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Social Organization and Technological Leadership

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The Competitive Dynamics of International Leadership

This contribution to the convergence debate is dedicated to the propositions that as we reach the end of the twentieth century, the United States is falling behind both technologically and organizationally and that the United States, having fallen behind, will find it very difficult to put in place a mode of social organization required to catch up to the new leaders. Let me summarize the basic competitive dynamics involved. A national economy (say, Japan's) that rises to international industrial leadership does so on the basis of a mode of social organization that is capable of generating higher-quality products at lower unit costs than can be achieved on the basis of the mode of social organization that characterizes the old industrial leader (say, the United States). The old leader seeks to compete on the basis of what has now become a traditional mode of social organization. Indeed the old leader finds that by adapting to the new competition on the basis of the modes of organization and the types of technologies that made it successful in the past, it can continue to remain competitive for a time. Meanwhile, however, the new leader is continuing to use the social organization of its economy to generate innovation. By the time the old leader recognizes that it must change its mode of social organization in order to compete, the new leader has forged ahead.

Because the essence of social organization is the coordination of the abilities and incentives of numerous individuals toward a common goal, the old leader cannot simply decide to adopt the new and more powerful mode of social organization. Technical knowledge may transfer easily, but the social organization that is needed to develop and utilize this knowledge does not. Rather, to catch up, the old leader must begin a long process of social transformation, one that transforms the character of the relationships among those who participate in the nation's economy. In the absence of a commitment to engage in such social transformation, even the (now traditional)

modes of social organization that had brought the old leader to international prominence may begin to deteriorate, thus making catching up all the more difficult and falling behind all the more likely.

This chapter summarizes a large and growing body of research, including my own (Elbaum and Lazonick 1986, Lazonick 1990, 1991, 1992b), on the impacts of social organization on technological change and productivity growth across the leading national economies during the twentieth century. The empirial focus is on the social organization that characterized two key changes in international industrial leadership: the change in leadership from Britain to the United States in the first half of the twentieth century, and the change from the United States to Japan in the last half of the century. Then I examine the evidence that suggests that over the past quarter-century, in the face of increasingly intense global competition, the United States has been falling behind in its ability to develop and utilize technology.

The Rise and Decline of the British Economy

In *Productivity and American Leadership,* Baumol, Blackman, and Wolff (1989, pp. 21–22) recognized that the twentieth-century experience of the British economy was one of falling further and further behind. But they made no attempt to explain either Britain's long-term relative decline or, the other side of the same analytical coin, why the United States and Germany were able to forge ahead.

The historical scholarship and debate on these issues are considerable. In the mid-1980s, Bernard Elbaum and I, in conjunction with a number of other scholars, put forth an analysis that rooted the British economic decline in the twentieth century in the modes of social organization that had carried the British economy to industrial leadership in the nineteenth century (Elbaum and Lazonick 1986). Central to the shift of industrial leadership from Britain to the United States (particularly in consumer goods) and Germany (particularly in capital goods) from the late nineteenth century was a movement from market coordination to managerial coordination of economic activity. In an era of less complex technological development, market coordination of economic activity had the competitive advantage of avoiding the higher fixed costs of managerial coordination. But through managerial coordination, the productive benefits that could be attained from more complex technologies more than offset the high fixed costs of developing and utilizing these technologies (Lazonick 1991, chap. 3).

The problem for Britain in the twentieth century was that the very market-coordinated structures of industrial organization that had previously enabled its economy to become the international industrial leader undermined the incentives and constrained the abilities of British enterprises and industries to make the transition to managerial coordination. Without making such an organizational transition, the benefits of the more advanced technologies being developed elsewhere could not be obtained within the British economy.

Although enterprise management had been important to the success of the pioneering factories in the early stages of the British industrial revolution, as the nineteenth century progressed, firms came to rely more on the external environment rather than on internal planning and coordination to ensure access to the productive resources required to generate (what were by the standards of the time) high-quality

products at low unit costs. The most important external resource that became available to British manufacturing firms in the nineteenth century was an ample supply of highly skilled and well-disciplined labor. Senior workers—known collectively as "the aristocracy of labor"—not only contributed their own skills to the building and operation of machinery but also recruited junior workers whom they trained and supervised on the shop floor (Burgess 1975, Harrison and Zeitlin 1985, Hobsbawn 1984, Lazonick 1990, chaps. 3–6).

Employers' reliance on skilled labor to organize work and train new workers had the advantage of low fixed costs not only for individual firms but also for the British economy as a whole. The progress of the British industrial revolution did not rely to any significant extent on state-supported or industry-supported education. The reproduction of an abundant and skilled labor force by means of worker-run, on-the-job training required little, if any, expense to either employers or the state.

These worker-run apprenticeship systems, moreover, yielded high levels of labor productivity. Eager to gain entry to the aristocracy of labor, the promise of promotion kept younger workers hard at work. The older workers, generally protected by union bargains that assured them shares of productivity gains were themselves not adverse to long and steady labor. Skilled workers' intimate practical knowledge of production methods meant that as by-products of shop-floor experience, they were able to keep imperfect machinery running steadily and to contribute to minor technological improvements.

As older workers trained younger workers, supplies of specialized labor expanded in certain localities during the nineteenth century. Given an industrialist's choice of business (itself typically a function of his own specialized training in a particular locality), he would tend to invest where labor with the necessary specialized skills was in relatively abundant supply. As a consequence, particular industries became increasingly concentrated in particular regions of Britain during the nineteenth century. The regional concentration of specific British industries meant that employers had access not only to large supplies of labor with the requisite skills but also to communication and distribution networks that supplied a regional industry with its basic inputs, transferred work-in-progress across the industry's vertically specialized productive activities, and marketed the industry's output.

The growth of a regionally concentrated industry facilitated the vertical specialization of constituent firms in a narrow range of activities, with these firms relying on other firms both to supply them with the necessary inputs and to purchase their outputs for resale downstream. The tendency toward vertical specialization was self-reinforcing because the growing availability of suppliers and buyers for intermediate products made it all the easier for new firms to become established as specialists. Hence the growth of a regionally concentrated industry was characterized more by the entry of new firms than by the growth of existing firms. Vertically specialized industries became horizontally fragmented industries (for a case study, see Lazonick 1983, reprinted in Lazonick 1992b).

The evolution of industry structures characterized by regional concentration, vertical specialization, and horizontal fragmentation as well as employers' ongoing reliance on skilled labor to organize work on the shop floor diminished the need for business firms to invest in the development of managerial structures. The lack of managerial organization in turn reinforced the tendency for industrial structures to be

fragmented and specialized. Limited in their managerial capabilities, proprietary firms tended to confine themselves to single-plant operations, thus facilitating the entry of new firms into vertical specialties and hence increasing the extent of both the horizontal and the vertical fragmentation of industrial sectors. By reducing the managerial and financial resources necessary to run a business, the vertically specialized and horizontally fragmented industry structures permitted proprietary capitalists to avoid separating capital ownership from managerial control.

In the late nineteenth century, the leading economist of the era, Alfred Marshall, recognized the contribution to British industrial leadership of these regionally concentrated industries. Marshall (1920, pp. 283–88) eventually even coined a phrase—the "industrial district"—to describe these regional agglomerations. More than that, with his distinction between external and internal economies of scale, Marshall provided a theoretical perspective on the process of economic development that is exceedingly useful for understanding both the sources of British industrial leadership in the nineteenth century and its loss of industrial leadership in the twentieth century.

Economies of scale entail the spreading out of fixed costs over a larger output. These economies of scale are "external" when the growth of industry output occurs through an increase in the number of enterprises in the industry, and they are "internal" when it occurs through the growth of existing enterprises. Hence, given the business enterprise as the unit of analysis, external economies of scale imply industrial fragmentation and market coordination, and internal economies of scale imply industrial concentration and management coordination.

By themselves, however, economies of scale, whether external or internal, tell us nothing about why, at any given level of output, the resources employed in the industry are more or less productive (see Lazonick 1991, chap. 3). In other words, the existence of economies of scale does not explain the level of development of productive resources in an enterprise or industry.

Yet the sources of such development are critical to whether economies of scale will be internal or external to existing enterprises. For it is when existing enterprises within an industry develop superior capabilities that are enterprise specific that it becomes possible for these enterprises to gain a competitive advantage through internal economies of scale. Conversely, the attainment of competitive advantage on the basis of external economies of scale implies that the development of superior productive capabilities occurs more generally in the industrial district rather than in particular enterprises.

As I have already explained, the prime source of the development of productive capabilities in the industrial districts of nineteenth-century Britain was the skilled labor required to operate technologies that, even when mechanized, were highly imperfect. With the rise of managerial capitalism abroad in the twentieth century, the persistence of craft-based and market-coordinated industrial structures that had carried the British economy to international dominance in the nineteenth century impeded the development and utilization of advanced technology. In the staple industries—iron and steel, shipbuilding, mechanical engineering, and textiles—that had brought Britain to economic supremacy, more organizational capability resided in craft control on the shop floor than in the underdeveloped managerial structures (see Lazonick 1990, chap. 6).

Insofar as British craft workers continued to cooperate with their employers in

the twentieth century, it was in squeezing as much productivity as possible out of the existing technologies, often by failing to maintain the quality of the product, driving their shop-floor assistants as well as themselves to supply more effort, and (as it became necessary in order to retain their jobs) accepting lower wages. Immobile because of their highly specialized skills, both workers and employers had the incentives to ensure the survival of the firms through which they gained their livelihoods. Many British firms in the staple industries were able to survive for decades by living off the plant, equipment, and infrastructures accumulated in the era of British industrial leadership (Elbaum and Lazonick 1986).

In some industries (mechanical engineering in particular), employers tried to use their collective power to break the crafts' control over the organization of work and the determination of remuneration. Even when employers rolled back prior union gains, however, craft control was not eliminated, in large part because proprietary capitalists, lacking managerial structures, had no organizational alternative to put in its place. What is more, even in a new machine-based industry such as automobile manufacture, in which the craft unions were not already ensconced, shop-floor control on the craft model became dominant in the first decades of the twentieth century as the automobile manufacturers tended to rely on craft workers to plan and coordinate the flow of work on the shop floor (for a summary, see Lazonick 1990, chap. 6).

Reliance on shop-floor workers to perform what we now consider to be managerial functions continued during the interwar period, even in firms such as Austin and Morris that were becoming dominant mass producers for the British market (see Lewchuk 1987). In the 1940s and 1950s, under conditions of tight labor markets combined with the limited opportunities for firms that relied on labor-intensive technologies to generate new sources of productivity, these workers used the shop-floor organizational responsibilities that had been delegated to them as the foundations on which to build specialized craft unions. The result was that by the 1960s one could find scores of separate craft agreements in place at any time in any one automobile plant, with the resultant fragmentation of employer–employee relations placing severe constraints on the managerial coordination of the specialized division of labor within the plant.

Yet the British automobile industry remained viable in global competition until the 1960s because of its low fixed costs (including the almost complete neglect of research and development) as well as the acceptance of relatively low returns by workers, managers, and owners. The 1960s and 1970s revealed, however, that like the staple industries of the nineteenth century, the British automobile industry had reached the technical and social limits of the utilization of its resources. Facing the continued development of the continental producers as well as the rise of the Japanese automobile manufacturers, the economic viability of the British industry could no longer be sustained.

The development of organizational capability was somewhat different in the science-based industries of the second industrial revolution—in chemicals, rubber, electrical equipment and appliances—in which it was impossible to enter into competition on the basis of technological capabilities inherited from the past. Largely through the efforts of dedicated and aggressive entrepreneurs (typically, although not always, owners as well as managers) who either developed new technologies or controlled foreign patents, a number of British firms such as Lever Brothers, Pilkington Brothers, Dunlop, Courtaulds, Crosfield's, Nobel's, and Brunner, Mond were able to become serious global competitors in the late nineteenth and early twentieth centuries (for business histories, see Barker 1977, Coleman 1969, Jones 1984, Musson 1965, Reader 1975, Wilson 1984).

Nevertheless, after the turn of the century the largest British firms were not only much smaller than the largest U.S. firms but also much more under the control of family ownership. In his recent book *Scale and Scope: The Dynamics of Industrial Capitalism*, Alfred Chandler (1990) attributed the relatively poor performance of British industry during the twentieth century to the persistence of "personal capitalism" in an era when managerial capitalism was making world leaders out of the economies of the United States and Germany. By personal capitalism, Chandler meant a system of corporate governance in which enterprise owners exercise control over capital-allocation decisions and hence over strategic decision making as well as day-to-day management of the enterprise. In short, ownership is integrated with control. By this definition, during most of the nineteenth century, personal capitalism was widespread in major industries, not only in Britain but also in all of the most advanced industrial economies, including those of the United States and Germany.

In speaking of "the continuing commitment to personal capitalism in British industry," Chandler (1990, chap. 7) meant that the British entrepreneurs who had transformed new ventures into going concerns in the capital-intensive industries of the second industrial revolution had "failed to make the essential three-pronged investment in manufacturing, marketing, and management" that could generate the economies of scale and scope being attained by their main international rivals. Most seriously deficient was investment in management: "The pioneers recruited smaller managerial teams, and the founders and their families continued to dominate the management of the enterprises" (Chandler 1990, pp. 236, 286).

In the twentieth century, British personal capitalism was successful in food, drink, and tobacco—industries in which brand-name recognition (i.e., assurance of product quality) was a source of competitive advantage but did not require large investments in complex technology and organization. "In branded, packaged products," Chandler (1990, p. 268) argued, "British entrepreneurs created national and international organizations that could still be personally managed by an extended family with a very few close associates." But such personal management was inadequate to global competition in standardized light machinery, electrical equipment, chemicals, and metals. In these industries, Chandler (1990, p. 275) contended, there was entrepreneurial failure in the last decades of the nineteenth century and the first decades of the twentieth century.

What accounts for this "continuing commitment to personal capitalism" in Britain in an era when managerial capitalism in the United States and Germany was on the rise? Chandler's basic answer to this question is the first-mover advantages of Britain's rivals. "As early as 1890," Chandler (1990, p. 284) pointed out, "the German and American first movers had already acquired powerful competitive advantages in their national markets, and this, in turn, provided a base for marketing abroad." Once the U.S. and German enterprises had achieved these economies of scale, it would have been irrational for British producers to try to compete. As Chandler (1990, pp. 285–86) summed up his argument:

> Whatever the exact reasons for [British] entrepreneurial failure were, two points are clear. First, entrepreneurial failure in the new industries can be precisely defined. It was the failure to make the three-pronged investment in production, distribution, and management essential to exploit economies of scale and scope. Second, the time period in which that investment could have been made was short. Once first movers from other nations had entered the British market, often supplementing their marketing organizations by direct investment in production, the window of opportunity was closed.

But what can one say about the "exact reasons" for the failure of British enterprises to take advantage of the technological and market opportunities of the second industrial revolution? More specifically, what was it about the social environment in which British enterprises operated that led to their failure to make the necessary and timely investments in organization and technology? Was British "entrepreneurial failure" simply a cultural phenomenon that reflected a peculiarly British penchant for maintaining personal control over one's firm? Or was the failure of British industrialists to match U.S. and German investments in organization and technology conditioned by the social organization of the British economy, including the social organization of the enterprise itself, in the late nineteenth and early twentieth centuries?

My explanation for the persistence of "personal capitalism" lies in three interrelated systemic dimensions of the social environment in which the nation's industrial enterprises operated: the social system, the educational system, and the financial system (the following argument is elaborated, with references, in Lazonick 1986, reprinted in Lazonick 1992b, and Lazonick 1991, chap. 1). British industrialists of the late nineteenth century were generally middle class, with their home bases in the industrial districts of the Midlands and the North. Among those engaged in business, large accumulations of wealth and substantial political power were in the hands not of these industrialists but of financiers based in the City of London. Using upper-class educational institutions as means of entry and marriages as instruments of merger, wealthy financiers joined with the old landowning elite (many of them grown recently wealthy through rising land values) to form a new aristocracy. The wealth of this restructured upper class was not, as was increasingly the case in the United States and Germany, based on the application of science to industry and the resultant profits from technological innovation. Rather, the bases of wealth in financial activities were social connections and acquired reputations. Hence the importance for ultimate economic success of family connections and associations made at elite educational institutions—Oxford and Cambridge as well as public schools such as Eton and Harrow.

Lacking industrial roots, the aristocracy who controlled these elite institutions during the era of the second industrial revolution had no need for an educational system that developed technologists. They valued the study of science as a branch of sophisticated knowledge but had no interest in its application to industry. Indeed, the British elite positively resisted the notion that a concern with technology had any place in an aristocratic education. They wanted education to set them apart from the lower orders, not bring them in closer contact with them. For, as I have already outlined, in the rise of Britain to international industrial dominance during the first industrial revolution, technological knowledge had generally been in the possession of groups of

workers—the so-called labor aristocrats—who gained this knowledge through the development and utilization of machinery on the shop floor.

Nor did successful industrialists who accumulated sufficient fortunes to contemplate joining Britain's upper class effectively challenge the anti-industry bias of Britain's elite educational system. Of middle-class, or even working-class, backgrounds, Britain's most successful industrialists sought to elevate their social standing by distancing themselves from the technological roots of their prior advance. They typically located their head offices in London and sent their sons to be educated at the elite public schools and, if possible, at Oxbridge. Thus they did not see it as in their interests to transform the nation's premier educational institutions into servants of industry. Their goal was, rather, to partake of aristocratic culture to serve their aspirations for upward mobility, which meant accepting the antitechnology bias of that culture. As the historian Donald Coleman (1973) put it in a well-known essay, successful industrialists sought to become "gentlemen" rather than "players."

In seeking to move up the social hierarchy, successful industrialists did not abandon industry for finance; barriers to entry into finance and related pursuits were high precisely because of the centrality of social connections and reputations to the success of the financial enterprise. Rather, as successful British industrialists sought to move up the social hierarchy, control over an established industrial enterprise remained the foundation of their material wealth and the most assured means of passing wealth on to their children. They brought in their sons and sons-in-law to manage their businesses, thus perpetuating the integration of family ownership and control. The larger owner-controlled firms that, because of enterprise expansion or a dearth of qualified family members, had to recruit top managers from outside the family gave highest preference to young men with a classical Oxbridge education. As a result, the most influential British industrialists put little pressure on the elite educational institutions to offer technical and organizational training even to the future captains of industry. Instead, the elite educational institutions became instrumental to the persistence of "personal capitalism."

By virtue of their educational backgrounds and social aspirations, those in control of British industrial enterprises in the first half of the twentieth century were not themselves well equipped or well positioned to lead their firms in the pursuit of technological innovation. Within the enterprise, the top managers of the most successful enterprises of the second industrial revolution set themselves apart as an elite social class, thus creating an organizational barrier between themselves as strategic decision makers and the technical specialists who were expected to implement enterprise strategies. Increasingly after the turn of the century, many of the technical specialists employed by science-based enterprises came from the newly established provincial universities that did try to cater to the educational needs of technologists. The second-class status of the graduates of the provincial universities was confirmed when they took up employment in a major British industrial enterprise. Because of the way in which the top managers of the personally managed enterprises were recruited, these technical specialists could not view their initial employment in even the larger enterprises as a first step up a managerial hierarchy that might ultimately lead to positions of control.

As a result of these barriers to social mobility within the enterprise, technical specialists were less committed than they might otherwise have been to furthering enter-

prise goals, and they were more likely than they would otherwise have been to view interfirm mobility as the main route to career progress. Such prospects of employee exit in turn reduced the incentive for the owner-managers of these enterprises to invest in the productive capabilities of these technical specialists. Even in the cases of trained scientists and engineers, therefore, leading British enterprises relied more on market coordination than management coordination in their employment of labor (see Dore 1990). In industries in which the development and utilization of technology depended on the development and utilization of highly specialized technical skills, enterprises that relied on market-coordinated employment relations could find themselves at a decided disadvantage in global competition.

But market-coordinated employment relations placed British enterprises at a competitive disadvantage only when foreign enterprises based on more management-coordinated employment relations were able to generate higher-quality products at lower unit costs. The key question, then, for understanding the social organization of the enterprise as a source of global competitive advantage is why, in a given industry, the social structures of enterprises in nations such as the United States and Germany were more management coordinated than they were in Britain. Put differently, why did a transition from "personal" (or proprietary or market) capitalism to managerial capitalism occur more rapidly and thoroughly in the enterprises of Britain's competitors than in British enterprises? Here I can only outline the answer to this question for the case of the United States. Nevertheless, the Anglo-American comparison makes clear the growing importance of social organization not only within the enterprise but more generally within the national economy as a source of industrial leadership and global competitive advantage in the first half of this century.

Organizational Capabilities and American Leadership

The Anglo-American comparison is worth making not only because British and U.S. enterprises competed in many industries but also because the two nations had a common cultural heritage. As late as the 1860s, the United States' system of higher education was based on the Oxbridge model. In both nations, moreover, the ideology prevailed in the nineteenth century that individualistic enterprise constituted the most powerful force for economic development.

As late as the 1890s in the United States, ownership of industrial enterprises remained integrated with managerial control. Yet over the next generation, there was a separation of ownership from control in the most successful and enduring U.S. managerial enterprises, and the U.S. system of higher education had been transformed to cater to the needs of U.S. managerial structures (Lazonick 1986, reprinted in Lazonick 1992b, Noble 1977). Why, by the early decades of the century, should such a change in enterprise governance have occurred on such a widespread basis in the United States, compared with Britain?

To comprehend how and why asset ownership was separated from managerial control in U.S. industrial enterprises requires answers to two questions. First, how was ownership transferred from the original owner-entrepreneurs who managed a company to the new owners who did not exercise managerial control? Second, how did it happen that the managers who were left in control of these companies after the transfer

of ownership were both able and willing to apply science to industry in ways that generated technological innovation and, in many cases, global competitive advantage? As in the case of Britain, to answer these questions requires analyzing the dynamic interaction of the social system, the educational system, and the financial system in shaping the organizational evolution of the enterprise (the following argument, with references, is elaborated in Lazonick 1986, 1991, chap. 1, and 1992a).

Until the Great Merger Movement that began in the 1890s, a national market in industrial securities did not exist in the United States (Navin and Sears 1955). But by the 1890s a number of enterprises in the more capital-intensive industries had used retained earnings to finance continuous innovation that enabled them to capture dominant market shares. Key to the success of these enterprises was the willingness of owner-entrepreneurs to invest not only in production and distribution facilities but also in managerial personnel. These dominant enterprises were central actors in the Great Merger Movement, and the most successful mergers occurred in the industries of the second industrial revolution—industries in which enterprises gained competitive advantage through continuous product and process innovation and high-speed utilization of production and distribution facilities (Chandler 1990, chap. 3).

The Great Merger Movement did more than merely concentrate industry. With J. P. Morgan taking the lead, Wall Street financed the mergers by selling to the wealth-holding public the ownership stakes of the entrepreneurs whose companies were being merged. The ultimate result was the creation of a national market in industrial securities. Through the mediation of Wall Street, ownership of the assets of the newly merged companies was transferred from the original owner-entrepreneurs to a widely distributed population of wealth-holding households. After the turn of the century, a company that emerged as dominant in its industry could go public without merger and have its shares listed on the New York Stock Exchange.

In taking these enterprises public, the sale of common shares did not finance new investments in organization and technology. Rather, it financed the retirement of the old owners from the industrial scene. By purchasing these shares (increasingly on the secondary market), the new owners did not assume managerial control. What attracted these portfolio investors to the stock market was the fact that an ownership position in a company did not require any further commitments of time, effort, or finance to that company. When owners became dissatisfied with the performance of "their" companies, they could simply sell their ownership stakes on the highly liquid stock market to other, anonymous, portfolio investors who wanted to become owners for a while. Ownership had thus been separated from control (see Lazonick 1992a).

The managers now in control were not owners but salaried employees. Increasingly in the first decades of this century, the salaried employees who rose to positions of top management in the U.S. science-based enterprises had been recruited to their companies as university graduates in search of careers. The education that they received, moreover, provided them with the basic cognitive capabilities to apply science to industry, capabilities that they improved through in-house training and experience during their careers (Lazonick 1986, reprinted in Lazonick 1992b).

In Britain, as we have seen, the higher education most valuable for men destined for top management positions served to distance these future leaders from the application of science to industry rather than to immerse them in it. A classical college education, modeled after Oxbridge, had in the mid-nineteenth century also held sway in

the United States at institutions of higher learning such as Harvard and Yale. With the coming of managerial capitalism, however, these educational institutions were transformed to meet the requirements of U.S. industrial enterprises for line and staff specialists. The pressure for educational change began to build in the mid-nineteenth century when the advocates of Jeffersonian democracy sought to establish institutions of higher learning that would elevate the social standing of the independent farmer and artisan while giving them advanced practical knowledge in agriculture and the mechanical arts. The ultimate legislative result of this movement was the Morrill Land Grant College Act of 1862 that funded the establishment of agricultural and mechanical arts colleges in every state in the nation.

As it turned out, individuals intent on being independent farmers or artisans had little use for the bachelor's degrees that the land-grant colleges offered. But the emerging system of managerial capitalism did. In current discussions of the rise of U.S. managerial capitalism, a much neglected industry is agriculture. From the 1890s the U.S. Department of Agriculture in effect transformed the land-grant colleges into operating divisions of a huge managerial bureaucracy that, in regional experiment stations attuned to improving the productivity of local crops, applied science to industry and, through extension services, sought to diffuse the resultant technologies to the mass of farmers who, in their combined roles as "plant" managers and "shop-floor" workers, transformed purchased inputs into salable outputs (Ferleger and Lazonick 1992). Also from the 1890s, U.S. manufacturing enterprises began to take an interest in the land-grant colleges—MIT among them—as a source of supply of scientists and engineers (Noble 1977; see also Servos 1980). This was a time when, for the sake of developing new technologies, the most prominent U.S. mass production enterprises were building in-house capabilities to apply science to industry (Hounshell and Smith 1988, Mowery and Rosenberg 1989, pt. II, Reich 1985) and, for the sake of utilizing these new technologies, were successfully eliminating craft control of production from the shop floor (Lazonick 1990, chap. 7, Montgomery 1987).

The growing importance of the land-grant colleges in American economic life in turn put pressure on the older colleges to make their scientific and educational activities relevant to the needs of industry. Especially after the turn of the century, when (largely through philanthropic foundations established by business fortunes) wealth accumulated in industry provided massive funding for education, managerial capitalism could use the entire system of U.S. higher education, whether privately or publicly funded. Industrial enterprises increasingly recruited managerial personnel from the system of higher education and then, through in-house training and on-the-job experience, developed the productive capabilities of these employees and promoted the best of them to middle-level and upper-level managerial positions. That there was room at the top for such career managers had been ensured, moreover, by the separation of ownership from control (Lazonick 1986, reprinted in Lazonick 1992b).

But why then did such a separation of ownership from control not occur in Britain during the first decades of the century? There were, after all, well-developed markets in industrial securities in Britain in advance of the United States. In my view, the key explanatory factor was the social segmentation that I have described between strategic decision makers and technical specialists within the owner-controlled British enterprise. By distancing themselves socially and often geographically from the technological activities of their enterprises, owners as strategic decision makers became unwilling to invest in the core capabilities of their enterprises and became less knowledgeable (if not ignorant) of what these core capabilities were. Hence a transfer of company ownership from owner-entrepreneur to wealth-holding public, as occurred in the United States, would not have left a qualified managerial team in its place.

The failure to invest in organizational capabilities, moreover, meant that British enterprises that had been successful in their entrepreneurial phases did not have the national or global competitive advantages that would have led the wealth-holding public to pay dearly for shares in these companies. The public sale of such a company, therefore, would have been less remunerative to the owner-entrepreneurs than was the case for their counterparts in the United States. R. C. Michie (1987) has shown that the London Stock Exchange was much less selective in listing companies than was the New York Stock Exchange, an organizational difference that may well have reflected the emergence of more markedly dominant enterprises in the United States than in Britain. Important, and perhaps paramount, sources of these cross-national differences in competitive advantage were differences in the social organization of U.S. and British enterprises that participated in the second industrial revolution.

Besides permitting the separation of ownership from control, the rise of managerial coordination in the United States had profound implications for the organization of work on the shop floor. Unlike Britain with its accumulations of skilled labor supplies in industrial districts, the interregional and interoccupational mobility of workers in the United States rendered skilled labor scarce throughout the nineteenth century. When U.S. industrialists wanted to engage in mass production, they had to look to skill-displacing technological change to overcome the constraints on labor supply that a highly mobile work force had imposed. To ensure the development and utilization of the skill-displacing technologies, U.S. industrialists had to invest in managerial structures. The result, by the middle of the nineteenth century, was the rise of a characteristic "American system of manufactures" (Hounshell 1984).

Nevertheless, during the rapid postwar expansion of American industry, U.S. manufacturing enterprises, and particularly those that sought to compete on growing national markets, found that they had to rely extensively on skilled labor to coordinate, and even in many cases plan, their production activities. By comparison with the persistence of craft control in Britain, however, American reliance on skilled shop-floor labor to coordinate production activities was generally short lived, as U.S. industrialists developed technological and organizational alternatives to leaving skills, and the control of work, on the shop floor. By employing unskilled immigrants from eastern and southern Europe, by investing in de-skilling technological change, and by elaborating their managerial structures to plan and coordinate the productive transformation, U.S. industrial capitalists attacked the craft control that workers—typically of British and German origin—had staked out during the 1870s and 1880s (Montgomery 1987).

The initial response of shop-floor workers to the exercise of managerial control was to form craft unions. When employers refused to bargain with these unions, shop-floor workers turned to restricting output in order to exercise direct control over the relation between the work effort they provided and the pay they received. During the first three decades of this century, employers used both political and economic power

to eradicate and diffuse workers' attempts to assert shop-floor control. They relied on repression, instigated and financed both privately and publicly, to eliminate radical elements in the American labor movement. But having deprived their workers of militant alternatives, the leading industrial employers also gained the cooperation of their shop-floor workers by sharing some of the managerial surplus with them and by holding out (what during the 1920s at least appeared to be) plausible promises of employment security (see Brody 1980).

As I have argued elsewhere (Lazonick 1990, chap. 7), the phenomenal productivity growth in U.S. manufacturing in the 1920s could not have been achieved without managerial success in gaining control over work organization on the shop floor. At the same time, however, the decades-long managerial offensive against craft control—combined with the evolution of a highly stratified educational system that effectively separated out future managers from future workers even before they entered the workplace—left a deep social gulf between managers and workers in U.S. industrial enterprises. During the 1920s, even as many dominant industrial enterprises shared some of their surpluses with workers in the forms of higher wages and more employment security, U.S. managers, ever fearful of a reassertion of craft control, continued with their quest to take, and keep, skills off the shop floor.

The Great Depression, with its massive layoffs of blue-collar workers even by many of the most progressive employers of the 1920s, served to deepen the social separation of management from the shop-floor labor force. In response, the U.S. labor movement reorganized, but this time on an industrial rather than a craft basis, and used the crisis of the 1930s to wring from the state a measure of economic security for workers that private enterprise had shown itself incapable of providing. In the renewed prosperity of the 1940s, when the dominant mass producers once again sought to gain the cooperation of workers by offering them high wages and prospects of secure employment, they had to deal with powerful mass production unions.

These unions did not challenge the principle of management's right to plan and coordinate the shop-floor division of labor (see Lazonick 1990, chap. 9). In practice, however, the quid pro quo for union cooperation was that seniority be a prime criterion for promotion along well-defined, and ever more elaborate, job structures, thus giving older workers the best access to a hierarchical succession of jobs paying gradually rising hourly wage rates. In return, union leadership sought to ensure orderly collective bargaining, including the suppression of illegal work stoppages.

From the 1940s to the mid-1960s, union–management cooperation in the coordination of shop-floor relations permitted high enough levels of productivity to sustain a competitive advantage, despite the failure of the dominant mass producers to address the issue of de-skilled, monotonous, and hence alienating work. By sharing with blue-collar workers some of the gains that came with international dominance, U.S. mass producers exercised a substantial degree of control over the supply of effort on the shop floor. But just as the structures of cooperative labor–management relations that had served British employers well in the nineteenth century were to become barriers to organizational transformation in the twentieth, so too would the labor–management relations that prevailed in the U.S. era of economic dominance prove problematic when a more powerful mode of developing and utilizing technology came on the scene.

Organizational Capabilities and Japanese Leadership

Over the past two decades, Japanese manufacturing has outperformed U.S. manufacturing in the mass production of consumer durables, particularly automobiles and electronic equipment. These are the industries in which the United States had its greatest international competitive advantages in the first six decades of this century. Having gained competitive advantage in the consumer-durable industries, Japanese manufacturing has also made great progress in vertically related capital-goods industries: machine tools, electrical machinery, and semiconductors. Now in the 1990s, there is no doubt that Japanese manufacturing has taken the leading role in the microelectronics-based third industrial revolution.

As was the case historically in the United States, the Japanese state has played an important role in protecting the home market to permit business organizations to develop and utilize their productive resources to the point that they could attain a competitive advantage in open international competition. But the Japanese state has also gone further. It has maintained a stable macroeconomic environment, including high levels of employment and a relatively equal distribution of income across sectors, thus enlarging the extent of the Japanese market for manufactured goods. It has created incentives for consumers and businesses to purchase goods (e.g., televisions and computers) that embody state-of-the-art technologies. It has limited the number of firms competing in major manufacturing industries, thus creating incentives for these firms to incur the high fixed costs necessary to attain a competitive advantage. It has promoted cooperative research and development among major Japanese competitors. It has ensured manufacturing corporations access to inexpensive finance. And the Japanese state has provided industry with a highly educated labor force to fill blue-collar, white-collar, and managerial positions (Anchordoguy 1989, Best 1990, chaps. 5–6, Johnson 1982, McCraw 1986).

But however important the role of the Japanese state is in shaping an environment conducive to economic development, the formulation of investment strategies and the building of organizational structures to carry them out has been left to private-sector enterprises. Over the long run these organizations have outperformed and, in my view, will continue to outperform their U.S. counterparts because of management coordination that extends beyond the limits of the planned coordination of the specialized division of labor as practiced under U.S. managerial capitalism. First, management coordination in Japan extends across vertically related enterprises (or units of financial control) to a much greater extent than it does in the United States. Second, within the dominant Japanese enterprise, management coordination extends further down the organizational hierarchy to develop the skills of male production workers—the type of workers whom, historically, American managers have been loathe to entrust with skills (see Lazonick 1990, chaps. 7–10). Both these extensions of management coordination significantly enhance the organizational capability available to Japanese enterprises (Abegglen and Stalk 1985).

The combination of far-reaching management coordination within private-sector manufacturing and the activist role of the state in creating an economic and social environment conducive to the emergence of innovative capitalist enterprises represents a qualitatively new mode of business organization in the evolution of capitalism.

The extent of the collectivization of interests under Japanese capitalism contrasts with the more limited planned coordination of the specialized division of labor under U.S. managerial capitalism and the virtual lack of planned coordination that existed during the days of British proprietary capitalism. But in the light of the success of U.S. managerial capitalism earlier in this century, it must be recognized that the social organization of the Japanese economy is not a completely new model of successful capitalist development. Rather, it is a more thoroughgoing elaboration of the model of management coordination that brought the United States to global leadership earlier in this century.

A fundamental institution of Japanese collective capitalism is the enterprise group, or *keiretsu*. The original enterprise groups in modern Japan were the family-controlled *zaibatsu* that led the development of heavy industry—particularly iron and steel and shipbuilding—from the turn of the century until World War II. The abolition of *zaibatsu* control in the aftermath of World War II ultimately left the enterprise groups intact. Shares of individual enterprises were distributed across industrial and financial companies, both within and across groups. These companies act as "stable shareholders" that seek neither high yields nor capital gains on their equity positions. Rather, they hold the shares for the sake of ensuring reinvestment in industry in general, which over the long run generates more business for the companies in the activities in which their competitive advantages lie (Ballon and Tomita 1988, Gerlach 1989).

Since the end of World War II, the largest of these corporate entities—Mitsubishi, Mitsui, and Sumitomo—shorn of family control, have remained powerful corporate actors in the Japanese economy, along with a few other large groups built up by either powerful banks or industrial enterprises such as Toyota and Sony that, having emerged as dominant in the automobile and electronics industries, can take the lead in the planned coordination of group activities, including setting up new vertically related enterprises as the need arises. Enterprise groups permit the core companies to enjoy the advantages that the vertical integration of production and distribution creates for the borrowing of technology and the implementation of process and product innovation, without enduring the disadvantages of unmanageable bureaucracies that stifle technological and organizational change. By circumventing the intrafirm organizational structure through subcontracting arrangements with satellite firms, the core company can pursue new investment strategies that require entrepreneurial initiative and leaps in technological capability.

The growth of enterprise groups gives core companies an opportunity for strategically locating more labor-intensive activities in smaller firms in which the technical specialists have direct proprietary interests in enterprise performance and in which control of the terms of employment and work conditions need not be shared with the enterprise unions that have become central to labor–management relations in the dominant companies. Although as subcontractors for the core enterprises, the satellite firms can in principle act independently, in practice the very success of the innovative strategies of the dominant enterprises and their commitment to maintaining long-term relations with their subcontractors leads the smaller firms to view themselves as members of an integrated organizational structure (Best 1990, chap. 5, Dore 1986, Smitka 1991).

Over time, some of these "satellites," if successful, can take on lives of their own,

as in the case of Fanuc, the company set up by Fujitsu to develop numerical control units for machine tools (Collis 1988). Even then, the very fact that one strong vertically related enterprise has emerged out of the development of another creates a continuing basis for cooperative investment policies while each builds its own internal organization. The organizational capability developed through intercompany cooperation within groups undoubtedly enhances the ability of firms from different groups to engage in cooperative research and development projects, as has been the case in the emergence of an internationally competitive Japanese computer industry (Anchordoguy 1989).

The ability to organize cooperative investment strategies *across* enterprises is enhanced by the structure of managerial decision making *within* enterprises. Consensus decision making—the *ringi* system—emphasizes the two-way flow of ideas and information up and down the corporate hierarchy. Consensus decision making grew out of the need of the rapidly growing *zaibatsu* of the early twentieth century to lure college graduates—products of a concerted effort by the state to create an educated elite—away from prestigious government posts. Considerable technical information was required from, and considerable authority had to be delegated to, these professional managers. Even in the cotton textile industry, which in Japan as in Britain and the United States played a major role in early industrialization, the recruitment of college graduates to serve as mechanical engineers was central to the achievement of high levels of productivity on the basis of inexpensive cotton and unskilled labor (Mass and Lazonick 1990, Morikawa 1989, Yonekawa 1984).

Ringi permits the knowledge and outlooks of the various division and department heads to become integral to the planning process itself. By formalizing a system of gathering input and approval from the various persons who will be responsible for overseeing the implementation of strategic decisions, *ringi* permits the identification and, if need be, accommodation within the organization of potential obstacles to the success of a strategy before strategic commitments have already been made. When operating effectively so that individual managers cannot circumvent the group process, consensus decision making eliminates competing centers of decision-making power within the organization that might otherwise undertake investments that have conflicting objectives. In effect, investment strategy and managerial structure are organizationally integrated.

At the same time, the process of consensus decision making not only provides a valuable source of information from below for top executives but also helps ensure that large numbers of more specialized managers on their way up the hierarchy are developing a general conception of organizational needs and capabilities. By promoting the transformation of technical specialists into general managers, consensus decision making enhances management coordination of the development and utilization of productive resources.

The institutional basis for the devolution of decision-making power from chief executives to a wider group that extends further down the formal hierarchy is permanent, or lifetime, employment. Japanese managers typically rise out of the ranks of "white-collar workers" who enter the firm after graduating from college. Like consensus decision making, the policy of permanent employment was extended to professional managerial personnel in the early twentieth century in order to attract them away from government service and to create the long-term attachments that would

make it worthwhile for the business enterprises to invest further in the recruits' training (Daito 1986).

Over time, however, the offer of permanent employment has been extended further down the organizational hierarchy. Before World War II, permanent employment was used as a strategy to transform "key" skilled workers *(oyakata)*—who, as highly mobile labor contractors, had recruited, trained, and supervised shop-floor labor—into permanently employed foremen who now performed the same functions, but with a long-term commitment to one particular company (Gordon 1985, Okayama 1983). In the early 1950s a strategy of substituting cooperative enterprise unions for the militant industrial unions that had arisen after World War II resulted in the extension of permanent employment status to all male blue-collar workers in the larger enterprises (Cusumano 1985, chap. 3).

Some argue that permanent employment is not a critical economic institution in Japan because "only" some 30 percent of the Japanese labor force have permanent employment status. But this figure, derived from the present proportion of the Japanese labor force that is unionized, includes virtually all males working for the dominant industrial enterprises, whether as blue-collar or white-collar employees. Within these dominant industrial enterprises, the most prevalent form of labor force segmentation is between women, who are generally excluded from permanent employment (although in recent years some university-educated women have gained access to it), and men. Moreover, many male industrial workers who do not have permanent employment status enjoy substantial employment security often amounting to de facto permanent employment because the smaller-sized firms for which they work have long-term organizational ties with core companies that in part owe their organizational integration and dominance to the institution of permanent employment (see Cannings and Lazonick, forthcoming, Lazonick 1993).

The phenomenal successes of these dominant business enterprises have in turn made it economically viable for the government to implement policies that lead to employment stability in small-scale enterprises in agriculture and retailing, even though the workers in these sectors would not be counted among the ranks of "permanent employees." In dynamic historical perspective, permanent employment in what have emerged as the dominant business enterprises has been central to Japan's rise to industrial leadership.

Japan's permanent employment functions both as a training system that develops the skills of employees in a planned and coordinated way and as an incentive system that elicits efforts of high quality and quantity from individuals. During the first decade of an employee's career, promotion and pay increases occur by gradual steps and by seniority: "Fast tracks" have been rare in the Japanese corporate enterprise. During this initial period, the company invests in considerable specialist training of its permanently employed personnel. In contrast with the American practice of applying the terms unskilled, semiskilled, and skilled to different types of jobs to be filled by different types of workers, the Japanese have used these terms to apply to the stages through which a particular worker passes during the first 10 years of employment. The company also provides more general training by rotating employees to different technical specialties within the enterprise and, at times, even within the enterprise group. When qualitatively new investment strategies require qualitatively new skills, the permanent employment system gives Japanese companies the incentive to invest in the retraining of mid-career personnel (Koike 1987).

The existence of permanent employment and the emphasis on seniority in promotion and rewards, particularly in the early years of an employee's career, encourages personnel to cooperate with one another in pursuit of the business organization's goals. It is only in mid-career that promotion on the basis of individual performance becomes important, although even then seniority continues to have some influence on promotion decisions and remains the predominant determinant of salary increases. To encourage individual creativity and initiative, non-seniority-based incentives are also used, in particular the possibility of retaining an influential position in the company after the normal retirement age. But especially when the technology is complex and costly, economic success depends on not only individual initiative but also cooperative effort, and collective rewards may supply the appropriate incentive mechanisms. Backed by the bargaining power of enterprise unions, all permanent employees receive semiannual bonuses, which typically constitute one-third of an individual's annual earnings but are adjusted according to the profitability of the firm and thus its ability to pay (Abegglen and Stalk 1985, chap. 8, Dore 1987, chap. 4).

Through the organizational commitments inherent in permanent employment, the skills and efforts of male blue-collar workers have been made integral to the organizational capabilities of their companies, thus enabling the Japanese to take the lead in innovative production systems such as just-in-time inventory control, statistical quality control, and flexible manufacturing. Critical to the functioning of these production systems is the willingness of Japanese managers to develop the skills of shop-floor workers and then to depend on the initiative of these workers to exercise their skills. The recent success of Japanese mass producers in introducing flexible manufacturing systems owes much to the fact that for decades before the introduction of the new automated technologies, blue-collar workers were granted considerable discretion to monitor and adjust the flow and quality of work on the shop floor (Cusumano 1985, chaps. 5–6). Moreover, the ability of Japanese managers to develop the skills of blue-collar workers owes much to the existence for over a century of a national system of mass education designed specifically to ensure that the work forces of the future possess the general cognitive competence that advanced production technology requires (Dore and Sako 1989, Odagiri and Goto 1993).

Japanese practice is in marked contrast with the U.S. managerial concern with using technology to take skills and the exercise of initiative *off* the shop floor, a practice that goes back to the late nineteenth century when the success of U.S. mass production was dependent on breaking the power of craft workers and transferring to management the sole right to plan and coordinate the flow of work. Despite the existence of militant unionism in Japan at various points in the first half of the twentieth century, there was never any attempt by Japanese workers or their organizations to establish craft control on the shop floor (Gordon 1985, pt. 1). As a result, Japanese employers never had to confront the established craft positions of workers, as was the case with U.S. manufacturers around the turn of the century, nor did they have to resign themselves to simply leaving skills on the shop floor in the hands of autonomous craftsmen, as was the case in Britain.

Historically, the problem facing Japanese employers was not to rid themselves of

skilled workers who might use their scarce skills to establish craft autonomy on the shop floor. Rather, their problem coming into the twentieth century was the absence of a self-generating supply of workers with industrial skills. To overcome this constraint, industrial capitalist employers had to make the investments that would transform unskilled workers into skilled workers and then retain them by integrating them into the organization. To be sure, these same employers generally accepted the institutionalization of permanent employment, enforced by enterprise unions, only when compelled to do so by the threat of militant unionism after World War II. In practice, however, out of the exigencies of developing and utilizing workers with industrial skills, the social foundations for the current permanent employment system were laid in Japan decades before the long-term commitment of the enterprise to the blue-collar worker became a recognized organizational feature of Japanese industry.

I must emphasize once again that the long-term relation between the business enterprise and its employees is not a social invention of the Japanese. Since the late nineteenth century, within managerial structures, such commitment of the organization to the individual, and of the individual to the organization, was essential to the foundation of the formidable productive powers of U.S. managerial enterprises. In a successful enterprise, the managerial structure represented a highly integrated community of interests that permitted a highly complex specialized division of labor to coalesce into a powerful collective force.

What the Japanese have done is to build on these communities of interest within the enterprise, by extending membership in the community not only to managers but also to nonmanagerial personnel. In contrast, to this day American managers cling to the ideology that the blue-collar worker is an easily dispensable "hourly" employee, even though the provision of stable long-term employment to these workers has been both cause and effect of the growth of major U.S. enterprises. What the Japanese have also done is to build these communities of interest across legally defined firms, thus tying the interests of the shareholders of any particular enterprise to the success of large groups of enterprises and, indeed, to the economy as a whole. In contrast, the prevailing managerial ideology in the United States is that the industrial corporations are run in the interests of shareholders, even though the separation of share ownership from managerial control has been both cause and effect of the growth of major U.S. enterprises.

The United States Is Falling Behind

In the 1960s and 1970s, as the Japanese mounted their global challenge in consumer electronics and automobiles, Americans were inclined to attribute Japan's competitive advantage to low-wage labor and long work hours. This response was reminiscent of British views of Japan's sources of competitive advantage in the 1920s, when the Japanese cotton textile industry was taking away market share from Britain's leading export industry. During the 1930s, however, as the Japanese cotton textile industry continued its rise to global dominance, foreign observers who visited Japanese textile mills noticed that its progress in cotton textiles depended on much more than cheap labor and long hours. Japan's success also depended on the development of an indigenous textile technology and its implementation within a highly managed structure of business organization (Mass and Lazonick 1990, Robertson 1990).

Indeed, the organizational capabilities that enabled Japan to gain a competitive advantage in cotton textiles in the decades before World War II bore a remarkable resemblance to the organizational capabilities that characterized Japan's consumer electronics and automobile industries in the decades after World War II. Low wages and long hours did not hurt Japan's competitive position in either of these periods. But foreign observers discovered as they visited Japanese automobile plants in the 1980s that the foundation of Japan's sustained competitive advantage was its ability to develop and utilize technology.

Now that Japan's wages have risen to U.S. levels and steps are being taken to cut the hours of labor (see various recent issues of the *Japan Labor Bulletin*), the dynamic interaction of organization and technology sustains Japan's competitive advantage not only in consumer durables and automobiles but also in vertically related capital-goods industries. A growing case-study literature on the sources of Japanese competitive advantage reveals that these industries did not catch up to the West simply by borrowing foreign technology (Anchordoguy 1989, Collis 1988, Cusumano 1985, 1991, Dore 1990, Tyson and Yoffie 1991, Vietor and Yoffie 1991, Womack, Jones, and Roos 1991; see also Mass and Lazonick 1990). Just as was the case with Britain in the last half of the nineteenth century and the United States in the first half of the twentieth century, the basis of Japan's competitive advantage over the past few decades has been the development and utilization of productive resources (Freeman 1987, Odagiri and Goto 1993).

I have already reviewed how, in the twentieth century, Britain failed to transform its educational, financial, and social systems to respond to the competitive challenges from abroad. The institutional structures that had enabled Britain to gain international industrial leadership in the nineteenth century no longer sufficed in the twentieth century. The British economy, of course, did not collapse. In the old staple industries, it continued to compete on the basis of traditional organizations and technologies (Elbaum and Lazonick 1986). In doing so, however, it failed to transform the educational, financial, and social systems to support the emergence and growth of managerial capitalism, thus constraining the development and utilization of technology even in new industries (Lazonick 1990, chap. 6). Even if the nation's fate was not a plunge into poverty, over the long run British incomes were lower on average than were those of its most successful international rivals.

Does a similar fate await the United States? The economic history textbooks of the mid-twenty-first century may give us the full explanation (although I should point out that even the standard economic history textbooks of the late twentieth century do not have a good explanation of the rise of the United States to industrial dominance in the first half of this century). But what can one say about what is happening to the competitive position of U.S. industry in the 1990s? (For recent surveys, see Dertouzos, Lester, and Solow 1989, Franko 1991, Kupfer 1992, U.S. Congress 1991.) In industries such as pharmaceuticals, forest and food products, aerospace, and chemicals in which the United States is still ahead, is it developing the technological and organizational capabilities required to sustain its existing competitive advantages in the future? And in industries such as electronics, metals, motor vehicles, and industrial machinery in

which the United States has fallen behind, will its industrial enterprises be able to reorient their investment strategies and organizational structures toward generating technological innovations that can enable the United States to catch up? Or will strategic decision makers in these lagging industries be content with what I have elsewhere (Lazonick 1991, chap. 3) called *adaptive responses* that seek to reap the returns of past investments rather than invest in the technologies and organizations that can generate returns in the future?

In the concluding pages of this chapter, I shall provide only a broad outline of a number of apparent weaknesses of U.S. industrial enterprises engaged in global competition. In doing so, it is useful to distinguish between economic activities that *develop* productive resources and those that *utilize* them (see Lazonick 1991, chap. 3). The development of productive resources can generate superior technologies. But in doing so, the enterprise, industry, or national economy incurs fixed costs that can result in low unit costs only if the resources that have been developed are sufficiently utilized. Without the development of productive resources, one cannot have technological innovation. But without the utilization of productive resources, access to superior technologies cannot result in economic success.

The development of productive resources requires both long-term finance and highly specialized scientific and technical knowledge. Throughout the twentieth century, U.S. enterprises that have been in the forefront of global competition have been well endowed with both. I have already recounted how, as an integral element of the U.S. rise to industrial leadership during the first half of the century, the separation of ownership from control in major U.S. industrial corporations gave professional managers the power to retain earnings as the financial foundation for long-term investment strategies. When necessary, they leveraged these retained earnings by means of long-term bond issues at relatively low rates of interest.

From the 1950s, however, this commitment of internal finances to long-term growth began to erode as managers became owners and as institutional investors collectivized the power of shareholders (see Lazonick 1992a). The result was the shareholders' increasing ability to extract financial resources from the very industrial enterprises that were best positioned, financially, organizationally, and technologically, to undertake innovative responses to international competitive challenges. The proportion of after-tax corporate profits distributed as dividends was already high at 44 percent in the 1960s and 45 percent in the 1970s. Yet it rose to 60 percent in the 1980s. As total after-tax profits fell and total dividends climbed, the payout ratio rose to 72 percent in 1990 and 76 percent in the first three-quarters of 1991 (*Economic Report of the President 1992,* p. 397). In regard to external finance, real interest rates on Moody's Aaa corporate bonds rose from an average low of 0.39 percent in 1950–54 to an average high of 2.21 percent in 1965–69. In 1980–84, these yields were 5.43 percent, and in 1985–89, 6.15 percent. Although long-term interest rates have abated somewhat in the early 1990s, they are still at much higher real levels than for most years before the 1980s (*Economic Report of the President 1992,* p. 378).

The ability of portfolio investors to extract high yields from U.S. industry derives from the rise of a powerful market for corporate control. It is true that the much-publicized hostile takeovers of the 1980s did not affect industries that are R&D intensive, and some financial analysts have concluded, therefore, that the rise of the market for corporate control has had no adverse impact on the competitive performance of the highest value-added sectors of the U.S. economy. But to focus on these headline-making events is to misread what the market for corporate control has been all about. What it has not been about is using the ownership rights vested in shareholders to gain control over the *management* of enterprises. What it has been about is using those ownership rights to gain control over the *accumulated resources* of enterprises. The objective of participants in the market for corporate control is to extract existing value from industrial corporations, by either tapping what they call the "free cash flow" or selling off businesses. Their objective is not to create value for the future.

From this perspective, one can begin to understand how the financial environment of the 1980s adversely affected the long-term investment strategies of U.S.-based industrial enterprises in general, and especially those in high-technology industries in which technological innovation requires long-term financial commitment. During the 1980s all publicly traded U.S. industrial corporations felt under pressure to pay out a much higher proportion of their retained earnings as dividends than they had historically. Even a company as immune from hostile takeover as IBM has claimed that in the 1980s and early 1990s it was not able to retain sufficient earnings to finance the necessary long-term investments to compete globally.

This effusion and diffusion of critical industrial finance from the U.S. industrial enterprises best positioned to develop superior productive resources have gone forward not only under pressure from Wall Street but also with the cooperation of the top managers of industrial corporations. They have benefited handsomely from accommodating the rise of the market for corporate control. Although the real after-tax earnings of the average American worker fell by about 13 percent during 1970s and 1980s, the real after-tax compensation of the average CEO of a major U.S. company increased by 400 percent (Crystal 1991, p. 27).

The higher levels of compensation of U.S. executives are particularly evident when compared with their counterparts abroad. In 1990 the total compensation of CEOs of the 30 largest U.S. corporations was, on average, $3.1 million. For British CEOs, the comparable figure was $1.1 million, for French and German CEOs $0.8 million, and for Japanese CEOs $0.5 million (*New York Times,* January 20, 1992). Much more than in other nations (although much the same thing has been going on in Britain over the past two decades), the top managers of major U.S. corporations have been using their control over corporate revenues to benefit themselves at the expense of their organizations.

In terms of a commitment to innovation, the problem with the explosion in the pay of top managers is not so much the amount of financial resources that they extract from the enterprises that employ them. Rather, the problem is that, as the key decision makers on the investment strategies of their enterprises, the overcompensation of top corporate managers enables them to win economically even if their enterprises, and most of the people in them, lose.

We should also mention that such behavior is totally absent in dominant Japanese corporations. In Japan, strategic managers can benefit from neither the sale of stock nor, as was the case with "golden parachutes" in the United States in the 1980s, the sale of executive offices. Even if top managers in Japan own shares on their own account, their dividend income is minimal because Japanese companies use their financial resources to further the innovative capabilities of the organization, not to fill the pockets of their shareholders. The personal incomes of top managers are tied to

the hierarchical structure of compensation within the enterprise, and their strategic behavior is disciplined by their career-long membership in the organization (see Abegglen and Stalk 1985, chaps. 7–8, Ballon and Tomita 1988, Dore 1987, chap. 6).

The financial revolution of the 1980s may have had adverse impacts on the organizational capabilities of U.S. corporations. While hostile takeovers and forced downsizings of the 1980s made career paths for technologists in industrial enterprises less secure, alternative employment opportunities arose in financial pursuits that highly educated entrants to the labor force found difficult to ignore (see, e.g., McCartney 1992). Even though Wall Street began laying off personnel after October 1987, salaries in the financial sector remained inordinately high. In 1989 the average compensation (salary and bonus) for the more highly paid stratum of corporate-finance and merger-and-acquisition specialists at the top ten securities firms was $450,000 if they had entered the firm in 1983, $300,000 if they had entered in 1986, just over $200,000 if they had entered in 1987, and about $140,000 if they had entered in 1988. The average compensation of the lower-paid specialists ranged from just under $300,000 if they had entered in 1983 to $100,000 if they had joined the firm in 1988 (*Wall Street Journal*, December 8, 1989, pp. C1, C5). During the 1980s it was not only with the Japanese that industrial America could not compete.

The recession of the late 1980s and early 1990s greatly accelerated the tendency that had been building since the early 1980s to terminate the employment of salaried personnel (Nussbaum 1992; see also Nussbaum 1986). To some (as yet undetermined) extent, this downsizing represents a necessary rationalization of overstaffed corporate bureaucracies. There is a danger, however, that forced downsizings might be diminishing the abilities of U.S. industrial enterprises to pursue innovative investment strategies. The inability of the enterprises to offer long-term employment security and income growth even to its salaried employees may reduce the organizational commitment of those salaried employees whom the company retains. As shown by the recent experience of many dominant U.S. companies (including IBM), the most able and experienced employees may look outside the company for employment. If and when they do in fact leave the company, they take with them skills acquired through in-house training and experience. Consequently, the company not only loses its investments in human resources but often finds that these resources are subsequently at the service of its competitors. The loss of human resources as well as competitive advantage makes the company reluctant henceforth to invest in the skills of its key personnel.

The long-term result of such responses is an erosion of organizational capabilities within the enterprise without any guarantee that the reduction of investment in human capabilities will be replaced elsewhere in the economy. Evidence of the extent of this perverse dynamic within U.S. industrial corporations, and its impact on enterprise performance, requires careful case studies of the organizational evolution of major U.S. enterprises (for well-researched journalistic studies, see Holland 1989, Keller 1989).

A failure of U.S. industry to invest in scientific and engineering capabilities is not, however, evident in the available aggregate data. In 1988, the employment of engineers in the United States stood at 2.7 million, an increase of 121 percent from 1970, and four-fifths of these engineers were employed by industry (U.S. Department of Commerce 1991, p. 595). From 1970 to 1988, the number of scientists and engineers employed in R&D in the United States increased from 544,000 to 949,000, or by 74 percent, and those employed specifically by industry increased from 376,000 to 717,000, or by 91 percent (U.S. Department of Commerce 1991, p. 594). Over this period, industry increased somewhat its expenditures (in real terms) per full-time equivalent scientist and engineer that it employed.

The number of scientists and engineers per 10,000 labor force participants in the United States was 65 in 1970 and 66 in 1986 (U.S. Congress 1991, p. 210). The Japanese, who had only half the number of scientists and engineers per 10,000 labor force participants as the United States in 1970, had caught up with the United States by the mid-1980s. During the last half of the 1980s, R&D expenditure as a percentage of GNP were about equivalent in these two nations, about 2.8 percent (U.S. Department of Commerce 1991, p. 591). By themselves, these data are consistent with the convergence hypothesis that the challenge to U.S. productivity leadership is just a matter of previously less advanced industrial nations catching up.

Even in terms of the aggregate data, however, the much greater role of the military in U.S. R&D expenditures (about 30 percent of the total for the United States and virtually nothing for Japan) reduces the impact of U.S. R&D investment because of a lack of spillover from military to civilian applications (see Nelson 1990). One reason for the lack of spillover in particular and of the decline in U.S. leadership in technological development more generally may be a neglect of long-term generic (or "pre-competitive") research at the corporate level of major industrial enterprises, with the R&D focus devoted overwhelmingly to product and process development at the divisional level. To document the changing character of the U.S. R&D effort, more systematic research is needed (for the most useful surveys to date, see Mowery and Rosenberg 1989, 1990).

Evidence from Japan (based on lectures by Japanese research executives at Harvard's Kennedy School of Government) is that its major high-technology corporations that in the past emphasized applications of technology as part of the process of catching up are now using some of the returns from catching up to finance central research laboratories in which to generate knowledge about the technologies of the future. As for the present, analyses of patent citations by Francis Narin and his associates show that by the beginning of the 1990s, Japan was forging ahead in virtually every high-technology field (Narin and Olivastro 1991; see also Broad 1991).

If a reversal in long-term technological capability between U.S. and Japanese industrial corporations is taking place, it may also be affecting the different ways in which U.S. and Japanese industrial enterprises are using the unparalleled public-sector research capabilities of major American universities. Unlike the United States, where over a century ago, the U.S. federal government, through the Department of Agriculture, began funding basic research, the Japanese never developed universities for this purpose. Instead, as part of the process of catching up, Japanese companies applied scientific knowledge generated abroad to Japanese industrial requirements. But now that they have caught up, Japanese high-technology companies have been establishing close links between U.S. universities and their central research laboratories. U.S. industrial corporations, in contrast, appear to be increasingly interested in using university research capabilities for applied rather than basic research (for debate on these issues, see Etzkowitz 1991). If so, it may be that in the future Japanese companies will use the basic-research capabilities of U.S. universities to help them forge ahead in high-

technology industries such as aerospace, medical equipment, chemicals, and biotechnology, and by failing to use these basic-research capabilities, U.S. companies will forgo a powerful means of catching up.

As for an industry such as automobiles in which the United States clearly fell behind in the 1980s, what the Japanese have shown in recent years is their ability to gain competitive advantage even when manufacturing in the United States, by transplanting the modes of shop-floor work organization that have already worked so well in generating exports from Japan (Kenney and Florida 1991). A key component to Japanese success in the United States has been the willingness of Japanese transplants to invest in the capabilities of shop-floor workers, as part of a broader investment strategy to build what Michael Porter (1990) calls a "home base" outside Japan (see also Lazonick 1993). Yet these are precisely the types of investments that dominant U.S. mass producers have been reluctant to make in the United States (see Lazonick 1990, chap. 9). In competition with the Japanese over the past quarter-century, the organization of work on the shop floor has been the Achilles heel of U.S. manufacturing (see Lazonick 1990; see also Florida and Kenney 1990). With its managerial structures in place, American industry may have entered the second half of the twentieth century in the forefront in the development of productive resources. But its weakness lay in the utilization of productive resources-manufacturing processes in which large numbers of shop-floor workers had to interact with costly plant and equipment.

Into the 1960s, U.S. enterprises dominated in the mass production of automobiles and consumer electronics by investing in special-purpose machinery that then required the cooperative efforts of masses of relatively unskilled labor to generate high levels of productivity. Aided by a centralized union movement, these enterprises secured a degree of shop-floor cooperation from production workers by offering them more employment security and better pay than could be found elsewhere in the U.S. economy. But the major industrial enterprises did not give these blue-collar workers substantive training. Nor, as we have seen, did they ever make explicit, and hence more secure, the long-term attachment of the "hourly" employee to the enterprise. Without this commitment of the organization to the individual, one could not expect the commitment of the individual to the organization that might have enabled U.S. mass producers to respond quickly and effectively to the Japanese challenge. In terms of the organization of work on the shop floor, the strength of that challenge derived in large part from investments in the skills of blue-collar workers (Cusumano 1985).

Production workers in the United States receive much less training and tend to be much less skilled than their counterparts in Japan or Germany (see Kazis 1989). As I have already stated, the de-skilling of shop-floor work in the United States arose out of successful managerial strategies to introduce mass production technologies that could take control over work organization out of the hands of craft workers and instead use inexperienced and untrained immigrant labor (see Lazonick 1990, chap. 7). The development and utilization of these mass production technologies required investment in skills. But those who received extensive training were better-educated technical specialists who were integrated into the managerial structure as salaried employees with the potential for rising up the managerial hierarchy. It was on this organizational and technological foundation that U.S. industrial enterprises achieved their positions of global industrial leadership.

The problem for the United States is that it has been in those mass production

industries in which it was once preeminent that the Japanese have changed the organizational and technological foundations of industrial leadership by developing and utilizing the skills of production workers as well as technical specialists. They have done so, moreover, on the basis of a mass education system that since the late nineteenth century has provided the preemployment cognitive foundations for the subsequent skill development of both production workers and technical specialists in the workplace.

In the United States, the unskilled shop-floor worker is the product of an inferior primary and secondary education that sufficed as long as the U.S. model of skilled technical specialists and unskilled production workers yielded a global competitive advantage. But the educational requirements of industrial leadership have changed. Numerous comparisons of educational achievement among the OECD nations have shown that the United States ranks at or near the bottom (see Ferleger and Mandle 1992, Kazis 1989).

One might expect that a nation such as the United States, with its historic commitment to equal opportunity through mass education, would quickly respond to the changed educational requirements of global competition by upgrading the cognitive capabilities of its future work force. In the past, the captains of industry have recognized the need to improve the education of the masses. Indeed, much of the funding of mass schooling after the turn of the century came from the philanthropic foundations established by major industrialists, John D. Rockefeller and Andrew Carnegie foremost among them. That was, however, an era when the U.S. economy was rising to its position as global industrial leader. Despite a general consensus in the United States that investments in mass education are the top priority for industrial regeneration, the wealthiest Americans have shown little interest in making the funding available, through either philanthropic means or tax-financed government expenditures (see Reich 1991, chap. 24).

The failure to provide high-quality mass education in turn constrains attempts by industrial employers to develop the skills of production workers to complement advanced process technologies. U.S. industry underinvests in the training of its shop-floor workers, both relative to its own investments in managerial personnel and the investments of its international competitors. Given this lack of in-house training and the difficulty in utilizing advanced process technologies (e.g., robotics) on the shop floor, U.S. industrial enterprises tend to search for alternative, less technologically complex, investment strategies.

If present-day U.S. industrialists are unwilling or unable to take the lead in making the necessary educational and training transformations, one might expect that the workers themselves, through their unions, would apply pressure on business and government to make such investments in human capabilities. In many Western European nations and to some extent in Japan, unions play precisely this role, be it through direct participation in investment decisions at the enterprise level or through political representation in local and national governments. In the United States, however, the 1970s and 1980s witnessed a dramatic weakening of the labor movement at precisely the time when unions needed to be brought into the investment decision-making process in both the private and public sectors. To do so, the adversarial business unions of the 1950s and 1960s needed to be transformed into partners of industry. Instead, through plant closings and legal rulings, the union movement was weakened. The

sharp decline of union membership from over 20.1 percent of wage and salary workers in 1983 to 16.4 percent in 1989 reflects a longer-run trend that manifests the erosion of organizational capabilities in the United States (U.S. Department of Commerce 1991, p. 425).

The weakening of the U.S. labor movement is also reflected in the decline in the real wages of U.S. manufacturing workers over the past two decades. Real hourly wages have been falling in manufacturing since the late 1970s, and from 1978 to 1990 real weekly wages declined by well over 10 percent (U.S. Congress 1991, chap. 1). This drop in the real wages of manufacturing workers manifests a growing inequality in income distribution that characterized the 1980s and persists in the 1990s. More than that, however, it also demonstrates an erosion of organizational capabilities. Within a major manufacturing enterprise (which was the type most apt to be unionized), well-established arrangements for sharing productivity gains with workers provide the social basis for generating the gains to be shared (Lazonick 1990, chaps. 8–10 and app.). The willingness of workers to supply high levels of effort increases productivity, and the cooperation of workers in the utilization of productivity-enhancing process technologies creates incentives for employers to invest in these technologies. A loss of control over the supply of effort on the shop floor, therefore, makes employers reluctant to invest in advanced machine technologies and in the skills of shop-floor workers needed to complement these machines. The long-run decline in real manufacturing wages reveals these perverse impacts of prevailing labor–management relations on shop-floor technological change and productivity growth.

In those industries in which the United States has fallen behind, therefore, the social organization of enterprise, industry, and the economy prevents it from catching up. In those industries in which the United States has remained ahead, more powerful modes of social organization abroad may lead to the emergence of new international leaders. A half-century after the fact, the British are now beginning to understand the role of social organization in their own long-run economic decline. Americans can wait, if they so wish, for future economic historians to document fully when, how, and why their nation entered into a long-term industrial decline. Or they can begin now to think seriously about the transformations in the social organization of the American economy that international competition requires.

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