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The Evolution and Transplantation of Toyotism

The development of the Japanese auto industry in the postwar period is exceptional in industrial history. At the end of the Korean War, in 1953, the Japanese companies manufactured a mere 50,000 cars. By 1960, the figure had increased tenfold, to nearly half a million. By 1970, it had gone up another order of magnitude, to 5 million. The 11 million mark was passed in 1980, making Japan the world's number one auto manufacturer. The level of productivity of the Japanese companies reached that of the American firms as early as the mid-1960s, and shortly after the Japanese passed them by. By the 1970s, the Japanese automakers were setting new world standards of quality as well.

The leading Japanese companies long pursued a "VW line," meaning that they concentrated on a few basic models that they manufactured year after year with incremental improvements. The companies concentrated their resources, as Ford had in the teens, on the development and fine-tuning of the production process (see Cusumano 1985). In the 1980s, however, the Japanese also took the lead in product development in the auto industry. Investment in research and development rose much more sharply than in Western Europe and the United States. Measured by the number of company patents approved in the United States in 1985, Toyota, Nissan, and Honda, in that order, led both their American and European competitors.¹ The rule of the strong yen, which was institutionalized by the Plaza agreement in 1985, reinforced the Japanese automakers' commitment to product upgrading and unleashed intense domestic competition to introduce new models and features. In the five years from 1982 to 1987, Japanese automakers introduced more than seventy new models while U.S. manufacturers released only about twenty and the European firms about forty. The Japanese firms succeeded in combining high manufacturing productivity with efficient design processes,

which, compared with their American and European counterparts, dramatically reduced resource consumption, as measured by the number of engineering hours spent on the development of each new product.²

Some years after Japan had become the world's largest car producer and exporter, internationalization of production was begun. After a cautious start, the pace accelerated in the mid-1980s with the establishment of a growing number of transplants, principally in North America.

In this chapter, I shall first summarize some of the main features and conditions of the paradigmatic production philosophy of Japanese auto manufacture — the Toyota system — as it was developed in Japan during the 1950s and 1960s. I shall also relate Toyotism to Taylorism in three respects: work process and labor deployment, the managerial structure, and the employment relation. In the next section, the focus shifts westward, to the Japanese transplants in North America and the United Kingdom. My purpose is to analyze the preconditions for the impressive success of these factories, which are the principal exponents of lean production in the Western world, and to examine the nature of work in these plants. I devote special attention to four issues: skill development and qualification requirements (multitasking or reskilling), JIT control and worker autonomy, the nebulous meaning of teamwork, and the problem of physical strains and work hazards.

Rise and Defeat of the Independent Unions

When the Japanese auto industry began to expand under heavy state protection after the war, the production system of the American car industry was the reference point. Both the product and labor market conditions in Japan were very different, however, from those in the American car industry. For one, there was much less room for mass production than in the United States. Volumes were radically lower; in 1950, for instance, thirty thousand vehicles were produced in all. This was the equivalent of one and a half day's production in the United States. For another, the Japanese companies had a wide product spread; indeed, the auto firms had begun as manufacturers of light trucks. Moreover, the economic resources of the companies and the purchasing power of the home market were very limited. It was therefore necessary for the car manufacturers to adapt American methods to fit the efficient manufacture of lower volumes and, despite limited resources, to be able to expand. The crushing defeat of independent Japanese labor unions after a number of dramatic conflicts in the early 1950s gave the auto companies the opportunity to develop just such forms of low-cost rationalization.

After the war had ended and the Americans had forced democracy on Japan, the labor movement enjoyed an enormous upswing. Trade unions mushroomed in virtually all sectors of society, so that union density rose from almost zero in

the autumn of 1945 to more than 40 percent one year later. Most of the new unions were organized as enterprise unions and comprised both blue- and white-collar employees. Japanese workers were eager to unionize in this feverish period and, as Haruo Shimada has noted (1988), enterprise unionism seemed to be the easiest and most practical way for them to achieve this goal. In the prewar period, before the authoritarian rule of the 1930s, Japanese workers had put forward three broad demands. The first demand concerned job security. The second concerned predictable and secure wages instead of the more prevalent output pay, which was considered capricious and unreliable. The third demand focused on the discrimination and segregation in Japanese firms, where workers were not treated as “full members” but often experienced scorn and a painful lack of respect from management.³

This “program” was aggressively revived by the postwar unions. After a series of major strikes in 1946 to stop management plans to fire workers, firms across the country were forced to announce “no-dismissal” pledges. During the war the government had prodded companies to introduce predictable and stable wages in the form of seniority (*nenko*) systems. The unions perceived this as a fair and objective basis for remuneration, and after the war the *nenko* principle was diffused further, despite management desire to eliminate it. At the same time, formerly pervasive divisions between blue-collar workers and white-collar staff were largely eliminated and workers gained “full citizenship” in the enterprise community. Moreover, in many companies unions also gained a strong influence on shop-floor practices and labor deployment.

For management, the strength of radical labor unions on the shop floor represented an intolerable loss of control. A determined counteroffensive was launched with the support of the American occupation authorities, which in the wake of the Cold War increasingly stressed the importance of Japan as a strong and stable ally. The pattern was set during a five-month conflict at Toshiba in 1949, which Andrew Gordon (1990:248) summarized as follows: “In a tactic that has since been replicated hundreds of times, the company refused to bargain with the existing ‘first union’ or to renew its contract, while it simultaneously identified a core of cooperative workers willing to lead a ‘second union’. The latter repudiated the oppositional stance of the first union, accepted some dismissals, restrained its wage demands and supported management efforts at ‘rationalization.’ ”

Workers in the auto industry had first been slow to participate in the general labor advance, but eventually a strong union developed at Nissan that took the initiative to form a national union of auto workers. Japanese business leaders considered this development very dangerous. In 1953 Nissan management, with determined backing from commerce and industry, found the time ripe for a showdown. The struggle concerned power on the shop floor, where Nissan’s

union had, through its shop committees, called into question the right of the company unilaterally to order overtime and reassign labor.⁴ But the struggle was also about a basic principle of unionism, Was there to be a cohesive national industrial union or a system of company unions closely connected to company interests?

In a series of strikes and lockouts in 1953, the union at Nissan was crushed and its leaders were fired and a new “second union,” loyal to the company, was formed. These events were a death blow to the national auto workers’ union, which was dissolved in 1954. In sharp contrast, in the 1950s and 1960s, auto unions in Western Europe and the United States became increasingly powerful national organizations.⁵

The defeat of the independent trade union movement in the Japanese private sector had three important consequences: First, the companies got a free hand in matters of shop-floor organization and the supervision and utilization of the work force. Second, the defeat contributed to the critical lack of a social force capable of carrying out a general social welfare policy, as in Western Europe, or national contracts, as in the unionized sectors of American industry. Thus, employees’ security, income development, and social benefits came to be wholly dependent on the company for which they worked. Third, small companies (up to one hundred employees) came to lack a union organization almost entirely. This helped strengthen the industrial dualism—the extremely large differences in wages and employment conditions between big and small companies—that had already existed before the war. This dualism became a very important aspect of the total structure of Japanese auto production.

In large companies, several early postwar gains were retained, albeit in a more restricted and controlled framework. These included job security for the core (male) work force, the seniority-based wage system, and the policy of treating blue- and white-collar workers equally and with respect. Thus, management’s espousal of common goals and joint efforts to increase productivity was endowed with enough legitimacy in the eyes of most workers to become the long-term basis for cooperative labor relations.

The Toyota Revolution

The restrictions of the product market and the possibilities for management posed by the defeat of industrial unionism were the basis for the Toyota Revolution of the 1950s and 1960s. This new way of organizing production, materials, and suppliers came to set the norm for all Japanese auto firms. As at Ford, the Toyota system developed in a process of trial and error. The individual features were often not unique in themselves, but in their entirety they became a new production matrix. Demands for far-reaching economizing in the use of materials and workers

formed the departure point for this revolution. Taichi Ohno, a key figure in Toyota's production development during the 1950s and 1960s, met these demands with new methods.⁶

Manufacturing in the smallest possible batches replaced the American philosophy of "optimal batch sizes." New materials-control methods, the *kanban* system, and JIT deliveries were developed to manage this small-batch production. "Inventoryless" manufacturing gradually became an overall method for streamlining processes and the flow of materials. Several important consequences followed.

One consequence was that setup times had to be reduced, which led to dramatic reductions in changeover times. At the start of the 1970s, after fifteen years of systematic work, Toyota could reset its press lines in three minutes, compared with three hours before 1955 (Cusumano 1985:284–85).⁷ (The Western car industry still needed several hours in the early 1980s.)

As a consequence of the ever smaller buffers between different manufacturing steps, the production process became ever more sensitive to disturbance. Manufacturing quality, expressed as the goal of zero defects in every stage, therefore played a central role beginning in the 1960s. The export offensive following the oil crisis of 1974 further underlined the role of quality. As in many other areas, Toyota seized on methods developed in the United States but applied them far more rigorously.

Furthermore, small-batch manufacture led to the need for a highly flexible work force, with rapid and frequent relocation of personnel according to the production needs of the moment. To ensure such flexibility, Toyota invested heavily in work simplification, as Ford had done in the teens: As Shigeo Shingo noted in *The Toyota Production System* (1981:132), "This [flexible capacity] requires that the machines be developed and simplified, so that a new operator can perform the job independently after three days' training."

The principle of the minimum use of materials in work had its equivalent in least possible staffing. In the late 1940s, Taichi Ohno introduced the rationalization of cycle times on the assembly lines and multimachine tending in the machine shops. During the 1950s, each operator had an average of five to ten machines to tend; this principle was further extended during the 1960s and 1970s.

The principle of least possible staffing also had as a consequence that routine inspection work was integrated into the production line as the responsibility of the operators and foremen. As with the reduction of setup times, this no-fault policy led to new means and methods for avoiding unintentional mistakes, for example the *poka-yoke* principle, incorrectly translated as "fool-proof devices" [Shingo 1981:132]. But cycle-time rationalization, multimachine tending, and the integration of inspection work also contributed to greatly heightened work intensity. The absence of union-imposed limitations, in the form of ceilings on

line speeds and staffing, played a central role in this connection. In an interview with Cusumano, Ohno conceded that “workers hated this and the technique of operating several machines at once. . . . Had I faced the Japan National Railways union or an American union I might have been murdered” (Cusumano 1985:306).⁸

Ohno succeeded in controlling the Toyota union, however, by using a mixture of methods: on the one hand, management threatened to dismiss recalcitrant workers; on the other, workers were promised long-term job security. Like many other large firms, Toyota was also able, as Gordon has emphasized (1990:250), to show “real creativity in building on the notion, rooted in the practice of the early post-war era, that blue-collar workers were full members of the enterprise, and they involved these men in self-directed (though circumscribed) endeavors to improve morale and raise output.”

Another central feature of Toyota’s production system, which originally arose for purely economic reasons, was the strategic decision, made in the 1940s, to refrain from vertical integration. As great a share as possible of components manufacture was assigned to suppliers (*sh’tauke*), which were closely associated with Toyota but economically independent. This required great efforts in the 1950s and 1960s to streamline the quality and delivery systems of these suppliers. In return, Toyota was able to expand during these decades, using much smaller investments than would have been required otherwise. Moreover, the much lower wage level of the small *sh’tauke* could be exploited in carrying out severe cost cutting.⁹

Toyota’s suppliers were organized hierarchically in a veritable production pyramid. A few, relatively large firms were responsible for a complete function and delivered directly to Toyota. These in turn had a considerable number of parts suppliers connected to them, which often engaged even smaller firms for various subjobs.¹⁰ During the 1970s and 1980s, many of the suppliers on the first and second levels could — in step with Toyota’s expansion and ever more developed products — become advanced components firms with extensive research and development.¹¹ By contrast, at *sh’tauke* on lower levels, low wage costs and high flexibility (with no lifetime guarantees for employees) remained essential competitive advantages.¹²

At Nissan, management did not enjoy the same position of power as at Toyota — even after its victory over the union in 1953. Thus, work could not be made as intensive. One expression of the differences between Toyota and Nissan, and between the Japanese and American manufacturers as well, was labor’s share of the value added. In 1980, after thirty years of nearly unbroken expansion, this share was but 46 percent at Toyota, whereas it was 85 percent at Nissan and 87 percent at Ford.

Toyota’s capacity to achieve major increases in productivity in a “mature”

industry without any technological innovations in either products or processes is indeed striking. This feat was achieved through extraordinary and incessant attention to shop-floor practices — work simplification, machine setup procedures, quality-control methods, and materials ordering. But why this attention, and why did it happen in Japan?

In a provoking analysis, Alice Amsden (1990) has pointed to the importance of Japan's character as a late industrializer to explain this phenomenon. In Britain, industrialization was based on *inventions* realized by entrepreneurs in processes of trial and error, whereas in Germany and the United States *innovations* emanating from systematic problem solving and the application of science were the driving force. In contrast, Japan, like other late industrializers such as Korea, based all of its industrialization on *borrowing* technology, which meant that even leading firms had to wage competition without the aid of any technological advantage. Borrowing, or *learning*, is also a creative process but of quite another type and demanding other skills than the Western process of industrialization did. As Amsden emphasizes, in firms competing on the basis of making borrowed technology work, the shop floor tends to achieve a strategic focus. Thus, production engineers acquire a very important role, as well as strong social recognition. In Japan, as in Korea two decades later, this resulted in a particularly effective shop-floor management and in general in a markedly technical orientation within management.¹³ The shop-floor focus also resulted in a "Spartan regard" for staff functions as efforts were made to keep overhead costs to a minimum. This policy at Toyota — and at the Japanese manufacturing firms in general — was later followed by firms in Korea.

Small-Batch Manufacturing as the Basis for Flexible Mass Production

Does Toyotism represent an abandonment of the basic principles of mass production? A good deal of confusion exists around this question, often because *production in small batches* is confused with *short total production runs*. Shingo, an expert on Toyota's production methods, rejects the idea that the Toyota system is "the antithesis of the philosophy of mass production upon which American industry had been founded." He points out that Toyota, "with its Corolla, broke the world record for the number of vehicles produced of one and the same type." Moreover, he emphasizes, "the question in this area is not whether or not to mass produce, but whether to produce *large or small batches*" (my emphasis) (1981:110ff).

The Toyota executive made having small inventories a priority and chose therefore to concentrate on small-batch manufacturing. The object, however, was to produce the highest possible cumulative volume of each product. Long total

runs were (and are) decisive for carefully preparing the manufacture of each part; standardizing tools, methods, and operations; streamlining suppliers; and developing the JIT flow. As Shingo points out, “It cannot be said the Toyota system is the antithesis of mass production; it is, on the other hand, the antithesis of large-batch manufacturing” (1981:112). In short product runs, tools and methods contain unique features for each manufacturing order and the prospects for standardization and bureaucratized control are extremely limited. By contrast, in the small-batch manufacture of long-run products, the same tools and methods are used a great many times. Flexibility is a matter of switching quickly between a number of standardized models — of retooling from model A to model B, for instance. The high frequency of such switching in the Toyota system has also meant that “resetting work” could itself be standardized and intensified. It has become part of the highly rationalized system of mass production. In Western long-run manufacture, switching has been a low-frequency, craft-type work, very different from the repetitive operations in production. The Toyota system’s flexibility of mass production can thus be said to represent an extension of the sphere of influence of scientific management.

During the 1980s, these methods, which were originally developed to cope with quick switching between batches within the framework of long production runs, increasingly came to be used to enhance the capacity to break in new models. In the event of automation, moreover, the Japanese companies have, to a considerably higher degree than their Western counterparts, installed convertible rather than dedicated equipment. Combined with a highly efficient process of product design and an increasingly dynamic network of suppliers and assisting firms, this has enabled Japanese automakers to reduce their break-even levels for each single product. During the 1980s, the Japanese companies on average produced 120,000 units per year and model, compared with more than 200,000 for the European and American firms. The total runs (or accumulated volume) per model was also much lower: 500,000 for the Japanese models, 1.8 million for the European, and 2.1 million for the American (see Jones 1989).

Toyotism as a Complex Extension of Taylorism

Many analysts have claimed, in common with the authors of *The Machine That Changed the World* (Womack, Jones, and Roos 1990), that Toyota’s personnel policy and production management amount to a fundamental break with Taylorism. This is misleading in several ways. I shall use Craig Littler’s breakdown of the Taylorist approach (1978) to analyze this question: organization of the work process: minute division of labor, high degree of predetermination, standardization (“one best way”), and control; managerial process: a high degree of division of tasks and functional specialization; personnel policy and company-employee

relations: a “minimum interaction model” marked by an individualistic and economic approach. In regard to these three features, Toyotism entails a complex combination of continuity and change.

Highly Standardized Work

The work process in Toyota’s production system has a short-cycle, highly repetitive structure throughout. Assembly takes place on machine-paced lines in which there are short instruction times, and training takes place directly on the job. It takes a couple of days to a week to learn what is necessary. Standard operations sheets prescribing movements and times are used at each work station. New operators are trained and performance is judged on the basis of these timetables. As Shingo notes (1981:151–52), “The standard operation sheet is accordingly an important instrument for reaching Toyota’s goal of being able to train new operators to perform the job independently after three days. . . . At Toyota it is insisted that the standard time be held to. . . . If deviations occur, the first question is if the operator’s movements depart from the standard.”

Work standardization is important in increasing work intensity, as Shimizu emphasizes: “In order to eliminate parasitism and superfluous work motions, a thorough standardization that can be immediately understood and observed by everyone is necessary. In order to promote standardization complicated work tasks must be avoided as much as possible and work simplified. . . . When work itself is simple and repetitious, it is easy to identify parasitical and superfluous persons (oneself included)” (quoted in Dohse, Jürgens, and Malsch 1984:17).

The labor process in the Toyota system is thus designed according to classic Taylorist principles. At the same time, inventoryless small-batch production requires a work force that is not highly specialized but rather is capable of performing a number of different tasks. These different tasks, however, are mainly variations of similar simple jobs (three days’ instruction time for production work is, as mentioned above, a general goal at Toyota). According to Eishi Fujita (1988:6), the reassignments often entail heavy burdens: “Transfers to an unrelated working position, mostly to a simple one everyone can do, does not make workers able to utilize their abilities and it is a heavy burden to them.”

Representatives of the Swedish Metal Workers’ Union were especially interested, during a visit to Japan in 1989, in the prospects for training in the auto industry. Their report revealed a great gap between the image of continuous learning for everyone in Japanese work life and the reality on the shop floor. Investments in advanced training could only be found in highly automated sections. In the case of such manual jobs as those on Nissan’s assembly lines, the training consisted of a short introduction to the company plus workplace training

lasting a total of two weeks. In the case of partly mechanized processes, such as the manufacture of electrical fans, a select few (about 2 percent) were trained each year in maintenance work. Because absenteeism was so low, the company saw no need to train more of its employees. In general, the workers' prospects for training were closely linked to advancement in the shop-floor hierarchy. Advanced training was reserved for workers who were promoted, as in traditional Western organizations (Grehn and Pettersson 1989:14). As I will explain, the difference is that the promotion system is much more comprehensive in Japan.

The feature of the Japanese production system perhaps most often associated with a different and broader way of utilizing personnel is that workers and foremen continuously offer suggestions for improvements. Rationalization activities (so-called *kaizen*) are not reserved for engineers but are the responsibility of everyone. The vertical hierarchy and managerial prerogatives have not been changed, however. Workers are encouraged to offer proposals for rationalizing standard operations by improving quality and productivity, but management exclusively makes the decision to change methods—precisely to ensure that operations remain standardized. At the close of the 1960s, it became mandatory at Toyota to attend quality circles and suggestion meetings; management set quotas, and the workers' success in fulfilling them was an important factor in the determination of the yearly bonus (Cusumano 1985:357).

It is certainly true that scientific management has not traditionally included making large-scale use of employees' suggestions for improvements to enhance performance, but this is not because the use of such methods would have contradicted the goals of scientific management. On the contrary; Frederick Taylor's follower Frank Gilbreth, for example, considered it crucial that the operators cooperate in developing the standard methods. No means were available for eliciting such cooperation, however. Instead, Taylor saw that workers used their skills to resist increasing performance demands. *Kaizen* is not based on there being a differently designed work process but rather a distinct employment relationship that includes novel forms of labor deployment and career systems.

In an analysis of the Toyota-GM joint venture NUMMI in California, Paul Adler (1991:59, 80), in contrast to other proponents of the Toyota system, stresses the intense bureaucratization and Taylorization but only to perform a reanalysis (or "revisionist reading") of both phenomena. There are different forms of bureaucracy, he argues. The traditional form, associated with Max Weber's famous "iron cage," is the "compliance bureaucracy." In contrast, NUMMI and the Toyota system represent a "learning bureaucracy," where the most intensely bureaucratic procedures "appear to serve the purpose of organizational learning." As for Taylorism, Adler distinguishes between the technical dimension—division of labor, standardization, and so on—and the social dimension of authority and control. In NUMMI, he asserts, "technical Taylorism" plays the central role,

while the social dimension is democratized: “Taylorism can be oriented towards learning rather than social control if workers participate in the definition of the rules that govern their work, or the organization has some other way of assuring that the rules will reflect a shared understanding of the technical requirements of the job” (Adler 1991:63–64).

The designation of the Toyota model as a learning bureaucracy is pertinent and important in that it captures how the dynamics of the Japanese production system challenge and transcend our traditional understanding of some fundamental organizational concepts. Unfortunately, this quality of the overall system does not alter the utterly repetitive and fragmented character of the jobs or explain why the alleged democratic version of Taylorism is everywhere combined with such intensification of work and line speed.

Dense Management and Flexible Labor Deployment

Compared with the management structure of Fordism, the Toyota system’s managerial organization is marked by a complex combination of continuity and innovation. When the Ford system was developed at Highland Park in the teens, it created the conditions for (and required as well, because of its high sensitivity to disruption) a considerably more extended system of managerial control than had characterized earlier forms of industrial organization. The Toyota system is even more dependent on comprehensive control and to a corresponding degree has a broader management structure. The position of foremen (*kumichō*) on the shop floor is extremely important. Foremen distribute tasks, choose work methods, determine operation times, assess employees’ attitudes and efforts, and determine wages and advancement possibilities on the basis of the carefully worked-out system for individual evaluation. The union has no influence over either performance standards or individual wages. Further, in Japan, the foreman is also usually the union representative. Finally, the workers are organized in groups led by subforemen (*hancho*), which further strengthens the role of first-line management.

On the one hand, Toyota has not followed Taylor’s ideal of having a highly specialized managerial apparatus with “functional foremen.” On the other hand, production and shop floor management is even more densely staffed. In the early 1980s, for example, there was one subforeman for every five workers, one foreman for every fourteen workers, and one senior foreman (*kōchō*) for every forty-three workers. Thus, for every forty or so workers, there were eight subforemen, three foremen, and one senior foreman (Fujita 1988:20). This dense managerial structure plays a critical role both in avoiding disturbances and in mobilizing workers in rationalization activities.

Personnel Evaluation

The capacity to mobilize workers in the never-ending effort to increase productivity is closely linked to the career system and individualized personnel evaluation. In large firms, all regular employees, blue collar as well as staff, are normally classified in a grade or status system (*shokunoshikaku*). If, for example, a firm has ten different grades, workers entering the firm after junior high school start at grade 10, workers with a senior high school education at grade 9, and university graduates at grade 8.¹⁴ During their first years of employment, new hires in a certain job category all stay at the same grade level.

Advancement is linked to length of service, but depending on ability and attitude, employees enjoy different promotion speeds and reach different end positions. The promotion system is not directly linked to the organizational hierarchy, however. For example, Koshi Endo (1991) found that at one firm there were seven different status levels for production workers, from SS1 to SS7. Subforemen were selected from workers in the SS5 or SS6 category, while first foremen were appointed from workers in the SS6 or SS7 status. Consequently, there were workers with SS5, SS6, and SS7 status who were neither foremen nor subforemen. The same was true of white-collar employees.

Status is linked to one's wage, but within each grade there may be substantial individual differences. Decisive for an individual's promotion speed as well as for his wage within the grade is the personnel evaluation system (*satei*). Normally, every employee is evaluated once a year by his immediate superordinate, and the results are then checked by managers at one or two more levels.¹⁵ The items evaluated have nothing to do with the work assignment. Thus, the system focuses on the capacity of individuals, not actual work requirements. The assessment includes objective factors such as performance but above all a range of subjective factors, such as an employee's eagerness to perform his job, his attitudes as a team member, and his potential ability to perform jobs more effectively. As a result of this practice, employees are highly dependent on the evaluations of their superiors. This was not the case in the original *nenko* (seniority) system, which the unions pushed for after the war as an unbiased and equitable system of wage setting. During the labor shortage of the 1960s, however, young and diligent workers grew increasingly impatient with their low starting wages and the slowness with which they were promoted. At the same time, management, which never was very happy with the strict seniority order, wanted to introduce more individualized methods of evaluation to increase its control. The result was the development of the *satei* system, which was superimposed on *nenko* principles and rapidly spread through the entire industry.

The focus of the wage and promotion system on individuals instead of jobs

and positions makes the organization very flexible both at the shop floor and in the vertical management structure. While the work process is minutely standardized and rigid in terms of rules, procedures, and cycle (*takt*) times, labor deployment is elastic and worker treatment personalized. The system also fosters intense competition among rank-and-file workers (as well as among white-collar staff) over *satei* scores, with the result that there is a tendency for workers to comply and obey unquestioningly. According to Endo, this is especially true at Toyota: "The case of workers at Toyota is famous as one of the most extreme and Toyota workers are often disparaged in Japan for their lack of individual personality" (1991:13).

Furthermore, the *satei* system makes it difficult for employees to refuse overtime work or take off paid holidays, since such actions are assessed as evidence of a poor attitude. In the same way, the evaluation practice renders it hard for workers to decline to participate in nominally voluntary activities outside of working hours.

From Minimal to Maximal Interaction

The Fordist company-employee relationship was characterized by carefully defined tasks, relatively short and demarcated work times, and strictly economic compensation of employees. This was a highly productive combination at the time of the onset of mass production. The results, however, were instrumental work attitudes and little motivation to work. The Japanese model, by contrast, elicits "maximal commitment" from the regular, permanently employed work force.¹⁶ The differences between these two relationships manifest in several ways.

First, work effort in Japan is regulated not by the job descriptions of individual employees but by the norm of "unreserved commitment to the company." This manifests as a constant readiness to be reassigned within and between sections and shops (Deutschmann and Weber 1987:32).

Second, the company's core employees have job security and "lifetime employment," in glaring contrast to American firms' hire-and-fire practices.¹⁷ A by-product of the Japanese companies' obligation, which became especially palpable after the oil crises of the 1970s, is extremely narrow regular staffing. In the mid-1980s, Japanese car companies planned their staffing based on a rate of absenteeism of 5 percent, including vacations.¹⁸ The severe demands for attendance arose not just from economic motives. They were also very important for maintaining "total commitment" and reinforcing work as the central life activity of the employees.

Third, the total work time in Japan is very high. In contrast to developments in the West after the war, it has stayed high despite very impressive rates of productivity. In 1986, a regular year's work time at Toyota was 1,990 hours and

the average overtime was 370 hours, for a total paid work time of 2,365 hours (Fujita 1988). To this should be added various “voluntary activities.” By comparison, in 1988, the average work time in the engineering industry was 1,580 hours in Germany and 1,500 hours in Sweden.

The number of used vacation days was about six days for the leading Japanese auto companies in 1985. Absenteeism on other grounds was one day per employee on average. At Toyota, the employees made use of only 26 percent of their vacation days, at Mazda 24 percent, and at Nissan 34 percent. One reason for these low rates was the narrow staffing policy (Jürgens 1986).

Fourth, work times in Japan lack clear boundaries, just as work tasks do. Employees are expected to prepare the work and put their machines in order before the work day formally begins. Likewise, they are expected to stay after the work day has ended to participate in quality circles, for example. The remaining leisure time for male employees is often taken up with activities such as training, company outings, corporate exercise, and gatherings with colleagues and superiors.

One consequence of this “unlimited” employment relationship is that it does not suffice for the individual to do “his job” well. In the intense competition over individual wages, bonuses, and chances at promotions, the worker’s overall time and work commitment — work attendance, readiness to work overtime, participation in group and leisure activities, proposals submitted — play an extremely important role.¹⁹

Traditionally, the reaction of the working class to rationalizations has been characterized by spontaneous self-defense against what the Norwegian sociologist Sverre Lysgaard has called “the technical/economic system’s insatiable, inexorable, unilateral demands” (1976:73). The extensive literature on “output restrictions” in American industrial sociology and economics indicates the significance of this behavioral pattern.²⁰ It was on account of this pattern that Taylor insisted on a sharp distinction between conception and execution. This was also why he argued in favor of an individualistic approach; in his view, workers in a group would inevitably reduce their efforts to the lowest common denominator. In other words, Taylor saw no possibility of controlling and molding “the gang” in accordance with the company’s values and wishes.

The maximal employment relationship of Toyotism entails turning this pattern upside down. By means of a far-reaching integration of employees in the technical and economic system, based on the employees’ dependence on the company as well as the promotion and personnel evaluation system, tendencies toward collective worker action — in Lysgaard’s sense — are eliminated. “Spontaneous” cooperation between workers and management is thereby ensured. This cooperation is a necessity in Toyota’s synchronized and integrated production process, where even trivial mistakes can have far-reaching consequences. The

inventoryless and minimally staffed manufacturing system means the consequences of disruptions in production fall directly on the workers. Production quotas are usually constant, regardless of disturbances or absenteeism. This leads, as Richard Schonberger has noted (1982:61), to a situation in which “workmates put each other under a massive moral pressure” to turn in a good performance.²¹ Peer pressure in the work group is thus a functional part of the production-control system. To use Lysgaard’s words, the group organization of the Japanese production system, instead of constituting a defense against the “technical/economic system’s insatiable demands,” plays a role in enforcing these demands.

Japanese Transplantation

In the United States, the second oil shock of 1979 was followed by a deep crisis in the auto industry and rising unemployment. From 1978 to 1982, U.S. production of automobiles dropped from 13 to 7 million. Several studies showed a productivity ratio between the United States and Japan of 1:2 (see Altshuler et al. 1984). GM invested in a technological strategy, in the hope of catching up with the Japanese by means of a great leap in automation. This failed, however, as demonstrated by the inefficiency and low quality of the new high-technology plants, such as Hamtramck-Poletown in Detroit.

Coincidentally, while the American car industry was in crisis, the Japanese companies began their efforts at internationalization in earnest. Nissan and Honda led the way in establishing U.S. manufacturing facilities, initially with a low profile and small impact. The turnaround came in 1986, when Toyota demonstrated, with its NUMMI factory in California (co-owned with GM), that it was possible to reach Japanese productivity levels in an area where GM’s factories had failed dismally.

NUMMI became the success story of the year and aroused an enormous interest in the American auto world. The Japanese companies expanded rapidly after this; in 1990, they had ten assembly plants in the United States and Canada, with a total production of 1.7 million cars and light trucks. According to calculations carried out in 1987–88 in MIT’s International Motor Vehicle Program, productivity in these factories—defined as the time required to perform a number of standard operations in body manufacturing and assembly—was nearly the same as in the plants in Japan; namely, 40 percent higher than in American-owned factories in the United States, and nearly twice as high as in European-owned plants (Krafcik 1988).²²

The Japanese transplants also had much higher levels of quality than the American and European plants. This success was particularly noteworthy in that no other country’s car companies had succeeded in preserving their American plants. The Europeans, who on the surface had better prospects, had failed to

establish themselves in the United States. Volkswagen, the last remaining European transplant in the United States, had a worse and worse time making it in the 1980s. It drew the necessary conclusion in 1988 and discontinued its U.S. manufacturing operations. (An overview of the Japanese expansion in North America is presented in table 2-1.)

The establishment of Japanese auto companies in North America was followed by that of hundreds of Japanese suppliers. According to a 1990 study by the Office for the Study of Automotive Transportation at the University of Michigan, there were more than three hundred large or medium-sized Japanese-owned supplier transplants in the United States alone.

The Japanese auto companies have chosen Great Britain as their base for expansion in Europe. Nissan has been one of the pioneers, as it has in the United States. Production on a small scale began in 1986 in Sunderland, in England's crisis-stricken Northeast. Three years later, the output was 50,000 vehicles per year; the objective was to reach 200,000 in 1992. At the close of the 1980s, both Toyota and Honda revealed plans to follow Nissan and to make 200,000 and 100,000 cars per year, respectively, in Britain during the 1990s.

Japanese suppliers have also moved to Britain. According to Stuart Crowther and Philip Garrahan (1988), Nissan in Sunderland has sought to reproduce exactly the social and material conditions that have given the company total control over the production process in Japan. For example, by concentrating suppliers near the plant and on land owned by Nissan, the company gained decisive influence over these firms, especially regarding their product development, pricing policies, and industrial relations.

The establishment of Japanese production in the West has in some sense demystified the Japanese management system. Earlier, these companies' successes were ascribed to unique features of the Japanese culture. The growing number of Japanese auto plants in the United States and Britain has shown, however, that key elements in Japanese management and production philosophy can indeed be transplanted. At the same time, new opportunities have been created to investigate working conditions under the Japanese system. Much has been written about Mazda, Honda, and Nissan, in both the United States and Britain. The larger part of this material has a journalistic character, however; scientific studies are still in their infancy.

Rigorous Personnel Selection

The various transplants are similar in several ways. All of them manufacture Japanese products: many critical components are produced in Japan. This is true even of the joint ventures between Japanese and American companies, such as NUMMI. Insofar as local suppliers are used, they are required to satisfy much

TABLE 2-1. *Auto Transplants in North America, 1990*

<i>Company</i>	<i>Location</i>	<i>Year started</i>	<i>Production (1,000s)</i>	<i>Production planned (1,000s)</i>	<i>Planned employment level</i>
<i>United States</i>					
Honda	Marysville, Ohio	1982	430	510	8,000
Nissan	Smyrna, Tennessee	1983	240	440	5,100
NUMMI (Toyota and GM)	Fremont, California	1984	200	300	3,400
Mazda	Flat Rock, Michigan	1987	180	240	3,400
<i>Diamond Star</i>					
(Chrysler and Mitsubishi)	Normal, Illinois	1988	150	240	2,900
Toyota	Georgetown, Kentucky	1988	220	440	3,500
Subaru and Isuzu	Lafayette, Indiana	1989	70	120	1,700
<i>Canada</i>					
Honda	Alliston	1988	100	—	—
Toyota	Cambridge		60	—	—
CAMI Automotive (Suzuki and GM)	Ingersoll	1990	50	200	2,000

Source: Business Week, Aug. 14, 1989, and Automotive News, Jan. 7, 1991.

stricter demands for quality, frequency of delivery, and overall commitment than they have before.

With the exception of Nissan's plant in Tennessee, the design of the factories is very compact so as to achieve maximum utilization of space. The technical level is generally high. In the newer factories, for instance, transfer presses with extremely short setup times are standard. All the plants use mechanically controlled, high-paced assembly-line systems. The level of automation on the assembly lines varies. Mitsubishi and Chrysler's Diamond Star facility had more than one hundred assembly robots in 1990, but at other plants assembly is still almost completely manual.

The Toyota system is used at all the transplants, not surprisingly, most successfully at Toyota, in Kentucky. Nissan in Tennessee is somewhat of an exception; it is the most Americanized transplant in the areas of organization and management. Nissan, the oldest and for a long time the largest Japanese car company, has not wished to be Toyota's pupil and has only halfheartedly applied the techniques of its aggressive competitor.

An important cause of the transplants' high productivity is their extremely lean staffing, which assumes a very high attendance rate ("no-fault attendance policy"). To maintain this high rate, despite, for example, family problems (a large share of the workers at plants such as Mazda Flat Rock are women), social pressure and bonus systems are used. Regular disciplinary punishment is also employed and, as a last resort, dismissal.²³

Another feature, attested to by all visitors, is the high work intensity. The *kaizen* method and the *andon* system (the right to stop the line) mean there are no upper limits on performance. As in Japan, management demands total commitment from the employees. Accordingly, workers are often required to work overtime, on short notice, because of disruptions in the inventoryless production.

A basic precondition for this system is an intense personnel selection system. All the transplants received a large number of applicants when they were established, and they screened out a great many of them in an extensive selection process. It has been usual to receive thirty to one hundred applicants for each place. Those who are chosen are in many respects elite workers, both physically and mentally: young, strong, intelligent, well behaved, highly motivated, and inclined to cooperate.

Applicants who have worked in the American auto industry are not given special consideration; quite the contrary, they are judged to have a handicap. Further, applicants' formal educational background is not considered important. This, of course, represents a chance for individuals who did badly in school but who are nonetheless ambitious and have a will to succeed in life.

The screening process, as it was presented by Toyota's personnel director in 1990, is exceedingly rigorous (see Berggren, Björkman, and Hollander 1991). Applicants first undergo intelligence tests. The lower half are then eliminated. Next comes a dexterity test, and again the less gifted are taken out of the running. Then come tests designed to reveal the applicants' ambitions, initiative, and creativity. Group orientation and social skills furnish further grounds for selection. According to Toyota's personnel department, the result of this process is a worker who is aggressively oriented to performance, who is bent on being the best, and who wants to succeed in a career.

It would be a mistake, however, to identify the personnel practices at the transplants with the policies pursued by Japanese companies in Japan. For example, Japanese researchers visiting transplants tend to be surprised when encountering their egalitarian wage policy, since this is very different from the practice in Japan. An element that is still conspicuously missing is the personnel evaluation practice, the *satei* system, although nonunion plants, such as Toyota in Kentucky, are reportedly in the process of introducing some form of individualized assessment system.

Significance of Social Conditions

The transplants have been established in high-unemployment, somewhat rural regions where the workers enjoy few job opportunities. The wages are relatively high, often twice as high as in industrial jobs outside the auto industry. These fac

tors together have established the essential conditions for the new factory regime, including the possibilities for strict personnel selection and severe pressure for performance and discipline. The strategy of offering high wages combined with demands for maximum performance was recommended by Taylor as well, and Ford applied it with great success when he initiated his five-dollar day in 1914.

Mazda in Flat Rock, Michigan, and Toyota (NUMMI) in Fremont, California, established their operations in areas where Ford and GM, respectively, had had plants that failed. After twenty years of production in Fremont, GM closed down its factory there in 1982, putting six thousand people out of work in the process. According to Lowell Turner (1988:15), this plant closing and the ensuing loss of jobs “inaugurated a roller-coaster of dislocation and trauma” among the employees, who could not find jobs of comparable value in the region. With NUMMI, the well-paid industrial work returned. In a summary of the debate around the controversial factory, the *New York Times* concluded on January 29, 1989, that NUMMI was a place “where workers are thankful for their \$15-an-hour jobs—but live in constant fear of losing them. For many, the memories are still vivid of the low-paying jobs or unemployment they endured after G.M. shut the plant in 1982. That fear is what seems to motivate workers. . . . ‘We got a second chance here, and we are trying to take advantage of it. Many people don’t get a second chance.’”

When Womack, Jones, and Roos (1990) attempt to explain the success of the Japanese companies, they never mention a word about the social preconditions. The adaptation of the labor force, the discipline, and the low absenteeism are all exclusively the result, in their view, of the splendid qualities of the production system and of the confidence of the work force in the new management. The same policy is assumed to enjoy the same success everywhere, regardless of social and labor market conditions. It is interesting, therefore, to compare conditions within the same corporate group at different factories in different social environments.

The Swedish-owned household appliance company Electrolux is an international group with a traditional Fordist personnel and organizational policy that has shown scant interest in employee involvement. Why, then, do some of its plants have nearly Japanese-style personal data on their personnel? This question cannot be answered without taking into account social conditions. This is illustrated by table 2-2, which compares Electrolux plants in Sweden (Mariestad) and Great Britain (Spennymoor). (The latter plant is in the same region as Nissan’s facility in Sunderland).

Spennymoor differs from Mariestad with respect to the segmentation of the work force into those with permanent and those with temporary employment. The latter category can be as high as 20 percent of the work force at Spennymoor when orders are heavy. The insecure conditions of these workers strongly motivate the permanently employed workers to stand guard over their jobs in every way possible.²⁴ The technical level, moreover, is considerably lower at Spennymoor

Table 2-2. Personnel Data for Electrolux, 1989

<i>Data</i>	<i>Mariestad, Sweden</i>	<i>Spennymoor, Great Britain</i>
<i>Company</i>		
Short-term absence for illness	15%	5%
Other absences	13%	0%
Personnel turnover	25%	2.5%
<i>Labor market</i>		
Unemployment	0.9%	10%
Waiting days for sickness pay	0	5

Source: *Dagens Nyheter*, July 29–30, 1989.

(in inventory handling, for example). This can be explained by the much lower wage-related costs in Britain. The design of the work process differs as well; this too is connected to social conditions. Management in the British factory harbors classically Taylorist aspirations. In the words of the head of production: “We try to simplify the job and divide it up in shorter operations as much as possible, in order to minimize sources of error. . . . This is our way of reducing defects in manufacturing and increasing production at the same time.”

At the Swedish factory, by contrast, another orientation prevails, as the plant manager stressed: “We are building an experimental shop for testing different forms of work organization. The idea is to eliminate the most repetitive jobs and replace them with robots. All this to attain more stimulating jobs.”

Concessions as Union Strategy

American unions have been in a state of decline for a long time, as a result of falling rates of organization and incessant demands to accept concessions. The advent of the Japanese transplants has exacerbated these problems. Of ten assembly transplants in North America in 1990, only the four with some connection to the Big Three automakers had unions, and none of the more than 350 parts suppliers to the transplants were unionized (*Automotive News*, Jan. 28, 1991). To organize any of the new plants at all, the UAW had to make major concessions and sign contracts with very weak language (compared with traditional UAW contracts).

For the UAW locals at Mazda or Diamond Star, the experience of lean production was very different from that promised at the outset. Yet these union locals, which were truly pioneers, got little support from the national organization in their efforts to translate their experiences into a counterstrategy that could strengthen their members’ rights concerning overtime rules, absence for sickness, freedom in the workplace, organization of work, and so on. Instead, the UAW

hailed NUMMI as a model for the future and threw its support behind the entire Japanese factory regime.²⁵

This approach, of confronting the Japanese companies with concessions, created two fundamental problems for the UAW. First, it undermined the overall basis for union organization. Nissan made clever use of this weakness in 1989 to prevent unionization of the plant in Tennessee, as David Gelsanliter (1990) has documented. Time and again, Nissan put the question to its employees: why pay membership dues to the union when it made so little difference? Second, this strategy deepened the division and discord that had arisen in the UAW during the first wave of give-backs in the early 1980s. The union mobilizing begun at Mazda in 1988 was directed not only at the company but also (and with great bitterness) at the UAW and its official line. This has been vividly described by Joseph and Suzy Fucini (1990).

In Canada, the trade union movement generally enjoyed more favorable conditions than in the United States at the end of the 1980s. The unionization rate was more than twice as high (40 percent versus 18 percent); there was a rather strong social democratic party, which in 1990 won the election in Ontario, the most populous province; and social welfare policy was considerably more developed than in the United States. The Canadian Auto Workers' union (CAW) was formed in 1985 as a break-away from the UAW. At that point, the Canadian section of the UAW had for several years strenuously opposed the concession bargaining pursued by Detroit since the great car crisis of 1979–80. On the national level, the CAW sharply criticized the Japanese management system in a declaration adopted in 1989: "We reject the use of Japanese Production Methods which rigidly establish work standards and standard operations thereby limiting worker autonomy and discretion on the job. We reject the use of techniques such as Kaizen (pressure for continuous 'improvement') where the result is speed-up, work intensification and more stressful jobs" (CAW Research Department 1989:12).

Yet at CAMI, in Ingersoll, Ontario, the management system and personnel policy were largely the same as at the American transplants. Sam Gindin, the head of research for the CAW, in an interview in November 1990, stressed, however, that the context was fundamentally different:

While the UAW regards Nummi as exemplary and combats its critics, we regard CAMI as a compromise, which we must improve. At Nummi, Toyota's rigid attendance policy is regulated in the contract. The UAW cannot defend its members, but instead has to run around explaining how important a perfect attendance record is. At CAMI, on the other hand, attendance policy is a company rule, and the CAW can demand negotiations and file a grievance when management takes disciplinary measures. The Local is part of a lively union structure, it gets criticized and learns from others, along the way of building up its position for contract bargaining in 1992. The

UAW local at Nummi is completely isolated, and the critics which do exist in the plant, especially in the assembly department, don't get any support. It's a defeated union that only jerks now and then, but has no independence in relation to management (quoted in Berggren, Björkman, and Hollander 1991:53).

While the UAW pursues its low-key cooperationist policy toward the transplants, politics at the local level tends to be more adversarial. In 1991, the oppositional People's Caucus won the majority in the elections of the NUMMI local—a significant event that also demonstrated that the CAW's perception of the union as more or less dead was premature. In the same year, the radical leadership of the Mazda local decided to play hardball. In preparing the negotiations for the new contract, 90 percent of the workers voted to give the leadership the right to call a strike if needed. From this position the union was able to achieve significant gains, such as relaxation of the tight attendance policy; elimination of the "support member pool" (temporary employees); more union influence in company decisions about the outsourcing of work and the use of outside contractors; and a more stringent policy of worker protection, including the establishment of a written health and safety grievance procedure, a joint ergonomics training program, and union access to information such as symptoms surveys.

Working Conditions under the Lean Regime

On the surface, there are striking similarities between the Japanese practices and the European discussion of new production concepts involving reskilling and an "end to the division of labor." For instance, both German industrial sociology and the Japanese production philosophy emphasize teamwork, participation, and competence development. Yet the real content of these two approaches is very different. I shall try to demonstrate this by analyzing three aspects of auto work in the transplants: the character of skill formation, the JIT control system and increased work strictures, and the peculiar and elusive team concept.

Multitasking versus Reskilling

Japanese production organization is contradictory. On the one hand, it consistently applies the highly repetitive line system of Fordism in which there are strict requirements for standardized work operations. On the other hand, it stresses selection, flexibility, participation through submitting suggestions, and continuous learning ("multiskilling"). Toyotism's forms of labor utilization are considerably broader than Fordism's, but this is far from being equivalent to a general reskilling of production work.

First, the selection process does not favor applicants with occupational skills but rather those with no previous experience in the auto industry. This was

precisely Ford's approach in the teens. According to Peter Wickens (1987:181), the personnel director at Nissan UK, the purpose of the careful selection process is indeed to procure first-class workers but above all to show the world that manufacturing is not a last resort where one looks for work because no alternatives exist. The selection process aims at raising status or reevaluate, not reskill, production work. Nissan's purpose in sending this message is also to raise the quality of applicants to production management and industrial engineering, since it is supposed that highly qualified managers would be attracted by the prospect of managing a competent work force.

Second, a significant portion of the training of production workers is to socialize them into the company culture. In many transplants, the transfer of skills is not impressive.²⁶ The production head at Nissan in Sunderland, in an interview in 1989, rejected the notion of work cycles that were longer than 2.4 minutes: "In that case we wouldn't do anything but train people, and it would be hard to find substitutes and balance the line when absenteeism occurs" (*Ny Teknik*, no. 34). In comparison, cycle times at Volvo's Uddevalla factory were more than two hours, despite a much higher rate of absenteeism because of the large proportion of the work force who was female and generous social legislation.

Third, for most workers, the demands for flexibility mean they are alternating between similar repetitive tasks. This is multitasking, rather than multiskilling. To a varying degree, training in group-based problem solving, basic industrial engineering, and quality-control techniques is also provided,²⁷ but the bulk of the work still consists of very standardized and factory-specific operations. In contrast, genuinely skilled work is characterized by the possession of competencies of a general value to the labor market; individuals are endowed with independence and opportunities for choice.

Workers in skilled trades normally comprise a much smaller group at the transplants than has historically been the case in American auto plants.²⁸ Thus, the transplants compress the skill range in two ways. They elevate the traditionally unskilled production workers to some degree while significantly reducing the proportion of workers in skilled trades and the discretion and independence in their work. At NUMMI, for example, Toyota is determined to standardize maintenance procedures. In the words of the manager of the stamping department: "Fixing things isn't maintenance—that's repair. The general idea is to replace repairs with routine maintenance" (Adler 1990:68).

Increasing Work Strictures

A common conception is that the Japanese production system decentralizes decision making and increases the prerogatives of the workers. Few researchers

have investigated how much room actually exists for such developments, however, or have framed the analysis in comparative terms: decentralization compared with what? Of great relevance in this context is Janice Klein's analysis (1989) of the introduction of Japanese production methods in an American engine plant that earlier used self-managing work teams in accordance with the Scandinavian model.

In the United States and Western Europe, Klein points out by way of introduction, most initiators of organizational reform see group organization as a way to empower the work force. This was the original approach in the American engine plant Klein studied, which began in the 1970s with self-managing work teams and broad competence development. Process buffers gave workers autonomy and sufficient time to take part in production decisions. Top quality was the goal. The plant's good yields made it a model in the company. Greatly increased competition created a heavy pressure to cut costs, however, and the company decided to introduce just-in-time control and statistical process control (SPC). The workers took an active part in introducing this system, but they soon complained that the new methods undermined the whole idea of employee participation in decision making. The workers thought management had reverted to a traditional control mentality and that they had lost their individual freedom and team identity.

After the introduction of the JIT philosophy, the buffers, which earlier had created autonomy for both individuals and teams, were discontinued. As a result, the workers became completely subject to the unalterable pace of the line and the rigid cycle times. The stress level rose, as did the incidence of health problems. Moreover, the greatly increased dependencies in the production system reduced collective autonomy. Work teams found it more difficult to hold meetings, and the room for independent decision making diminished. Performance measures were radically changed, as Klein's interviews with production managers revealed: "It is not a 30-day time span, it is a 3-minute time span. . . . It used to be that you had a monthly goal and you really shot for it. Now they have targets every day. It used to be that you could loaf a little bit, and other days you knew you were under the gun. Now you're under the gun all the time" (1989:64).

In Klein's view, the JIT and SPC methods allow for greater participation by employees, as compared to a traditional "command-and-control" factory. But compared with the earlier arrangement in the same plant, the losses in autonomy were striking. As Klein notes (60): "The attack on waste, it must be understood, inevitably means more and more strictures on a worker's time and action. Our conventional Western notions of worker self-management on the factory floor are often sadly incompatible with them."

Adler (1991) has contested that the loss of autonomy in JIT systems is regrettable. His study of NUMMI verifies that the very tight coupling of all work stations and teams in the low-inventory system results in a significantly reduced autonomy.

He argues, however, that autonomy is not a critical motivating characteristic of jobs and stresses that “the fact that this coupling was seen by workers as the most effective way of managing operations seemed to ensure its endorsement.” Carrying the argument further, Adler maintains that autonomy is a kind of negative goal, the absence of external constraint. “The more important factor behind motivation and satisfaction might be the obverse—self-efficacy, or the power to accomplish significant objectives. When a job design . . . fits well the nature of the task, workers will feel empowered in a productive—as distinct from a political—sense, and this productive empowerment is a real source of satisfaction and motivation” (1991:72).

This line of reasoning has some strengths. But Adler fails to address the possibility that the alleged motivation and satisfaction may be in place *despite* the absence of autonomy and leeway in the job and because other and very different factors are more important, such as high pay and job security, competent and supportive management, and pride in the quality of the product. The strength of the oppositional unionists in this selected work force also suggests that there are important limits to the heralded motivation and satisfaction.

Visibility as a Means of Intensified Control

Production control of the Toyota type means that waste in the production system is reduced to a minimum by cutting down on reserves (both human and material). The system is stressed, and problems with workers, materials, or machines can be identified and removed, after which reserves are further reduced and the system is stressed again. Extra resources are considered as wasteful as producing scrap. It is just as important to identify sections that never have problems (and that therefore have “too many resources”) as those that have problems often. Mike Parker, a prominent American critic of Japanese production methods, has termed this system “management by stress” (1988:11): “Stress rather than management directives becomes the mechanism for coordinating different sections of the system. The stress throughout tightly links the different parts to make the system ‘self-regulating’ for management’s purposes.”

One result is personal stress, since all employees are required to do their utmost. This is an important reason for the strong emphasis on visualization—making all processes immediately visible, as far as this is possible. In this way, everyone can see who is responsible for a problem. A powerful instrument for visualizing problems, whether caused by materials, machines, or workers, is the famous *andon* device. Under the Toyota system, each work station has an easily seen panel with three lights. Green means everything is okay, yellow means the operator needs help, and red means he or she has stopped the line.

The *andon* system was introduced by Toyota at the end of the 1950s and is

applied consistently at the transplants. It has often been held out as an example of the transfer of prerogatives to the operators. It is important to understand the context, however. The right to stop the line functions as a replacement for the earlier negotiating system and the right to strike. Once a new product or assembly line has been broken in, the pressure is strong not to pull the cord, even when the tempo of production is very fast. Production stoppages are easily interpreted as the fault of the worker. The *andon* system is an effective instrument of control, but it is also a way of continuously intensifying work and selecting personnel. This function was described in Schonberger's study of a Japanese motorcycle engine factor in the United States (1982:87):

The red light brings frowns, but plant management is pleased when many of the yellow lights are on. Yes, *on*. As one Kawasaki manager put it, "When the yellow lights are on, that means we are really busting ass." To follow this reasoning, we must understand that the main reason for the yellow is too few assemblers on the line to handle the rate of output. If no yellow lights are on, management knows that the line is moving too slowly or there are too many workers. Usually, the response is to pull workers off the line and assign them elsewhere so that it becomes hard for the remaining workers to keep up; so yellow lights begin to come on. . . . Pulling assemblers off the line exposes remaining assemblers and their supervisors to trouble, e.g., inability to keep up without sacrificing quality, which leads to an attack on the cause of the trouble—whether human or mechanical—so that it won't happen again. . . . Pulling assemblers off the assembly line is quite like removing buffer inventories between fabrication work stations.²⁹

The Ambiguous Concept of Teamwork

The Japanese transplants in the United States have been strongly associated with the team concept. Yet Japanese experts on Toyota's production system and philosophy scarcely mention a word about teamwork. It was only after the Japanese companies had begun large-scale operations in the United States that they started to refer to their work organization as based on teams. In the United States the team concept was earlier associated with autonomous, self-managing work units. As used by the Japanese, the term has had a different—and shifting—meaning.

First, it refers to a company culture that lacks labor-management antagonisms, in which there is strong cooperation between the company and the union (in cases where the latter exists) and a climate marked by a strong sense of "we." All employees are supposed to be active and contributing members of the "company team." The team concept also extends to relations with suppliers. Customers and suppliers are supposed to work closely together "as a team."

Second, the team concept usually implies that the smallest units in the organization consist of groups led by team leaders. These teams play an important

role in the company's control system for, among other things, maintaining a high attendance rate. One innovative feature of the transplants is that the title of foreman (supervisor) has been abolished, although the function remains. This has never been the case in Japan. New terms are used, which vary from plant to plant. "Group leader" and "coordinator" are common; the analogy with sports is thought to express the appropriate associations. In fact, the discretionary powers attached to these positions are great in most transplants. At Toyota in Kentucky (but not at NUMMI), the team leader is the foreman, so workers are not given any double messages.

"Team" is probably not the best translation for the Japanese concept of work group; perhaps "platoon" might be better, at least for those transplants that are not unionized. For example, a November 1990 visit to Honda's engine plant in Anna, Ohio, revealed the following picture: when the workers go on their shift, they receive (while standing) instructions concerning the day's tasks from the foreman. He talks for five to ten minutes in a microphone. After the shift is over, the workers may not leave individually. They are again gathered in the information area, where they are told about the next day's plans. The workers then march off to the dressing room as a single unit. The impression that one is watching soldiers in the military is strengthened by the dress code, which requires uniforms and prohibits personal adornments.

Robert Cole (1979:201) has emphasized that worker participation in the Japanese sense differs in content from participation in the Western sense:

A second characteristic of job redesign at Toyota Auto Body is that the emphasis is not on participation *per se*, but rather on achieving the consent of the workers for policies which management wants to pursue, as well as on guiding workers in the direction in which management would like to see them move. This is apparent in the rhetoric the company uses; the term *sanka* (participation) is not used, rather the focus is on *nattokusei* (consent) and *kobetsu shido* (individual guidance).³⁰

In many cases, the team concept is used without a clear connection to any particular way of organizing work. In Peter Wicken's view (1987:92), "teamwork and commitment" have nothing to do with group work. In criticizing Volvo's Kalmar concept, he asserts that "while group working, as it is sometimes called, may require people to work together, there is no reason why this should lead to teamworking and commitment. . . . Indeed it is possible to envisage the opposite occurring. The nature of teamworking in our sense can be developed among people working individually just as, if not more, easily among those working together. It depends on what you call the team."

"Teamworking" at Nissan UK includes a significantly stronger standing for first-line supervisors than in traditional British industry. The foreman recruits his workers himself. The company stresses that the foremen meet their workers daily

in the teams' meeting place and that the usual distance between foremen and workers, in which there are no-go areas where foremen fear to tread, is absent. The official objective is to create a committed work force, without antagonisms between "us and them." Yet the Nissan team appears to have few safeguards against autocratic foremen, as Philip Garrahan and Paul Stewart have documented. The following comment by a worker was not atypical: "Everybody just kept quiet because the supervisors were never wrong. . . . I think the supervisors—the management—had all the power. If anybody said anything they would be kept back to clean the floors, daft things like that, they would find a way to get back at you" (1989:13).

The power relations and forms of control seem to vary considerably between plants. In unionized "team plants," the picture is more contradictory, and teams constitute more of a contested terrain. This is borne out by a study of the CAMI plant. Here, a group of researchers and unionists, "The Canadian Auto Workers Research Group on CAMI," launched a pioneering longitudinal research program in 1990 in which it planned to conduct field studies twice each year during a two-year period (see Huxley et al. 1991). The first intervention took place in March 1990, the second in November of that year, by which time the plant had reached full production for one of its product lines.

On both occasions, the researchers found a high level of participation in suggestion activities (71 percent of the respondents in the second study), and a majority of the workers supported QC activities. The assessment of the team concept was ambiguous, however. The social qualities were generally appreciated, but in the second round 41 percent of the interviewees thought teams were a way to get people to pressure one another to work harder, up from only 19 percent in the first field study. Also in the second round of observation, the research team discerned a growing overall disillusionment with CAMI's philosophy: 78 percent of the interviewed workers said that the management at CAMI still had all the power.

The "Double-Edged Sword"

"Henry Ford's sword was double-edged," Womack, Jones, and Roos claim in a critical part of their book *The Machine That Changed the World*: "Mass production made mass consumption possible, while it made factory work barren. Does lean production restore the satisfaction of work while raising living standards, or is it a sword even more double-edged than Ford's?" (1990:100).

Opinions are divided, they admit. There are those who call lean production "management by stress" and consider it worse from the workers' point of view than traditional mass production. But such a conclusion is altogether wrong, according to the MIT authors: "While the mass-production plant is often filled

with mind-numbing stress, as workers struggle to assemble unmanufacturable products and have no way to improve their working environment, lean production offers a creative tension in which workers have many ways to address challenges. This creative tension involved in solving complex problems is precisely what has separated manual factory work from professional 'think work' in the age of mass production" (Womack, Jones, and Roos 1990:101–2).

Work experience from the transplants presents a different picture. It shows that lean production, even more than the Ford system, is a double-edged sword. On the positive side, a number of features have proven to be highly attractive to American workers.

Positive Features of Lean Production

Job security. Historically, Japanese plants have offered much better job security than American-owned factories. The significance of this difference grew steadily during the 1980s, in line with the increasing scarcity of stable, good-paying jobs for nonprofessionals in the American labor market.³¹ A telling example occurred in 1988, when Nissan had considerable sales difficulties and completed cars were being stockpiled. In contrast to what American companies usually do in such situations, Nissan did not resort to layoffs or dismissals but rather retained all employees until the market improved.

Egalitarian character. The transplants have a consistently egalitarian appearance, while traditional American factories are marked by a glaringly obvious, razor-sharp distinction between blue- and white-collar employees. I was reminded of this when I visited a Mazda plant in 1990. An American engineer pithily described the hostility she felt toward the white-collar employees at the Ford factory where she had previously been employed as a blue-collar worker: "I hated those ties!"

Workers are required to work hard in Japanese plants. But the same demands are made on everyone, including managers.

Shop-floor focus. Production has high status and high priority at the company, and management values workers' proposals for improvement, if they suggest ways to increase productivity. Management of production seems in most cases to be of high quality, in line with the Japanese shop-floor focus.

Pride in work. All transplants see the quality of their products as central to their operation. The products are well designed, and suppliers maintain high quality and reliability. Many workers therefore also feel pride in the accomplishment of the enterprise.

A carefully selected work force. Transplants select their personnel extremely carefully. The process is stressful, but for those who are accepted there is a feeling of being one of the chosen. The book *Working for the Japanese* reports that it was

precisely the high quality of the personnel at Mazda that the workers most appreciated about working there. The heavy emphasis on team-based problem solving in the selection of workers also has advantages at the workplace. Furthermore, “teamwork” appears to have a strong appeal for many workers, even if there is frequently disappointment about its practical meaning and the desire for a more democratic team organization is widespread.

As Womack, Jones, and Roos (1990) stress, the Japanese production philosophy also entails great improvements in cooperating with and developing supplier firms. Here, as in their methods for achieving efficient product development, the Japanese companies have set new world-class standards. The manufacturer-supplier relationship is much more difficult to transfer to the West than the production system, however, since the implicit and intangible aspects of the relationship are so decisive.³²

The Down Side of Lean Production

Against the advantages listed above, the insatiable demands of lean production must be examined.³³

Unlimited demands for performance. Regulation of the utilization of labor and the speed of work so as to reduce the risks of injury and exhaustion has been a central trade union demand in Western industrial production. The transplants do not accept any union regulation of performance demands or other limits on the utilization of labor. Richard Hill, Michael Indergaard Child, and Kuniko Fujita, in their report on Mazda (1988), quote a union representative who expressed grave worry about this: “The Japanese, through kaizen, etc. are exploring the limits of human capacity. That may be all right in cycles but it’s not good to be pushed that way continuously and that’s a danger with all of the transplants” (1988:28).

For Japanese management, it is not just a question of making more efficient use of labor power. The high intensity of work is also an instrument for pushing rationalization constantly onward. If, according to this perspective, workers perform their tasks at so calm a pace that they can occasionally read a newspaper, then there is no force driving forth suggestions for improvement. In comparing Japanese transplants with GM’s plants, a striking feature was the relatively relaxed pace of work in the American plants, even in those that had high levels of productivity and quality, such as Buick City, in Flint, Michigan. Workers had time to talk with visitors and to read during short breaks at their work stations. This is unthinkable in Japanese factories.

Unbounded work time. Another classical reform tradition in Western industrial countries, especially in Europe, is the regulation and reduction of work time. This, too, is hard to combine with lean production. The extraction of overtime

in the transplants tends to be very high (except during periods of serious market problems, as NUMMI has experienced for most of its existence). Because of the minimal reserves of materials and persons, orders are often given on very short notice. Strictly speaking, lean production is not buffer-free. The long and flexible work times comprise the hidden reserve that is squeezed out in the production process. These flexible work times are an important precondition of the system's productivity and reliability.

The companies' far-reaching power over work times, which means production quotas in principle must be reached regardless of what has happened that day or shift, is also a way to promote improvement. If disturbances have the consequence that workers must stay after the end of their "normal" workday, their interest in ensuring that these disturbances are not repeated is naturally increased. In Europe, the eight-hour workday has been a goal for more than a hundred years. In lean production, it no longer applies. This feature is not confined to Japanese producers. Ford, the "leanest" American automaker according to MIT, has since its recovery after the deep crises in the early 1980s relied on large amounts of overtime to avoid plant expansion in times of brisk sales.

Little tolerance of work injuries. In most cases, the Japanese factories put great stress on safety and avoiding injuries that can lead to production stoppages. The products are also designed for easy manufacture—with great precision in the manufacturing of all parts and components. This is ergonomically advantageous in assembly since it reduces arduous insertion movements. Nonetheless, the high intensity and repetitiveness of the work and the long work times create considerable health risks, especially for cumulative trauma injuries. For example, an unusually high frequency of carpal tunnel syndrome, a nerve injury of the wrist, was reported at Mazda in 1988. Jim Warren, vice-chairman of Michigan Injured Workers, maintained: "I've never seen as high an intake or as many calls. I believe it's the result of a push for peak performance that disregards safety standards" (*Automotive News*, Feb. 13, 1989).

The overall frequency of work injuries was three times higher at this factory in 1988 than at comparable American installations according to reports in the Detroit press (see, for example, *Detroit Free Press*, July 7, 1990). Yet there appeared to be little tolerance of injuries. The teams had room for only high achievers, and light jobs had been contracted out. Several injured workers were dismissed on the grounds that there was not enough suitable work.

Mazda may represent an extreme case of schedule pressure, but there are other reports of heartless treatment of workers injured in production. Nissan in Tennessee has produced several examples: "As soon as people are injured they have no use for them," says Hardin, a former foreman. "You take the best employee, a hard worker with a good attitude and say an elbow goes out from overwork.

They'll say, 'Get him the hell outta here.' It is hard for me to believe it, and I have seen it" (*Progressive* 5 [1987], no. 6).

At Honda in Ohio, workers were already worried about the rapid pace of work in the mid-1980s. In a 1986 interview in *Washington Monthly* (July–Aug.), a worker summed up the situation: "If it doesn't get you physically, it will mentally sooner or later."

The company was proud that it had never dismissed any workers, but employees wondered what job security was worth if it was not physically possible to work past the age of forty or fifty. During our visit to the engine factory in Anna, Ohio, in 1990, the managers did not acknowledge that the working conditions caused injuries; instead, they claimed, it all depended on the individual: "There are strong and weak persons. There are right and wrong attitudes" (Berggren, Björkman, and Hollander 1991:56).

The unbounded factory regime. By eliminating all reserves, lean production increases management's dependence on the work force. Thus, Womack, Jones, and Roos claim (1990:103) that lean production can "scarcely be more oppressive than mass production." They stress the role of trust and confidence as the foundation of the system: "If management fails to lead and the work force feels that no reciprocal obligations are in force, it is quite predictable that lean production will revert to mass production."

What the authors fail to mention is that management's increased dependence on the workers is more than compensated for by the stricter personnel selection and factory regime, replete with compulsory uniforms, a detailed conduct and discipline code, absolute demands for attendance, detailed regulation of the workplace, and the elimination of all personal attributes. In its ultimate form, this regime calls to mind a well-drilled army and a spirit far removed from the democratic quality associated in the Western European tradition with the concept of teamwork.

How workers could perceive the pressure of this regime was demonstrated by events at the U.S. Mazda plant in 1991. As part of the new contract discussed above, workers were provided with four paid absence allowance (PAA) days, which they could use at their discretion simply by notifying their supervisor a few hours in advance. Despite the alleged trust and feelings of reciprocity in lean production, this new right very quickly became a kind of safety valve for many workers and, as a result, production came to a stop on Fridays in several departments. To guarantee production without having to add workers, the company proposed to restrict the use of PAA days, especially on Fridays, and in exchange offered substantial bonuses. The workers voted no; the right to decide for themselves on one single issue was obviously too important to be substituted for money. (The company subsequently introduced the restrictions unilaterally, which was fol-

lowed by a new vote in which the tougher proposal was sweetened by a significant “signing bonus” and additional vacation days.)

The German researchers Christoph Deutschmann and Claudia Weber have termed the Japanese company culture a new form of “social heteronomy” —that is, the opposite of autonomy—which is marked by an organized intimacy rather than the traditional instrumentalism of mass work. Referring to Richard Bendix, they warn against “the totalitarian potential contained in the informal collectivism of modern company management” (Deutschmann and Weber 1987:49). A strong work commitment has, in the Western tradition, been identified with the culture of skilled trades and professionals. The former have also been associated with a strong union consciousness. In the transplants, maximum commitment is demanded of the mass-production workers as well but under conditions that weaken the independent standing of trade unions and severely circumscribe the freedom of action enjoyed by the worker collective. Experiences from the unionized transplants nevertheless reveal a remarkable resurgence of union activity and commitment, in several cases strengthened by a sense of disappointment over all the “false promises.” The president of the CAW’s Local 88 in Ingersoll, Rob Pelletier, described this disappointment in the course of reviewing his own experiences:

Many of us came to CAMI totally naive as to how a plant functions, and had no reason to question the CAMI plant system. We all wanted CAMI to be the employment Utopia described by the employee handbooks. . . . When I became Vice-President the previous winter I did so because I didn’t want a bunch of Union hot-heads running the Local, doing nothing but running management down and bad mouthing everything we had worked so hard to establish as “The CAMI way.” In the interim, I experienced and heard about as much reality as I could take, until I realized what a smokescreen it all was. I became exactly what I had hoped to protect this Local and this Company from (*Off the Line* 5 [1990]).

The MIT team has attempted to close the debate on the Japanese production system by appointing it the standard global production system and heralding it as vastly more productive as well as beneficial to workers than preceding systems of manufacturing. The argument over its advantages and disadvantages goes on, however, as starkly opposing views are continuously put forward. And inside Japan, where the economy is more dynamic and competitive than ever, criticism of the “regime of long working hours” is mounting in the automotive industry. The same is true of the working conditions, which are frequently referred to as “*san kei*” (3K—*kitsui, kitanai, kiken*), or “hard, dirty, and dangerous.”

Japanese automakers have responded to the labor market pressure and recruitment difficulties in two principal ways—by stepping up their international expansion and by sharply increasing their investments in automation in an attempt to find a technological solution to the labor problem. The traditional Toyota model of low-cost rationalization based on continuous shop-floor improvements,

which is at the heart of NUMMI's success, is being superseded by a more divided work organization with a much stronger emphasis on professional specialists, such as permanent and specialist *kaizen* teams.³⁴ But there are also signs of increasing social concerns among the auto manufacturers, which are expressed by, among others, the president of Toyota, Shoichiro Toyoda. The outcome of these considerations is unclear, but lean production is certainly not the ultimate station of industrial development.