Productive Efficiency and the Lean Production System in Japan and the United States

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The lean production model originated in Japan, where it was partly responsible for the labor–management cooperation and productive efficiency of Japanese industrial relations during the 1970s and 1980s. Recent evidence suggests that its transference to the US has met with much less success. This article argues that the key to the relative superiority of the lean production system in Japan has to do with the institutional mechanisms in place in that country, but which are absent in the US, to incorporate workers' shopfloor concerns in production. The lean production system runs the risk of improving productivity and product quality through increased worker effort and stress, and reduced worker health and safety. Mechanisms for worker voice insure that this 'mean' side of lean production is foregone, that workers possess a sense of both justice in the sharing of shopfloor rewards and legitimacy in the authority possessed by superiors, and thus that workers willingly cooperate with management to enhance productive efficiency.

Keywords: labor–management cooperation, lean production, productivity, worker voice

The system of lean production has spread rapidly across the globe since its emergence in Japanese manufacturing in the 1960s and 1970s. It represents an approach to production that strives to eliminate fat or waste from the production process by making workers responsible for productivity and product quality. The lean production model has been one of the pillars of the highly productive

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Japanese economy during the postwar period. Its transference to other countries has met with less success. In the US, for example, workplaces employing such techniques apparently witness little significant productivity improvement (Freeman and Kleiner, 2000), and yet are associated with worsened worker health and safety, lower job stability and little improvement in worker pay (Brenner et al., forthcoming; Osterman, 2000). How does one account for the different performance of the lean production approach in these two countries?

Several explanations have been advanced in the literature that could account for this difference. Some analysts have recently argued that productivity improvements stem not from the piecemeal adoption of one or another workplace feature but rather from the way in which workplace features are packaged. Since the US has not adopted all of the institutional aspects of the lean production system found in Japan – the most notable absence being the promise of lifetime employment – it may not reap the hoped-for productivity boost. Ichniowski et al. (1997) find evidence that supports this explanation. Their study of steel finishing plants in the US found that lean production methods lead to greater productivity effects when coupled with employment security and profit-sharing, two prominent features of the lean production model in Japan.

Cultural differences also have been advanced as a possible explanation for differences in productive efficiency across countries with similar organizational features. We know, for example, that self-interested behavior that comes at the expense of the group is not as acceptable in Japan as it is in the US. Perhaps Japanese workers are thus less inclined to put their own individual interests above those of the company, in which case lean production in Japan may result in greater improvements in productivity and product quality than in the US.

In this article, which is based on an examination of the secondary literature and some of our own recent research, we advance a different explanation for the divergent performance of the lean production system in the US and Japan. Like existing explanations, we emphasize the absence of certain formal institutional features in the US version of lean production, as well as differences in informal shopfloor institutions based on custom and practice and which ultimately rest on cultural differences. However, our analysis points to the lack of certain formal and informal institutional arrangements for the protection of workers against increased stress, greater labor

intensity and threats to health and safety inherent in the lean production system. We argue that the consequences of the negative working conditions of the US lean production model have led American workers to be less cooperative with management than their Japanese counterparts, and that this accounts for the lackluster productivity performance of transformed workplaces in the US.

We begin the article with a discussion of the determinants of labor–management cooperation in production, wherein we argue that workers are less likely to cooperate with management if they view the sharing of shopfloor rewards as unjust and the authority of management as illegitimate. Next, we turn to a discussion of the various features of the lean production model in the two countries. Here we argue that the shopfloor protections offered workers in Japan facilitate cooperation whereas the absence of such protections in the US militates against cooperation due to workers' feeling of distributive injustice and the illegitimacy of managerial authority. In the final section of the article, we briefly discuss the challenges currently faced by both countries in their use of the lean production model. Japan is facing pressures to eliminate certain features of their lean production system that are arguably crucial for eliciting worker cooperation. The US must find a western counterpart to those features of the Japanese model that protect workers from the negative shopfloor consequences of lean production methods.

Labor–Management Cooperation in Production

Production is a sphere of economic activity with a distinct form of exchange between participants. Neoclassical economists view the transaction between the owners of capital and workers in the sphere of production as one of a market exchange – no different, in fact, than that between the owner of a grocery store and a consumer. Marxists argue, on the contrary, that this transaction is not dictated by the exchange of property rights in a market setting at all, but rather by the power that capital possesses over labor in the labor process. Both stake out an extreme position.

Market forces such as the massive exit of labor from a particular firm can no doubt affect the conditions of production by forcing an employer to alter certain working conditions in order to secure an adequate labor supply. However, the simple market exchange,

which typically involves an agreement regarding the payment to labor per hour spent at work, leaves unaccounted for much of the activities in production. Moreover, attempts to fill this void with alternative formal institutions such as company policies and contractual agreements are also ultimately problematic. Anticipating future contingencies in production and delineating them in contractual form is extremely difficult. Third-party enforcement of these agreements, rules and regulations is often impossible.

When formal institutions – such as property rights and labor contracts – have a limited reach over a particular realm of social activity, it is informal institutions – such as norms, customs and traditions – that fill the void. Indeed, we would argue that informal institutional arrangements dictate outcomes in the sphere of production more than in most other realms of economic activity, except perhaps that of the household. Several implications flow from this insight.

One important aspect of the relation between capital and labor in production that stems from the limited reach of formal institutions and the space granted to informal institutions involves the use of power, a point emphasized by both Marx and Weber, among others. The power that one party holds over another in a typical market exchange is purchasing power. Where there is no ambiguity regarding the kind of work to be done, or where company policy or contractual agreement fully stipulate the nature of production conditions, the employer's power over workers is the ability to pay for their service. Where informal institutional arrangements hold sway, the power of management over workers is one of authority. The work gets done in the way that it gets done because of the authority of the boss. Compliance with authority may result from the superior knowledge of the authority figure (i.e. the person is an 'authority') or from his or her dictatorial capabilities (i.e. the person is an 'authoritarian').

A second aspect of the prominence of informal institutions in production is that the motives for cooperation between interacting parties are different. When agents interact within the formal institutional arrangements of a market exchange, they do so because of the direct mutual advantage that comes from such interactions. Agents may be motivated by similar concerns when acting within the informal institutions of production – workers may work hard, for example, as a way of currying favor with a supervisor who decides on promotions – but the quid pro quo is not formally regulated. Typically, agreeing to a boss's order involves a decision to co-

operate, not out of mutual advantage as in market exchanges, but for other reasons entirely.

What are these reasons? Numerous normative and customary concerns enter at this stage. Deference to authority may play an important role, as may an unwillingness to betray the output norms established by one's fellow work group members. Recent developments in the economics of production suggest that cooperation is fostered by improved communication between labor and management, by an enhanced belief in the 'truth' value of that communication, and by the belief on behalf of both parties that the structure of decision-making authority is legitimate and that the distribution of rewards from production is just. Cooperation, in turn, fosters productive efficiency.

We emphasize in this article the ethical and political aspects of the decision by workers to cooperate with management because we feel they are particularly important and yet all too often under emphasized in the literature. We postulate that labor's cooperation with management is premised on whether workers view management's authority as legitimate and whether they view the distribution of shopfloor rewards (e.g. health and safety vs productivity and product quality) as just.

Where workers view the distribution of shopfloor rewards as unjust and the authority of management as illegitimate, the result is likely to be less cooperation from workers. Alvin Gouldner's (1954) famous account of a 'wildcat strike' is an illustrative case. In this instance, workers had adopted a custom of clocking in to work after the official start time. One day, management attempted to eradicate this informal norm, and to alter workers' behavior so that it accorded with the formal rules. To the minds of managers, this move seemed uncontroversial in that it merely accorded with accepted formal regulations. However, the result was a strike, with lost production during the strike and continued productivity problems following the resumption of production as a result of reduced worker cooperation with management.

We believe that a fruitful way of understanding circumstances at this plant before the crisis in labor–management relations emerged is to view workers' customary procedure of clocking in late as a norm that they had adopted as a contingency for their cooperation with management in day-to-day production. Perhaps they felt that the work pace was too fast, or that the health and safety standards were inadequate, or that supervisors behaved in arbitrary ways

regarding assigned job tasks, and, in the absence of smooth procedures for addressing these issues, workers had adopted the custom of clocking in late. Cooperation with management was contingent on the justice and legitimacy workers perceived in the simple practice of clocking in late. When management tried to enforce the formal rules, this cooperation broke down, and, with it, the productive efficiency of plant operation.

Fairris (1997) has argued that a similar set of circumstances existed with regard to labor–management relations in the large, mass-production manufacturing plants of the US during the late 1950s and early 1960s. The early postwar years contained a form of incompatibility in the formal and informal institutional arrangements whereby the formal rules delegated control of shopfloor production to management while the informal norms and customs gave shop stewards and informal work groups significant power in determining working conditions. These informal norms and customs – such as agreements regarding work pace hammered out by supervisors and shop stewards or methods to insure health and safety enforced by informal work groups – had their origin in the union drives of the 1930s. However, beginning in the late 1950s and early 1960s, and in part due to emerging international competition and struggles over the introduction of new technologies, management attempted to eliminate these informal customs.

The unintended consequences of these management efforts were reduced worker cooperation in production and the increased devotion of resources to formal negotiation and dispute resolution. Statistics reveal an increase in wildcat strikes, grievances, absenteeism and contract language governing shopfloor conditions. Case studies reveal a general decrease in labor cooperation with management in production. And empirical analysis has formally linked this crisis of cooperation to the productivity slowdown that occurred in manufacturing in the late 1960s and early 1970s (see Fairris, 1997: Ch. 5).

In summary, we believe the production process is a unique realm, where the relationship between interacting parties is not mediated by market mechanisms but rather by authority relations, and where there is significant discretion on the part of the producing agent with regard to cooperation. We have highlighted the important role that feelings of distributive justice and the legitimacy of authority play in the cooperation between the parties in this relationship.

We turn now to an application of these ideas to the productive efficiency of the lean production system in Japan and the US.

Lean Production in Japan and the US

The lean production model makes workers responsible for the enhancement of productivity and product quality. It also strives for flexibility in the use of labor resources in order to enhance product variety. Behind the devolution of responsibility to workers is the view that workers have unique information regarding production that is not available to management, and that delegating responsibility in this way could thus lead to enhanced productive efficiency. Proponents of the lean production system argue that workers should control their own knowledge and information, especially the ability to cope with changes and to deal skillfully with 'unusual operations' (Koike, 1994).

Lean production methods require that workers do all of the tasks normally expected of them under a Taylorist approach to production, and more. Thus, the challenge posed by the lean production model is how to garner the willing cooperation of workers when their effort and responsibility are expected to increase. The various components of the lean production system are just-in-time (JIT) production schemes, worker teams and quality control methods such as total quality management (TQM) techniques and quality circles (see Womack et al., 1990).

The JIT component of lean production is devoted to the elimination of waste and to a seamless connection between the production process and markets. Inventories are held to a minimum, worker tasks are streamlined, redundant workers are eliminated, and the production process is fashioned so that it can respond to consumer needs promptly (Suzuki, 1994). Production processes require buffers – a stock of parts and components, backup machinery, extra workers – in order to deal with contingencies in production. JIT methods strive to minimize the use of buffers so as to expose weaknesses in the production system and address them promptly.

However, the minimization of buffers may have a significant impact on labor. A major advantage of buffers is that they provide workers with discretion regarding their pace of work. Stockpiling production enables workers to gain pockets of space away from

the drudgery and physical demands of work. With the removal of buffers, workers are deprived of the ability to create idle time, and hence their level of work effort increases (Sewell and Wilkinson, 1992; Parker and Slaughter, 1995). In forcing workers to work harder, this aspect of the lean production model risks violating workers' sense of justice in the sharing of shopfloor rewards and thereby their willingness to cooperate with management. Ironically, JIT production also makes such cooperation absolutely necessary because, in removing buffers, a breakdown in cooperation in one area of production can cripple the entire production system.

Under lean production methods, the responsibility for productivity and product quality rests with workers as members of a team. It is the team, and not an off-line engineer or a worker in the 'defects' department that is responsible for dealing with contingencies and quality control (Cole, 1994). Each worker team is typically assigned a set of tasks that forms part of a larger assembly operation. However, this set of tasks, as well as the production standards and quality goals that accompany it, is set for the team by management. Members of each team collectively possess the responsibility for achieving, but not the power to determine, these goals.

Because the responsibility is collective, and not individual, each team member becomes responsible for the performance of others. Covering the tasks of other team members during their absence (Ohno, 1998), and even consulting fellow team members regarding their poor performance, is part of the incentive structure management hopes to foster by creating work teams. Mutual monitoring and even disciplining may become part of the behavior of team members (Delbridge et al., 1992; Sewell and Wilkinson, 1992; Delbridge and Lowe, 1997). As Doeringer et al. (1998: 178) comment, this is a system of 'peer supervision and self-supervision'. This can contribute to stressful interpersonal relations between workers, and reduced satisfaction with the job.

Decisions concerning job rotation, the allocation of jobs among members, and the revision of work tasks to better attain set standards of performance are left to the team, in consultation with the team leader. Because production standards facing work teams are set by management, the power of teams is severely circumscribed. However, there is one person with some element of power within the team – the team leader. Accountability redounds to the team leader first; it is the team leader who is responsible for meeting production standards and for defects attributable to the team

(Delbridge and Lowe, 1997; Webb and Palmer, 1998). Team leaders are delegated the authority to monitor and supervise the activities of team members.

Team leaders serve two constituencies (Kaneko, 1997; Nomura, 1993). They are responsible for meeting production standards and quality goals set by management. But, they must also elicit the co-operation of team members, and thus must temper the negative impact of production standards, quality goals and work methods on workers. Thus, workers wield power and discretion under lean production methods depending on the power and proclivities of the team leader. Workers' sense of the legitimacy of the authority possessed by team leaders depends on their actions.

Various mechanisms have been instituted under the lean production system to insure high-quality products. At one extreme, there is TQM techniques and their more recent variants which focus almost exclusively on process changes such as the elimination of unnecessary time and motion, increased speed, simplification of tasks and reduced cycle times. These are top-down management approaches to re-engineering the production process reminiscent of the Taylorist principles of scientific management (Appelbaum and Batt, 1994). Their impact on workers has been largely to increase responsibilities, speed and stress.

At the other end are quality circles, which are joint-communication committees composed of workers and management that meet on company time to solve problems encountered in production. Quality circles may be devices for breaking the solidarity of work groups and local unions, and the meetings may be largely devoted to issues of product quality and production 'trouble shooting'. Alternatively, they may be communication mechanisms by which workers voice concerns to management, and quality circle meetings may be forums for suggestions regarding improvements in working conditions as well as productivity and product quality. Much depends on how quality circles are instituted and implemented.

In our view, the challenge facing the institution of a lean production system is how to garner labor's cooperation with management at the same time that workers' responsibilities – and perhaps effort and stress – are also increasing. We believe there are two important mechanisms for garnering labor's cooperation in production, and thus for achieving productive efficiency, under lean production arrangements: (1) enhanced lines of communication running from

workers on the shopfloor to top management and back, ensuring a measure of consensus in expectations regarding justice and legitimacy in production; and (2) an informal set of institutional arrangements – premised, for example, on the power of informal work groups or the benevolence of team leaders – that provides for just outcomes and the legitimacy of managerial authority, thereby insuring cooperation from workers independent of the formal rules and regulations. Lean production in Japan has both types of mechanisms. Lean production in the US possesses neither.

Lean Production in Japan

The superior productive efficiency of Japanese lean production, which is based in part on the superior cooperation between labor and management, stems from the existence of formal institutions for consensus building and certain informal, normative aspects of Japanese culture which affect shopfloor custom and practice.

It is often argued that labor–management consensus in Japanese production is produced through the efforts of and control by management. For instance, Japanese companies pay special attention during worker recruitment to hard-to-observe worker qualities such as flexibility, teamwork, loyalty and motivation (Doeringer et al., 1998). Similarly, Japanese companies provide many company-sponsored programs and activities, such as sports events and trips for employees, which are thought to contribute to increased labor–management cohesion and the building of shared expectations (Lincoln and Kalleberg, 1996). In addition, there exist informal employee associations in many Japanese firms[1] that are said to strengthen company cohesion. *Shain kai* (an association for employees), *Shinboku kai* (a get-together meeting), or *Kenjin kai* (an association of people from the same prefecture) typically encompass all employees, including senior managers, irrespective of union membership. Employee associations such as *Kenjin kai* or *Shinboku kai* play a significant role in ensuring that employees share certain managerial goals.

However, we think that it is naive to depict labor–management consensus in Japanese production as a manufactured form of consensus. There are both formal and informal institutions of production granting workers a 'voice' in production so that their

views of justice and legitimacy are taken into account both in the construction of formal institutional arrangements and in day-to-day shopfloor practice. Joint consultation between labor and management exists on a variety of levels in Japanese plants and firms.

At the most formal level there is joint consultation with either unions or company unions over the so-called Rules of Employment as well as matters not formally covered by the Rules.[2] Failure to reach satisfactory agreement in joint consultation can sometimes result in more formal bargaining between management and union. However, written contracts covering the employment relation in Japan, to the extent they exist, are typically short, general and abstract, with a simple clause stating: 'Should a disagreement arise, the parties will settle it amicably by consultation' (Hanami, l979).

One of the more important types of formal consultation in Japan is the so-called 'ringi' system of consensus decision-making. In general, this system works in the following way. The draft of a proposal to alter some aspect of the production process is written by an employee near the bottom of the organizational hierarchy. The draft, called *ringisho* (or ringi document), is then circulated among those concerned. The document is forwarded along to superiors in the organizational hierarchy and eventually given final scrutiny by top management. Although a 'tedious process of collective compromise' (Marsh, 1992: 251), the ringi system is undoubtedly one factor in labor–management consensus on Japanese shopfloors.

The great majority of Japanese companies also have joint labor–management committees[3] or small group activities such as quality circles,[4] which serve as mechanisms for workers to express their views about managerial policies. Indeed, in joint labor–management committees, labor unions and management take up a variety of issues such as 'employment or personnel policy', 'working hours', 'workplace environment' and 'worker welfare' and discuss them on a regular basis (Ministry of Labor, 1998). With regard to quality circles, Nitta (1988) has noted on the basis of a case study of the steel industry that in Japan they should not be viewed as merely unilateral control devices wielded by management, but as opportunities for coordination or negotiation between management and workers on the shopfloor. Nemoto (1992: 62), who was in charge of quality circles at the Toyota Motor Company, cites their importance in promoting 'a cheerful workplace'. Ohno (1998) stresses their contribution toward better labor–management communication on the shopfloor instead of their impact on the quality of the product.

Complementing these formal institutional arrangements for consultation and consensus building are the unique aspects of Japanese culture that operate at the level of shopfloor custom and practice. Harmony in human relationships, based on mutual understanding, is a basic social virtue in Japanese society (Hanami, 1979). As a result, the notion of formal contracts which spell out legal obligations that contracting parties can then appeal to in a judicial setting are anathema in Japanese culture. Indeed, to assert one's legal rights is tantamount to 'unethical behavior' in Japan (Hanami, 1979: 45).

The legitimacy of shopfloor managerial authority in Japan rests, in part, on a form of paternalism in which workers are obligated to their immediate superiors 'for favors received and (are) duty bound to repay in hard work and loyalty' (Cole, 1971: 184). The immediate superior is expected, in return, to advise and protect the worker, looking out for his or her interests in relations with persons of superior authority. A superior is expected to act with benevolence toward his subordinates, to exhibit, in Dore's (1987: 94) words, 'concern for the interests and dignity of subjects'.

Even as the paternalism of Japanese labor–management relations has faded somewhat in recent years, there exists a communal aspect to contemporary industrial relations in Japan that is reminiscent of the welfare capitalist arrangements of the early 20th-century US. Management maintains the belief that it is responsible for the well-being of workers both inside and outside the company. Shopfloor supervisors are expected to build a family-like relationship with rank-and-file workers. The Japanese shopfloor is a community rather than a marketplace where labor services are bought and sold (Hazama, 1978; Kubota, 1988).

Rank-and-file workers thus expect a shopfloor supervisor or team leader to refrain from oppressive aspects of labor control, and to advocate their interests vis-a-vis upper management. In return, workers show 'respect and deference' to shopfloor authority and cooperate with them in production. According to Shibata's participant observations (Shibata, 1999), supervisors or team leaders in Japan exercise influential power vis-a-vis upper managers and protect rank-and-file workers from the prerogatives of upper management. In Japan, team leaders are typically given the discretion to make certain decisions that industrial engineers are not allowed to overturn (Nakamura, 1997; Nakamura and Nitta, 1995). These buffering activities strengthen 'the sense of unity between the supervisors and workers' (Shibata, 1999: 202–3). Thus, a reciprocal

relationship between a supervisor and rank-and-file workers is established on the Japanese shopfloor.[5]

Nakamura and Nitta (1995) showed that where team leaders/supervisors are given great decision-making power, such as with respect to job rotation, these shopfloor managers did not implement decisions in arbitrary ways, but rather gave careful consideration to the expectations of workers. Dore and Sako (1998: 109) also note the 'benevolence which is rewarded with respect and deference' in the relationship between team leaders and workers in Japan with regard to the process of on-the-job training. Thus, some see in the Japanese version of lean production the potential for 'quasi-autonomous worker groups' (Nakamura and Nitta, 1995: 338) or 'semiautonomous teams' (Shibata, 1999: 201) led by the team leader.

This relationship is also rooted in the specifics of Japanese industrialization. In the early stages of industrialization in Japan, during the early 20th century, the skilled trades were composed of master crafts persons who traveled from firm to firm, typically accompanied by apprentices. These crafts persons possessed wide powers with regard to the control of production and personnel management. Master crafts persons had the authority to determine work methods, to hire and dismiss workers, to discipline and supervise them, and to determine their pay, working conditions and training.

With successive technological and organizational innovations, even though the demand for skilled workers was reduced, the former crafts persons were tapped for jobs in shopfloor supervision (Shirai, 1982: 98). Thus, in essence, the authority of the craft master was maintained even in the process of industrialization in Japan. Their authority was no longer based so much on their skills as on their competence for personnel management (Katsumata, 1999: 51). This enabled the customs of the earlier craftsworker community to survive even though technological innovations resulted in the demise of craft skills.

It was after the Second World War that the modern production system – the *sagyocho* system – was adopted in Japan. However, the quasi-patriarchal nature of the earlier labor–management relationship was maintained. This relationship between the Japanese shopfloor supervisor and workers went beyond that found in the US. For example, the former often includes an intimate personal relationship outside the company. In addition, the Japanese supervisor is expected to serve as mediator between upper management and rank-and-file workers.

In summary, then, while Japanese workers possess a very limited ability to directly influence certain shopfloor conditions, they are able to voice their shopfloor interests and to have them acknowledged by management through various formal and informal mechanisms for joint consultation. Lower-level management acts on behalf of those expressed interests out of a duty of paternal or communal benevolence. Managerial authority is thus viewed by workers as legitimate, and shopfloor outcomes are viewed as just, thereby contributing to labor's cooperation with management in production.[6]

Lean Production in the US

Lean production workplaces in the US lack formal and informal accompanying institutions that can temper their negative consequences for workers. The most obvious institutions that might act on behalf of workers in this regard – namely, a strong commitment by unions to worker control over working conditions and worker shopfloor empowerment through shop stewards and informal work groups – had been relegated to the status of historical artifacts long before the emergence of lean production methods.

The absence of significant union involvement in the affairs of production was set in place during the late 1940s, when General Motors, acting on behalf of American industrialists as a whole, withstood a months-long strike to reject the United Auto Workers' demand for greater worker participation in shopfloor conditions (Piore and Sabel, 1984). Many collective bargaining agreements henceforth explicitly granted management control over the realm of production through so-called 'management prerogative' clauses.

Curiously, despite the failure of these formal union demands, worker shopfloor power continued in the early postwar period in the informal custom and practice of shopfloor governance through the power of shop stewards and informal work groups. However, during the late 1950s and early 1960s, this informal shopfloor power was undercut through management's adoption of a 'contract and grieve' approach to shopfloor governance, wherein labor's power in production was limited to its rights as spelled out in collective bargaining agreements (Fairris, 1997).

The 'contract and grieve' approach to shopfloor governance altered the power configuration in production and thus the distribu-

tion of shopfloor rewards, as productivity increased and the working conditions of workers deteriorated. This set of institutional arrangements did not represent a stable equilibrium. During the late 1960s and early 1970s, workers staged an active revolt against the bureaucratic, management-driven 'contract and grieve' system of shopfloor governance. Workers' sense of injustice in the altered distribution of shopfloor rewards and illegitimacy of management's newly acquired power resulted in a massive failure of worker cooperation with management, which was an important contributor to the famed productivity slowdown of the period (Fairris, 1997).

Oddly, it was at this stage that pieces of the lean production model first emerged in US workplaces. Quality committees and (later) teams seemed like an ideal way of addressing workers' shopfloor discontent, and the new focus on worker responsibility and (later) quality control methods seemed like attractive ways of addressing the productivity and product quality concerns of management.

The focus on worker participation and decentralized decision-making were viewed by both labor and management as superior to the top-down approach of the 'contract and grieve' model. Institutional developments during the 1970s were thus accompanied by strong rhetoric regarding worker participation and a genuine concern for workers' conditions of production. Indeed, early versions of quality committees were known as 'quality of worklife programs', and were devoted to improving quality in both the working conditions of workers as well as the products they produced.

However, as international competition became more severe beginning in the early 1980s, 'quality-of-worklife' programs became mere 'quality circles' and their focus was changed. Quality circles became forums in which labor made recommendations on how to improve productivity and product quality so as to make the position of domestic manufacturers more competitive in the global marketplace. It was at this time that the remaining components of the lean production model – teams in production, JIT techniques and TQM programs – became more widespread in US manufacturing.

The further introduction of lean production methods placed an even greater burden on workers to increase the speed of production while at the same time decreasing defects. Thus, worsening physical conditions of production were combined with increased stress. With the absence of formal mechanisms, such as collective bargaining language, for addressing workers' shopfloor concerns, and with the workers' informal shopfloor power undercut, the one remaining

avenue through which workers' concerns might have been represented was by shopfloor management. Lean production methods grant significant discretionary power to the team leader, who in many respects is the modern day foreman in US workplaces.

Team leaders are workers in that they are required to know all of the jobs in the work team and to fill in for absent team members. But team leaders, like foremen, are also members of management in that they supervise workers' performance and have significant say in the design and assignment of workers to jobs. The decentralization of managerial authority characteristic of lean production means that team leaders have a fair amount of discretionary power over workers.

Shopfloor managers' regard for workers' concerns, and the extent of their power vis-a-vis upper management, had been resolved in the US by the early decades of the 20th century. Sumner Slichter's (1919) famous characterization of US production as a 'drive system' put the foreman as the 'driver' in this system. The personnel management movement that emerged during the 1910s and 1920s convinced management of the inefficiencies of a system wherein foremen wielded arbitrary and dictatorial powers, and personnel and human resource departments emerged in many companies to temper the power of foremen. The lack of empathy with the concerns of workers among shopfloor managers remains a prominent feature of US production, as does their general lack of power to convince upper management of the need for shopfloor change.

Team leaders occupy this position in the lean production model. Evidence suggests that many workers view the divided loyalties of the team leader as problematic. Moreover, many resent the fact that team leaders are rarely democratically elected by team members. (Team leaders are typically chosen by management, but are sometimes chosen jointly by union leaders and management in organized plants.) Thus, in some lean production plants, movements have surfaced among workers to have team leaders chosen by the workers themselves. At the CAMI auto plant in Canada, for example, while workers are generally supportive of the need for a team leader, they express the desire by an overwhelming majority (over 75 percent) for the team leader to be elected by team members (Rinehart et al., 1997).

In sum, the lean production model in the US is without sufficient formal or informal mechanisms for worker voice. While workers are

generally supportive of the move toward greater decentralization of decision-making and even greater worker responsibility in lean production settings, they are also clear about the need for greater mechanisms for worker voice within contemporary shopfloor arrangements (Freeman and Rogers, 1999).

A Comparison of Lean Production Outcomes

We have argued that while Japanese lean production arrangements possess significant mechanisms for worker voice, lean production methods in the US do not. We contend that these differences lead to different shopfloor outcomes for workers, and thus for differences in workers' sense of justice in the distribution of shopfloor rewards between labor and management and their sense of the legitimacy of managerial authority. These differences in outcomes, in turn, lead to differences in the extent of worker cooperation with management in production, and thus in productive efficiency, in the two countries.

It is important to note that cooperation enhances productive efficiency, and productivity in particular, through a variety of mechanisms other than merely greater worker effort.[7] When workers are cooperative with management, they are more willing to implement new techniques and new organizational innovations in production. They are also more flexible in production, and thereby willing to engage in tasks that are not part of their formal job description. When there is cooperation between labor and management, less time and energy is devoted to formal regulation and adjudication of the relationship through collective bargaining language, the delineation of company policy, or formal grievance procedures. Consequently, more time and energy can be devoted to production.

Cross-country comparisons of workers' sense of justice and the legitimacy of authority is a complex task, involving complicated social/cultural comparisons that are beyond the scope of this study. Instead, in this section of the article we focus briefly on the different shopfloor outcomes workers experience in the two countries. An essential ingredient in our case is that there is a greater sense of justice and legitimacy among Japanese workers, and thus greater labor–management cooperation in lean production settings in Japan than in the US.

Workers' feelings of injustice in the sharing of shopfloor rewards are a function of the stress, pace of production and related health and safety conditions they face as compared to the productivity rewards that accrue to management by virtue of workers' efforts.

A few studies have explicitly linked the transformation to the lean production model in the US to harder or more sustained effort by workers. Treece (1989: 80), for example, found that workers at the NUMMI plant worked 55 seconds out of every minute, while at the comparable, but untransformed, GM-Linden plant workers worked only 45 seconds out of every minute.

Several analysts have argued that while workers may put forth greater effort in lean production environments, they are also happier to do so because they participate in decisions regarding shopfloor production. However, surveys of workers at lean production plants appear to belie this claim. Babson's (1993) survey of workers at the Mazda plant in Flat Rock, Michigan, for example, revealed that three-quarters of the workforce surveyed felt that their work pace was so intense that they would be either injured or worn out before they reached retirement.

While working harder and faster may yield some satisfaction for workers through a greater sense of accomplishment, working under conditions of worsened health and safety is rarely satisfying. And yet there is growing evidence to suggest that lean production plants are indeed less safe than comparable untransformed plants in the US. The negative impact on health and safety appears to be related to the increased speed of production, but also to the pressure placed on workers to be responsible for quality and productivity.

The link between rationalization of production, work pace, and workplace health and safety has been emphasized in several case studies. For example, Berggren et al. (1991) visited a number of lean production auto plants in the US and found growing health and safety complaints related to the intense pace, repetitive job tasks and long hours. At one plant they found extremely high levels of cumulative trauma disorders (CTDs) – injuries associated with repetitive motions that are conducted rapidly and over extended time intervals – and an overall injury rate three times the level of other US auto plants (Berggren et al., 1991: 55).

Indeed, there is a parallel between the introduction of lean production methods in the US beginning in the 1980s and a disturbing rise in cumulative trauma disorders over roughly this same period.

The rate of CTDs per 10,000 workers rose from 3.6 to 27.3 between 1982 and 1999. By the early 1990s, illnesses associated with CTDs caused the longest absences from work among leading health and safety related events and exposures (US Department of Labor, 1992: 3, 5).

In a series of recent findings (Fairris and Brenner, 2001; Brenner et al., forthcoming), a firm statistical relationship has been established between cumulative trauma disorders and US plants employing lean production methods. In particular, the findings implicate quality circles and JIT production techniques. Quality circles and JIT approaches to production are both positively and statistically associated with CTD rates across a wide variety of manufacturing establishments. Moreover, their quantitative impact on CTD rates is sizeable, accounting for as much as 50 percent of the mean CTD rate in a sample of larger manufacturing establishments.

Critics of lean production methods find in the case study evidence convincing explanations for the relationship between CTDs, quality circles and JIT methods of production. They contend that American quality circles threaten labor solidarity, thereby undercutting the ability of workers to resist speedups and decreased cycle times, both of which are associated with cumulative trauma disorders.[8] Quality circles are also seen by these critics as inclining workers to feel responsible for improving productivity and quality in production, perhaps at the cost of sacrificing health and safety (e.g. Parker, 1985).

A JIT approach to production eliminates buffer stocks and integrates more off-line production jobs into the main assembly line, thereby preventing a larger number of workers from working ahead or building up banks. This acts to reduce worker autonomy over the pace of production, forcing a similar and constant rhythm to work throughout the plant. In a plant studied by Klein, autonomous worker groups became disempowered in precisely this way with the introduction of JIT procedures (Klein, 1989). The link to CTDs is therefore likely to be related to decreased worker control over the pace and timing of work.

Empirical studies of Japanese industrial relations reveal that the JIT system puts pressure on workers to produce there as well. Fujita's (1988) survey of worker attitudes at the Toyota Motor Corporation, for instance, revealed that many workers felt the rapid pace of work left them exhausted at the end of the workday.

However, interestingly, overall worker attitudes at Toyota were generally quite positive during this same period despite the dissatisfaction with stressful working conditions (Oyama, 1985; Nohara and Fujita, 1988).

A careful analysis of the impact of the Japanese lean production system on repetitive motion disorders has yet to be conducted. However, judging by the trajectory of 'joint disorder' problems in Japan following the onset of lean production methods in the early 1970s, lean production arrangements do not seem to have yielded the same outcome with regard to workplace health and safety there as in the US. The number of industrial accidents associated with 'joint disorders' resulting in lengthy absences (more than four days) or deaths fell over the period from 1975 to 1985, from roughly 9600 cases to a little under 7000 (Rodo-sho Rodo-kijun kyoku, various years).

With regard to the legitimacy of managerial authority, whereas in Japan shopfloor supervisors are able to respect worker concerns and to take these into account in production, no such ability appears to exist among supervisors in the US. Moreover, even if American supervisors and team leaders were inclined to protect workers' interests, it is doubtful how successful they would be. Compared to their Japanese counterparts, they appear to possess less power vis-a-vis upper level management, are less likely to be promoted from the ranks of workers, and oversee far more workers (Shibata, 1999).

Lincoln and Kalleberg's (l990) comparative study of production in the US and Japan yields illustrative findings in this regard. Their findings (Lincoln and Kalleberg, 1990: 90) on the effect of supervisor contact with workers in the two countries are particularly interesting. They find that supervisor contact decreases significantly workers' sense of autonomy in the US, but that such contact is associated with significant increases in workers' sense of autonomy in Japan. Supervisor contact was also felt to be significantly more 'controlling' by workers in the US compared to their Japanese counterparts (Lincoln and Kalleberg, 1990: 90).

The Challenges Facing Japanese and US Lean Production

Although we have argued that the Japanese version of lean production is relatively more efficient than the US version, recent pressures on the Japanese model suggest that it too could be subject to similar

problems of labor cooperation in the future. The most important of these recent pressures is the threat to the system of lifetime employment. Greater functional flexibility in the use of labor – that is, a greater ease of hiring and firing – is a competitive advantage in a world of rapidly changing product design and changing international division of labor. Japanese firms are aware of how lifetime employment security hampers their ability to be flexible in this way. However, to the extent Japanese firms begin to dismantle the system of lifetime job security, workers may feel a rising sense of injustice in the distribution of rewards from production, and a crisis of labor cooperation may emerge.[9]

With regard to the US, the challenge is clear. Addressing the feelings of injustice and illegitimacy that many workers currently possess regarding the lean production model will require the adoption of better mechanisms for worker voice. The evidence that workers want a greater voice in workplace issues is clear and compelling. Moreover, there is evidence to suggest that some transformed workplaces – Saturn, for example, and perhaps others in the so-called 'high performance' model – possess better mechanisms for worker voice. The US must find institutional arrangements that extend such mechanisms to the lean production workplaces, where the goal should be greater worker cooperation with management through improved worker voice in production.

Notes

1. According to Kato and Morishima (1995), the majority of firms answering their survey (53 percent) had non-union employee associations. Eighty-one percent of firms without unions had employee associations, whereas 48 percent of firms with unions had employee associations (Kato and Morishima, 1995: 8).

2. Japan's Labor Standards Law requires employers to clearly state for employees the rules governing wages, hours and other conditions of employment (Gould, l984). This often takes the form of a formal set of Rules of Employment for all employees, which the law obliges employers to arrive at in consultation with a union or, in cases where a union does not exist, a majority of the plant's workforce. To the extent disputes concerning the employment relation arise, it is generally the Rules of Employment to which parties refer for a statement of mutually agreed upon rights and obligations. Collective bargaining agreements often appear as an appendix to the Rules of Employment.

3. A recent survey conducted by the Ministry of Labor (1998) revealed that 78.1 percent of the labor unions answering their survey reported possessing joint labor–management committees (JLMC) at their establishments. An earlier survey

from the Ministry of Labor (1994) showed that among large firms, those with 1000 or more employees, 88.4 percent reported having JLMCs, while 63.3 percent of firms with fewer than 1000 workers had JLMCs.

4. According to the Ministry of Labor (1994), 69.6 percent of establishments with 5000 workers or more have small group activities including quality circles. The equivalent figure for establishments with 1000–5000 workers is 60.8 percent.

5. Some studies (Delbridge and Lowe, 1997; Shibata, 1999) show that this is a not universal practice among immediate supervisors. There are established cases of supervisors supervising workers in a coercive way and tending to identify themselves with upper management.

6. We do not wish to suggest that the working conditions of semi-skilled workers in Japan are ideal. They impose a heavy workload on workers, and dissatisfaction with this workload is reflected in significant rates of worker quits, especially among newly hired workers. Approximately 20 percent of new operators at the Toyota Motor Company, for example, leave within the first year. Moreover, the number of operators who quit in 1991 was four times that of 1985 (Shi, 1994).

7. Productive efficiency is not the same as productivity, but rather refers to a situation in which a firm is on the frontier of a relationship depicting the maximum possible benefits to the various stakeholders in production (e.g. productivity for capital owners and safe work for workers). A firm may be productively inefficient but profitable if it can provide workers with poor working conditions without being forced to compensate them monetarily. See Fairris (forthcoming) for a fuller description.

8. Problems of increased repetition, shorter recovery time (either breaks per shift or idle seconds per cycle), and excessive force have been confirmed by ergonomists as contributing causally to an increase in CTDs (Armstrong, 1986; Putz-Anderson, 1988).

9. Lifetime employment guarantees in Japan are not based in labor law, but rather are a form of implicit contract or norm among employers and employees. The current economic conditions in Japan are putting great pressure on employers to alter this system of employment guarantee. Imada (2000) suggests that there is a new breed of workers who value meritocracy, and for whom the notion of guaranteed employment is anathema. However, there remains strong support among firms for maintaining lifetime employment practices (Japan Labor Institute, 1998), and, despite the emergence of a new breed of worker, the majority of workers still look favorably upon lifetime employment guarantees and seniority-based wage systems (Imada, 2000).

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