworking sector. Our thanks to conference participants for useful comments and suggestions.

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