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Workers' Roles in Lean Production: The Implications for Worker Representation

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The writings on lean production, particularly those of the International Motor Vehicle Program (IMVP) at MIT that introduced the term, emphasize the performance advantages of this new production paradigm over mass production throughout all aspects of the automotive industry, from product development to manufacturing to supplier relations. Within manufacturing, many researchers have emphasized the distinctive differences between mass and lean production in the organization of work and the management of people. They attribute the performance advantages of lean production, in part, to a production logic that makes the contributions of production workers central to a process of improvement based on ongoing problem-solving activities.¹

Others emphasize the ways in which the distinctive roles for workers under lean production lead to exploitative treatment based on "management by stress"—an intensified workpace, exacerbated by the elimination of buffers and combined with management pressure. There is also divided opinion among researchers about the implications of lean production for unions, with supporters seeing a potentially broader role for worker representation and critics seeing a weakening of the collective and countervail-

ing power of unions as one factor that increases the potential exploitation of workers.²

Evidence that lean production offers improved economic performance in relation to mass production tells us little about these important questions because this outcome could arise as much from exploitation of workers as from the enlargement of worker contributions. Worker roles under lean production can only be understood through exploration of the complex dynamics that integrate worker contributions into the overall production system. Furthermore, how we think about worker representation under lean production depends heavily on how we understand worker roles. Different worker roles could imply different worker interests to be represented, or they could imply that the same worker interests must be represented in different ways. In either case, the analysis of workers' roles is the appropriate starting point before exploring issues of worker representation.

Workers' Roles in Lean Production

I will describe three primary roles for workers in lean production systems, drawing on observations from my fieldwork in connection with the International Assembly Plant Study: physical labor ("doing" work), cognitive input ("thinking" work), and member of a social entity ("team" work).

First and foremost is the provision of manual effort to assemble a vehicle. While auto manufacturing is extremely capital-intensive in its welding and painting processes, the final assembly process remains highly labor-intensive. Most production work at an auto assembly plant continues to require difficult and demanding physical labor, a fact that is sometimes neglected in the rosier accounts of lean production. The fact that lean production shares with mass production the use of a moving assembly line and a narrow division of labor means that the *physical* experience of "doing" work is not dramatically different in these two settings.³

A second role is cognitive—the involvement of workers in "thinking" as well as "doing." The cliche that workers know their jobs better than anyone else is undoubtedly true under any production system. What's different about lean production is its goal of developing a broader contextual knowledge in the workforce about the production system, so that a worker's deep, often tacit knowledge of one specific task becomes linked to an understanding of how the overall system works, and how one's piece of it

relates to other upstream and downstream tasks. Also different is the deliberate organization of work to encourage worker ideas to be surfaced, specified, and legitimized as an input to making changes in the production process—the process known as *kaizen*.

For management to want access to worker knowledge about the production process is not new. Frederick Taylor wanted such access, but without having to deal with the worker. Taylorism legitimized management's role in ferreting out information about how work was done, but in the process, delegitimized the worker's role. In one memorable quote, Taylor states that "Any improvement which [the workman] makes upon the orders given to him is fatal to success."⁴

In some respects, the organization of work under lean production resembles Taylorism. Worker ideas are not the dominant influence on the organization of work in a lean factory; engineers still establish the initial specification of the work process for each new model. *Kaizen* suggestions from workers are subject to careful documentation and comparison with the current process before adoption, and must be approved by engineers or managers; after a suggestion is adopted, the work is again standardized for all workers (including across shifts) who perform it, until the next change in specifications is proposed.⁵

But the fact remains that workers are encouraged, even expected, to contribute their ideas about improving their jobs; their suggestions are seen as valid and significant by managers and engineers, and are often adopted; and work organization and training policies are directed towards improving worker abilities to contribute to this cognitive process, rather than the reverse. Not only are the numbers of problem-solving suggestions per employee high in lean production plants, but the implementation rate is often extremely high as well, a telling indicator of the legitimacy afforded those ideas. If one believes, as I do, that the fundamental, core principle of Taylorism is the separation of conception and execution—of "thinking" work from "doing" work—the priority given to "thinking" by workers stands Taylorism on its head.⁶

Third is a social role—workers' involvement in "team" work. From management's viewpoint under mass production, the fact that labor was viewed as a commodity and that workers were seen as interchangeable and easily replaceable parts simplified its task with respect to the social organization of production. A random assortment of interchangeable parts does not add up to a social group. Mass production managers, whose job was to make sure that nothing would disrupt daily production, showed some concern about individual morale, due to the potential impact of high turnover or absenteeism on production consistency, but rarely worried about group morale.⁷

Under lean production, the social entity is too important to be ignored by management. Just as it legitimizes workers' cognitive inputs to improving the production process, lean production also legitimizes the informal social network in a company as an important source of coordination and commitment. Goals and incentives are formulated and work is organized to support the central influence of social interaction on the operation of the production system. The term "team" is difficult to define precisely in a lean production plant because it refers not only to the work team, the formal structural unit, but also to a notion of "team work" that embodies the goal of a cooperative relationship among work teams, among departments, among functional specialties, and among organizational levels.

The most important social relationship under lean production is with the company. Employees are encouraged to identify themselves with the company, rather than their team or department, because appealing to overarching company-level goals (including satisfying the customer through superior quality) provides a rationale and motivation for setting aside normal inter-group differences. At the same time, identification with company goals around performance, competitiveness and survival pulls workers towards identifying their interests as overlapping with managers at *their* company, and away from identifying with workers at other companies in the industry. (In lean production plants in Japan, this pull towards identification with the company is consistent with the enterprise model of unionism, but outside Japan, it conflicts with industrial unions, which want workers to identify their interests at the industry or class level, as will be discussed further below.)⁸

The social relationship *within* the work team is also extremely important for lean production to be effective. The peer relationships among team members, and the quasi-coach, quasi-staff support provided by the team leader, replace the traditional foreman whose rule was authoritarian in style and rule-based. In its place is the interdependence that accompanies a multi-skilling strategy and a "no buffer" philosophy that eliminates utility workers, so that absenteeism for one worker affects the workload of his or her teammates. The peer controls that emerge in such a situation can easily turn poisonous if there is not some degree of group cohesion, some process of close-to-the-source dispute resolution, personal influence that is based on expertise rather than seniority, and incentives that align team member interests with each other and with other teams in the plant.

To summarize, while traditional mass production managers tend not to think about the workforce as a social entity, lean production makes a deliberate and explicit effort to organize the informal social network in the production system to align employee interests as closely as possible with company goals.

With these three worker roles in mind—physical labor, cognitive input, and member of an explicitly-organized social entity—I turn now to the implications for worker representation.

Implications for Worker Representation

Contrasting worker representation under mass and lean production is more complex than comparing worker roles, for most of the benefits that lean production offers to individual workers pose challenges for unions. While there may be opportunities under lean production for unions to boost their influence and effectiveness in representing their members, each opportunity is accompanied by risks. In this section, I will outline three challenges for unions under lean production, and then explore the risks and benefits of each.

Central to this analysis is the idea that the "logic" of lean production assumes (and works to create) more overlap between managerial and worker interests than mass production, while important areas of conflict remain. Thus, all of the challenges posed to unions by lean production require coming to terms with the enlarged domain of shared interests, while continuing to address the issues involving conflicting interests. In this sense, unions face a situation similar to the period in the late nineteenth and early twentieth centuries, when mass production was supplanting craft production. Industrial unions had to find different ways of protecting workers under mass production that were consistent with preserving the economic gains of the new system. So must today's unions find ways under lean production to promote worker interests not shared with management (as discussed below) that are consistent with the system's fundamental logic—a logic from which shared benefits are derived.

The three challenges are as follows:

- Lean production dismantles "job control" mechanisms used by unions historically to protect against abuses of management discretion over the allocation of labor.
- 2. Lean production gives management more incentive to pay attention to worker skill and motivation, and to encourage identification with company goals.
- 3. Lean production pulls towards an enterprise model of unionism.
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Lean Production's Impact on "Job Control." Under the "job control" unionism model that dominated the U.S. auto industry for many years, wages were explicitly tied to jobs and not to worker characteristics; indeed, this approach required that all workers doing the same job receive exactly the same pay, regardless of any individual difference in how the job was performed. Collective bargaining contracts specified an elaborate job classification system, with much attention paid to the exact requirements of each job, and the seniority rights that guided promotions, transfers, and layoffs. Job security was emphasized, in the sense that workers were seen as "owning" a job earned through seniority. Disagreements between labor and management about the application of this system were directed through a grievance process that was also highly formalized.⁹

Under lean production, wages are detached from specific jobs. Job classifications for production workers are reduced to two or three (often from over one hundred), and workers in these broad classifications are paid the same basic wage for learning a number of different skills and jobs. Thus a worker's job no longer has a fixed definition; it has fluid boundaries and can change over time. Furthermore, the movement of workers across jobs can no longer be pre-specified via promotion, transfer, and "bumping" rules based on seniority rights. Finally, rather than "job security" based on "owning" a job, lean production typically provides employment security assurances that assume movement across jobs within the firm.

Workers are organized into teams, within which skills can be learned and jobs can be rotated. Workers may move across teams as well, in response to continual efforts to find process improvements that increase productivity and quality, and to adjust labor inputs to changes in volume. Many grievances may also be resolved at the team level with the assistance of a team leader—typically an hourly worker whose responsibilities overlap with those of management. When bonus plans are in place, management can potentially reward individuals for their contribution to production system improvements, further differentiating pay outcomes based on individual characteristics.

These features of work organization under lean production, all of which boost the cognitive role (the "thinking" work) of workers, render many of the work rules associated with "job control" ineffective. Indeed, this reflects a broader trend across industries in which management seeks more flexibility to deploy workers in different ways depending on market and/or production conditions. This change is threatening to unions, to the extent that they have drawn much of their power and influence at the plant level from the "job control" approach.¹⁰

However, the "job control" model is only one way for a union to exert influence, one that is relatively unique to the United States. In the face of

pressures to grant more shop-floor flexibility to management by relinquishing the mechanisms of job control, unions can (and are) asking for more influence over issues at the strategic level, ranging from competitive decisions about production levels and product changeovers, to investments in new technologies, involvement in hiring and training, and promotion decisions. Unions can also insure that the competitive situation facing a plant is well understood by the workforce, and in turn, that plant management understands the concerns of the workforce, particularly during periods of uncertainty.

In the auto industry, the NUMMI case shows the importance of both a sustained commitment to a "no layoff" policy and extensive information sharing with the union to the ongoing effectiveness of that joint venture plant. A more extensive union involvement is found at Saturn, where the union is directly involved in governance structures and has a major influence on managerial decision-making. In both cases, human resource and labor issues have a higher level of influence within corporate decisionmaking due to the expanded role of the union. Accomplishing this influence, however, requires new skills from union leaders, who must learn to manage change and wield influence in new ways based on their ability to locate and process information, educate and mobilize members, and communicate rank-and-file interests when they join with management in the decision-making process.¹¹

Lean Production as a "Fragile" System. The second challenge for unions is that lean production provides incentives for management to respond to workforce needs and actively boost worker motivation and skill. These incentives arise because lean production is a "fragile" system with respect to the role of workers, while mass production is "robust."¹²

Mass production attempts to protect the production process from potential variations in the quantity and quality of worker effort by relying on narrowly defined jobs that can be filled by interchangeable, low-skilled workers, inventory buffers that minimize the disruption caused by production errors or poor-quality parts, and an automation strategy aimed at minimizing worker discretion—all in the service of high-volume production to achieve economies of scale. It is "robust" because it can tolerate high turnover and absenteeism among demotivated and unskilled workers without a serious impact on its normal operating procedures and customary performance levels.

In contrast, lean production relies heavily on the contributions of a skilled and motivated workforce, as argued above, to make workable such production features as just-in-time inventory systems, small lot production, quick die changes, worker self-inspection of quality, and a flexible product mix. Rather than using buffers (e.g., incoming parts inventories, work-in-



process inventories, repair areas) to protect the production process from disruptions, lean production deliberately eliminates buffers to make problems visible, but then relies on "thinking work" from workers to minimize the disruptive consequences. In a way, workers thus provide the capability to deal with uncertain or changeable conditions that is provided by buffers under mass production. Lean production is "fragile" because its vulnerability increases if workers withhold their attentiveness at spotting problems and their skill at solving them. There is also an incentive for management to maintain a healthy relationship with the union, since with low buffers in the supply chain as well as in the assembly plant, even brief work stoppages can rapidly shut down production at multiple sites.

The risks for unions arise from the way a "fragile" system blurs the line between managerial and worker interests. First, as management exerts more effort to boost worker morale and skill, it becomes more of a competitor with the union for influence over workers and for worker loyalty. Second, if management provides voluntarily some of the things that unions have always struggled to obtain for workers, in order to keep the production system operating smoothly, then the rationale for having a union may be weakened in workers' eyes. Third, if management succeeds in having workers identify primarily with company goals, union efforts to achieve consistent organized action across the whole industry may be threatened. Finally, the more management involves workers (and unions) in strategic decision-making, the more constrained workers (and unions) will feel about taking actions that potentially affect a plant's competitiveness.

Unions have traditionally opposed participation programs initiated by management for these reasons. Furthermore, unions have found that management commitment to participation is often short-lived—lasting only until the first sign of economic difficulty. Ironically, this episodic enthusiasm (and disenchantment) with respect to worker participation has always limited the impact of such initiatives on unions. What is significant about lean production, therefore, is that management's reliance on "thinking work" and "team work" from the workforce provides a much stronger incentive to persist with participative efforts throughout the business cycle than when participation is viewed as an end in itself. This persistence potentially makes the risks outlined above more real.

What are the benefits for unions in the "fragile" nature of lean production? First, there are gains for their members from the cognitive and social roles for workers in the production system. There is considerable evidence that workers in lean production plants respond favorably to these expanded roles. Particularly noteworthy is that workers with prior experience in traditional mass production plants typically say they never want to go back to that setting.

Second is the enhanced power for the union in a tightly interdependent production system. As noted above, the low buffers of lean production mean that a union can readily inflict pain on a company through short, targeted work stoppages and other actions that fall short of a full strike, or use the threat of such action to boost their short-term bargaining power. Examples of unions using the "tight coupling" of a just-in-time (JIT) system to their advantage are already apparent.¹³

Third, even though management has incentives to attend to worker concerns, management and union agendas will differ, requiring an active union role in pursuing certain worker interests. Foremost is collective bargaining on distributive issues—nothing about lean production prevents unions from seeking fair wages and benefits that are carefully calibrated to industry patterns. Other issues relate to the physical role (the "doing" work) of workers in the production system—workpace, health and safety, ergonomics, use of overtime. While managers may pay some attention to these issues under lean production, unions can make them a much higher priority, an effective way to preserve worker loyalty and commitment to the union. Unions are likely to have greater leverage on these issues because lean production is more sensitive, in terms of economic performance, to a decline in worker morale than mass production.

Fourth, as noted above, unions can trade concessions on "job control" unionism for an enhanced role in influencing strategic decisions. In addition to engaging such strategic issues as capital investment, choice of technologies, outsourcing, and product planning, unions can influence how lean production concepts are interpreted at a given company, for example, the scope of supervisory roles or the process for selecting team leaders. Although many observers portray lean production in Japan as monolithic, there is in fact considerable variation in how this approach is implemented in different Japanese companies. We can expect similar variation in the U.S. and Europe as aspects of lean production are adapted to different national and company contexts, in part through the active influence of unions.

A final reality about the "fragile" nature of lean production is that not all companies, plants, or individual managers will be willing or able to accept the larger and more central role it gives to workers—particularly in companies making the transition from mass production. Not all companies using (or moving towards) lean production are equally competent with respect to understanding its principles or being able to implement them consistently over time. Either deliberately or inadvertently, managers schooled under mass production are likely to make decisions that violate the lean production logic in some important way. Then unions will be able to (and will need to) assert their primacy as representatives of worker interests.¹⁴

Unions should be attentive to certain "logic-violating" transgressions that may appear in plants using or moving towards lean production. One example is using *kaizen* for speedup, that is, a more intensified workpace over time, rather than efficiency gains through more effective organization of work tasks. Another is supervisor favoritism in the treatment of workers, in the absence of work rules governing the allocation of labor (such as transfers) and the boundaries of job duties. A third is a reluctance to implement worker suggestions because of management attitudes that do not tolerate a legitimized role for worker input. A fourth is a willingness to exploit norms of long work hours and frequent overtime. This is particularly relevant to Japan, where such norms have been strongly reinforced on a societal basis and have proven difficult to change, despite recent pressure from the government and unions.¹⁵

Lean Production's Pull Towards an Enterprise Model of Unionism. The third challenge for unions, the pull towards enterprise unionism, concerns union structure in relation to the production system. Union structure is typically viewed as related to the scope of the labor market and the product market, with craft unions representing skilled workers organized by occupation and geographical area, and industrial unions representing skilled and unskilled employees organized by firm on a national basis. But union structure is also influenced by the boundaries of knowledge in the division of labor of a production system.

In a craft system, the specific crafts are defined by the knowledge required to work effectively with certain materials and processes, for example, bricklayers with brick, and pipefitters with pipe. Jobs are broadly defined, integrate conception and execution, and require multiple skills. Innovation in work processes (and to some extent in products as well) occurs within the boundaries of the craft. Craft unions define themselves in terms of this knowledge boundary, and work to preserve the separateness of that knowledge (and the associated control over certain jobs) from that of other crafts.

Industrial unions define their jurisdiction on the basis of industry, but beyond that, also adhere to the boundaries associated with particular knowledge. Under mass production, skilled workers are organized on the basis of their craft knowledge, albeit within the industry. The much larger group of "unskilled" workers in industrial unions is also identified in terms of knowledge—what they *don't* know and don't have to know. With a narrow division of labor creating jobs with very low skill/training requirements, worker knowledge counts for little. Production jobs can be filled as easily by inexperienced workers as by experienced ones. With no defined knowledge base to justify the claim of "unskilled" workers to jobs, industrial unionism has relied on job classifications to establish "ownership" of

a set of job responsibilities and a structure for workers to move across jobs on the basis of seniority. These "unskilled" classifications and associated work rules have become relatively standardized in the industry as a way to regulate job movement and settle disputes over who "owns" a job.¹⁶

The boundaries of knowledge under lean production are different from both craft production and mass production in ways that complicate worker representation and union structure. The core conceptual knowledge is the production system of a particular company. Jobs are narrowly defined, but workers move among jobs over time to develop both conceptual knowledge and multiple skills. Innovation is focused as much on the interstices between jobs as within jobs—that is, the inter-group problem-solving that works from the information that a tightly inter-dependent, low-buffer system provides. With this inter-dependence, much of the knowledge that workers develop spans traditional boundaries—between unskilled production and skilled crafts workers, between the craft domains themselves, and between workers, engineers, and managers.

This blurring of boundaries renders both craft and industrial union structures problematic. It weakens the ties of skilled trades workers to a well-defined domain of knowledge and, by boosting the firm-specific component of their knowledge, weakens their ties to an occupational group that spans firms. Furthermore, it turns ''unskilled'' workers into skilled workers, in part by legitimizing the knowledge such workers have always had, and in part by developing a mix of both firm-specific and general (e.g., problem-solving) skills. Thus, the logic of lean production may, in part, push towards an enterprise model of worker representation because firm-specific knowledge about the production system is the clearest boundary to organize around.¹⁷

This is just one of a number of forces for decentralization that pose major challenges for national unions. Harry Katz examines evidence of decentralization in collective bargaining in six countries (Sweden, Australia, Germany, Italy, the U.K., and the U.S.) and argues that these trends "are similar and can be best explained by changes in work organization at the local level: More local bargaining seems to be a natural product of the increase in worker and union participation in enterprise and shop floor decision making. It also appears that local bargaining is essential for the identification and implementation of new, more flexible forms of work organization." Similarly, Richard Locke, in his study of industrial relations in Italy, claims that the local variation in work organization and industrial relations practices resulting from union-management productivity coalitions at some plants and companies undermines national unions. What is striking in both accounts is how the dynamism of union activity at the local level poses challenges for unions at the national level.¹⁸

The changes cited by these researchers result from the confluence of several economic and technological forces, many of which are independent from lean production. But the fact that the boundaries of knowledge under lean production are so strongly associated with a single firm rather than a craft or industry provides an additional push in the direction of local variation and enterprise unionism. Thus, like these other trends, the diffusion of lean production raises worrisome issues for national unions. How will national unions be able to take wages and working conditions out of competition across an entire industry if there is high variation in work arrangements across companies and plants, and workers identify their interests strongly with a particular company? What safeguards will prevent management whipsawing local unions, pitting them against each other to gain new products or new technologies to stay competitive? What protections will exist for workers at financially weak companies if unions adopt the stance that collective bargaining should be based on the situation of each company and abandon industry-wide norms?

For national unions dealing with these issues, the main hope lies, I would argue, in recognizing the greater leverage afforded by the enlarged roles of workers under lean production. Since, under lean production, motivated and skilled workers are crucial to the competitive advantage of firms, unions have an opportunity to demand strong policies on employment security and training. By making labor more of a fixed cost while also boosting its value in a human capital sense, such policies will give companies an incentive to avoid competing on the basis of wages and working conditions.

Conclusion

This essay argues that the role of workers under lean production is substantially larger than under mass production. The dependence of lean production on workers for "thinking" work and "team" work, as well as "doing" work, has benefits for the self-development of workers as well as the economic performance of firms. This poses three challenges for unions. First, they will face pressures to abandon "job control" unionism, which conflicts with key principles of lean production. Union efforts to preserve a "job control" strategy will result in a "lose-lose" struggle with management that is certain to affect economic performance adversely, and hence threaten the employment security unions seek for their members. However, unions can (and do) seek greater influence on management's strategic decisions in return for allowing greater flexibility in work organization. Second,

unions will find that managers have more incentive to be concerned about workforce skill and motivation under lean production. While this can benefit workers, it places management more directly in competition with unions for worker loyalty and identification and increases management willingness to maintain "voice" mechanisms that provide an alternative outlet for worker concerns. However, unions can strengthen the commitment of workers by supporting management initiatives that lead to mutual gains while also pushing hard for management to respond to issues (e.g., ergonomics, avoidance of speedup, limits on overtime) that will be higher priorities for workers than for managers. Third, unions under lean production will have to deal with changes in the boundaries of knowledge and with the blurring of boundaries across knowledge domains—both of which pull towards more local variation in industrial relations practices and an enterprise model of unionism, thus posing challenges for national unions.

There is a hypothesis in the making here, that those companies or plants utilizing lean production principles that respond most effectively to worker interests should demonstrate more consistent and higher economic performance over time. This hypothesis assumes that lean production plants which do not respond to worker interests will suffer deteriorating performance because of the "fragile" nature of the production system. It also assumes that unions are the form of worker representation best able to represent worker interests, but does not preclude the possibility that other forms of "voice" for workers in nonunion plants may have some of the same effect. The time dimension is important here, for no one doubts that lean production, like mass production, can show short-term performance gains through exploitative pressure on workers. At the same time, even if the hypothesis holds over the long term, it will not resolve questions about the implications for national unions. To answer those, we need to observe whether the dynamics of lean production described here hold over time, and whether it continues to spread in its current form or instead takes on hybrid forms, combining elements of mass and lean production, as it is adapted to different contexts.

The rise of lean production provokes uneasy reactions among union leaders and other supporters of labor for it seems to foretell the certain dismantling of union strategies and structures that have been dominant, and effective, for most of this century. In return, there is the uncertain promise of new benefits for workers if unions can shift their approach to take advantage of the greater centrality of worker roles. Yet lean production seems certain to continue diffusing, if only because of its performance advantages. Unions will be better able to represent their members effectively if they proactively grapple with the challenges and opportunities of lean production than if they try to block it or simply hope it goes away.

Notes

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1. John Krafcik, "Triumph of the Lean Production System," Sloan Management Review 30, no. 1 (fall 1988): 41–52; James Womack, Daniel Jones, and Daniel Roos, The Machine that Changed the World (New York: Rawson Associates, 1990); John Paul MacDuffie, "Beyond Mass Production: Flexible Production Systems and Manufacturing Performance in the World Auto Industry" (Ph.D. diss., MIT, 1991); John Paul MacDuffie, "Human Resource Bundles and Manufacturing Performance: Flexible Production Systems in the World Auto Industry." unpublished paper; Robert Cole, Strategies for Change: Small Group Activities in American, Swedish, and Japanese Industries (Berkeley: University of California Press, 1989); Paul Adler, "The 'Learning Bureaucracy': New United Motor Manufacturing, Inc.," in Research in Organizational Behavior, ed. Barry Staw and Larry Cummings (Greenwich, CT: JAI Press, 1993); Paul Adler and Robert Cole, "Designed for Learning: A Tale of Two Auto Plants," Sloan Management Review (spring 1993): 85–94.

2. Mike Parker and Jane Slaughter, Choosing Sides: Unions and the Team Concept (Boston: South End Press, 1988); Joseph Fucini and Susan Fucini, Working for the Japanese: Inside Mazda's American Auto Plant (New York: Free Press, 1990); Steve Babson, "Lean or Mean: The MIT Model and Lean Production at Mazda," Labor Studies Journal 18, no. 2 (summer 1993): 3-24; Laurie Graham, "Inside a Japanese Transplant: A Critical Perspective," Work and Occupations 20, no. 2 (1992): 147-173; CAW-Canada Research Group, David Robertson, et al., The CAMI Report: Lean Production in a Unionized Auto Plant (Willowdale, ONT: Canadian Auto Workers, 1993).

3. For some observers, particularly Christian Berggren in Alternatives to Lean Production: Work Organization in the Swedish Auto Industry (Ithaca, NY: ILR Press, 1992), this fact supports the conclusion that lean production does not differ from mass production in any significant way. While I will argue that it is the cognitive and social roles for workers under mass and lean production that are most fundamentally different, the involvement of workers in revising task specifications, rearranging equipment layout, and contributing ideas for design changes often reduces the physical demands of a given assembly line job.

4. This quote is from 1906; the source is unknown, probably a speech. It is included in the educational videotape "Clockwork: Frederick Taylor and Scientific Management" (1982), produced by California Newsreel.

5. On the relationship between Taylorism and lean production, see Paul Adler, "Time and Motion Regained," *Harvard Business Review* (Jan.-Feb. 1993): 97-108.

6. Even if we leave aside plants in Japan (where suggestions per employee may exceed one hundred per year, due to a long history of promoting worker suggestions and the use of monthly quotas to boost suggestion levels), suggestion rates and implementation rates are much higher at lean production plants than at mass production plants. For example, 1993 data from the International Assembly Plant Study shows that lean production plants in the U.S. averaged 4 suggestions per employee per year, with a more than 60 percent implementation rate, compared with 0.4 suggestions per employee in more traditional U.S. plants, with a 25 percent implementation rate.

7. This critique of mass production was developed by socio-technical systems (STS) theory, which arose in response to Taylorism's separation of "thinking" work from "doing" work. STS emphasizes the importance of informal social interactions in work groups and the relationship between the technical and social systems at work. See Eric Trist and Kenneth

Bamforth, "Some Social and Psychological Consequences of the Longwall Method of Coal-Getting," Human Relations 4 (1951): 6-38; Fred Emery and Einar Thorsrud, Democracy at Work (Leiden, Netherlands: Martinus Nijhoff, 1976); William Pasmore, Designing Effective Organizations: The Socio-Technical Systems Perspective (New York: John Wiley, 1988).

8. Research on the factors affecting company and union commitment suggests that these may differ depending on whether workers attribute their favorable and unfavorable experiences with their jobs to the company, the union, or both. Thus the question of whether strong identification with the company weakens union commitment (or vice-versa) is ultimately an empirical question. See Peter Sherer and Motohiro Moroshima, "Roads and Road Blocks to Dual Commitment: Similar and Dissimilar Antecedents of Union and Company Commitment," *Journal of Labor Research* 10, no. 3 (1989): 311–30.

9. On "job control" unionism, see Harry Katz, Shifting Gears: Changing Labor Relations in the U.S. Automobile Industry (Cambridge: MIT Press, 1985); Michael J. Piore, "American Labor and the Industrial Crisis," Challenge 25 (Mar.-Apr. 1982): 5-11.

10. See Thomas Kochan, Harry Katz, and Robert McKersie, *The Transformation of American Industrial Relations* (New York: Basic Books, 1986). This change equally threatens traditional management roles. Expanding the cognitive role for workers eliminates the rationale for "management rights" (i.e. unilateral management authority over all conditions and methods of work) as much as it does for "job control."

11. Claire Brown and Michael Reich, "When Does Union-Management Cooperation Work? A Look at NUMMI and GM-Van Nuys," *California Management Review* 31, no. 4 (summer 1989): 26-44; Saul Rubinstein, Michael Bennett, and Thomas Kochan, "The Saturn Partnership: Co-Management and the Reinvention of the Local Union," in *Employee Representation: Alternatives and Future Directions*, ed. Bruce Kaufman and Morris Kleiner (Madison, WI: Industrial Relations Research Association, 1993); Ann Frost, "The Determinants of Local Union Capabilities: An Historical-Institutional Approach," working paper (Industrial Relations Section, MIT, 1994).

12. Haruo Shimada and John Paul MacDuffie, "Industrial Relations and 'Humanware': Japanese Investments in Automobile Manufacturing in the United States," working Paper (Sloan School of Management, MIT, 1987).

13. For example, in the summer of 1992 the brief strike at a GM components plant in Lordstown, Ohio shut down production at several assembly plants, including Saturn. Overuse of this tactic can be counterproductive, however, since management can easily revert to mass production practice and begin stockpiling inventories again.

14. Differences in management competency and motivation will be another source of variation as lean production diffuses. Mass production principles were also implemented erratically and incompletely, particularly in Europe, due to the persistence of craft principles. See Wayne Lewchuk, *American Technology and the British Car Industry* (Cambridge, UK: Cambridge University Press, 1988).

15. Japanese Auto Workers, "Japanese Automobile Industry in the Future: Towards Coexistence with the World, Consumers, and Employees," mimeo (1992).

16. Even where managers (and especially foremen) are aware of the important "working knowledge" of production workers, there is no legitimized way for them to recognize or validate this knowledge. The logic of mass production requires minimal modifications of the production process to achieve economies of scale, and vests the authority to decide what modifications are made in engineers and staff.

17. This is obviously not the causal direction historically. Japanese companies had already established enterprise unions before the innovations of lean production emerged and were refined into a full production system. See Michael Cusumano, *The Japanese Auto Industry: Technology and Management at Toyota and Nissan* (Cambridge: Harvard University

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Press, 1985); Andrew Gordon, *The Evolution of Labor Relations in Japan: Heavy Industries,* 1853-1955 (Cambridge: Harvard University Press, 1985). However, as lean production spreads into other countries, special collective bargaining arrangements are often made to accommodate the logic of the production system. The dynamic of the relationship between union and management thereafter is what demonstrates this pull towards enterprise unionism. 18. Harry Katz, "The Decentralization of Collective Bargaining: A Literature Review

and Comparative Analysis," *Industrial and Labor Relations Review* 47 (Oct. 1993): 17, 3–22; Richard Locke, "The Demise of the National Union in Italy: Lessons for Comparative Industrial Relations Theory," *Industrial and Labor Relations Review* 45, no. 2 (1992): 229–249. On the economic forces that boost the influence of local unions, see also Harry Katz and John Paul MacDuffie, "Collective Bargaining in the U.S. Auto Assembly Sector," in *Contemporary Collective Bargaining in the Private Sector*, ed. Paula Voos (Madison, WI: Industrial Relations Research Association, 1994).