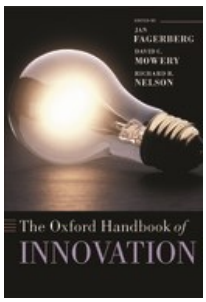

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CHAPTER

2 The Innovative Firm

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Abstract

The types of strategy, finance, and organization that support innovation process change over time can vary markedly across industrial activities and institutional environments. The innovative firm must, therefore, be analyzed in a comparative–historical perspective. This article presents and illustrates a framework for analyzing the "social conditions of innovative enterprise" in the comparative and historical experiences of the advanced economies. It builds upon prominent theories of the innovative firm. Furthermore, it focuses on the regional agglomerations of capabilities, now known as "Marshallian industrial districts," that, by the late nineteenth century, had enabled Britain to emerge as the world's first industrial nation. This article also provides a perspective on the emergence and growth of the US managerial corporation that propelled the US economy to international industrial leadership during the first half of the twentieth century.

Keywords: strategy, finance, organization, innovative firm, Marshallian industrial districts

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2.1 Introduction

WHAT makes a firm innovative? How have the characteristics of innovative firms changed over time? To address these questions, one requires a conceptual framework for analyzing how a firm transforms productive resources into goods and services that customers want at prices they can afford. To make this productive transformation, a firm must engage in three generic activities: strategizing, financing, and organizing. The types of strategy, finance, and organization that support the innovation process change over time and can vary markedly across industrial activities and institutional environments at any point in time. The innovative firm must, therefore, be analyzed in comparative–historical perspective. This chapter presents and illustrates a framework for analyzing the "social conditions of innovative enterprise" in the comparative–historical experiences of the advanced economies.

Section 2.2 builds upon prominent theories of the innovative firm to derive the "social conditions of innovative enterprise" framework. Section 2.3 focuses on the regional agglomerations of capabilities, now known as "Marshallian industrial districts," that, by the late nineteenth century, had enabled Britain to emerge as the world's first industrial nation. Section 2.4 provides a perspective on the emergence and growth of the US managerial corporation that propelled the US economy to international industrial
p. 30 leadership during the first half of the twentieth century.[1] ↳ Over the past few decades, the greatest challenges to the US managerial corporation have come from Japan. Section 2.5 identifies the social conditions of innovative enterprise that have characterized the Japanese model, while Section 2.6 outlines the distinctive characteristics of the US New Economy firm that has gained competitive advantage in a number of critical product markets in the information and communication technology (ICT) industries. Section 2.7 draws some general conclusions from this essay's comparative–historical perspective concerning strategy, finance, and organization in the innovative firm, and the methodology for studying these phenomena.

2.2 Social Conditions of Innovative Enterprise

Firms strategize when they choose the product markets in which they want to compete and the technologies with which they hope to be competitive. Firms finance when they make investments to transform technologies and access markets that can only be expected to generate revenues sometime in the future. Firms organize when they combine resources in the attempt to transform them into saleable products. To strategize, finance, and organize is not necessarily to innovate. By definition, innovation requires learning about how to transform technologies and access markets in ways that generate higher quality, lower cost products. Learning is a social activity that renders the innovation process uncertain, cumulative, and collective (O'Sullivan 2000*b*). The innovation process is uncertain because, by definition, what needs to be learned about transforming technologies and accessing markets can only become known through the process itself. By investing in learning, an innovative strategy confronts the uncertain character of the innovation process. The innovation process is cumulative when learning cannot be done all at once; what is learned today provides a foundation for what can be learned tomorrow. Investments in cumulative learning, therefore, require sustained, committed finance. The innovation process is collective when learning cannot be done alone; learning requires the collaboration of different people with different capabilities. Investments in collective learning, therefore, require the integration of the work of these people into an organization.

What is the theory of the firm that can comprehend how strategizing, financing, and organizing can support the innovation process? Over the past century, the theoretical efforts of economists have focused mainly on
p. 31 the optimizing firm rather than the innovating firm. The optimizing firm takes as given technological ↳ capabilities and market prices (for inputs as well as outputs), and seeks to maximize profits on the basis of these technological and market constraints. In sharp contrast, in the attempt to generate higher quality, lower cost products than had previously been available, and thus differentiate itself from competitors in its industry, the innovating firm seeks to transform the technological and market conditions that the optimizing firm takes as "given" constraints. Hence, rather than constrained optimization, the innovating firm engages in what I call "historical transformation," a mode of resource allocation that requires a theoretical perspective on the processes of industrial and organizational change (Lazonick 2002*a*).

The distinction between the innovating and optimizing firm is implicit in the work of Alfred Marshall, whose *Principles of Economics*, published in eight editions between 1890 and 1920, placed the theory of the firm at the center of economic analysis. Although Marshall's followers used his arguments to construct the theory of the optimizing firm that remains entrenched in economics textbooks, Marshall (1961: 315) himself

displayed considerable insight into the dynamics of the innovating firm, as revealed in the following passage:

> An able man, assisted by some strokes of good fortune, gets a firm footing in the trade, he works hard and lives sparely, his own capital grows fast, and the credit that enables him to borrow more capital grows still faster; he collects around him subordinates of more than ordinary zeal and ability; as his business increases they rise with him, they trust him and he trusts them, each of them devotes himself with energy to just that work for which he is specially fitted, so that no high ability is wasted on easy work, and no difficult work is entrusted to unskillful hands. Corresponding to this steadily increasing economy of skill, the growth of his firm brings with it similar economies of specialized machines and plants of all kinds; every improved process is quickly adopted and made the basis of further improvements; success brings credit and credit brings success; success and credit help to retain old customers and to bring new ones; the increase of his trade gives him great advantages in buying; his goods advertise one another and thus diminish his difficulty in finding a vent for them. The increase of the scale of his business increases rapidly the advantages which he has over his competitors, and lowers the price at which he can afford to sell.

What then constrains the growth of such a firm? In *Industry and Trade*, published in 1919, Alfred Marshall acknowledged that over the previous decades the large-scale enterprise had become dominant in advanced nations such as the United States and Germany. He invoked, however, the aphorism, "shirtsleeves to shirtsleeves in three generations" (Marshall 1961: 621) to explain the limit to the growth of the firm that would prevent a small number of large firms from dominating an industry. An owner-entrepreneur of exceptional ability would found and build a successful firm. In the second generation, control would pass to descendants who could not be expected to have the capabilities or drive of the founder, and as a result the firm would grow more slowly or even stagnate. The third generation would lose touch with the innovative legacy of the first generation, and the firm would wither away in the face of new entrepreneurial competition.

p. 32 Writing in the first decades of the twentieth century, Joseph Schumpeter (1934) also focused on the innovative entrepreneur who, by creating "new combinations" of productive resources, could disrupt the "circular flow of economic life as conditioned by given circumstances." In effect, Schumpeter was arguing that, through entrepreneurship, which he called the "fundamental phenomenon of economic development," innovating firms could challenge optimizing firms, and thereby drive the development of the economy. In 1911, when he first published *The Theory of Economic Development* (in German), Schumpeter, like Marshall, viewed the innovative firm as the result of the entrepreneurial work of an extraordinary individual. Over the subsequent decades, however, as Schumpeter observed the actual development of the leading economies, he came to see the large corporation as the innovating firm, engaged in what he called a process of "creative destruction"; the creation of new modes of productive transformation destroyed existing modes that had themselves been the result of innovative enterprise in the past.

In *Capitalism, Socialism, and Democracy*, first published in 1942, Schumpeter (1950: 118, 132) argued that "technological 'progress' tends, through systemization and rationalization of research and management, to become more effective and sure-footed" as it is undertaken as "the business of teams of trained specialists who turn out what is required and make it work in predictable ways." In a series of major works, Alfred Chandler (1962, 1977, 1990) documented the rise of the managerial corporation in the United States from the last decades of the nineteenth century, the evolution of its multidivisional structure from the 1920s, and the emergence of managerial enterprise in Britain and Germany. In *The Theory of the Growth of the Firm*, first published in 1959, Edith Penrose (1995) conceptualized the modern corporate enterprise as an organization that administers a collection of human and physical resources. People contribute labor services to the firm,

not merely as individuals, but as members of teams who engage in learning about how to make best use of the firm's productive resources—including their own.

At any point in time, this learning endows the firm with experience that gives it productive opportunities unavailable to other firms, even in the same industry, that have not accumulated the same experience. The accumulation of innovative experience enables the firm to overcome the "managerial limit" that in the theory of the optimizing firm causes the onset of increasing costs and constrains the growth of the firm (Penrose 1995: chs. 5, 7, and 8). The innovating firm can transfer and reshape its existing productive resources to take advantage of new market opportunities. Each move into a new product market enables the firm to utilize unused productive services accumulated through the process of organizational learning. These unused productive services can provide a foundation for the growth of the firm, through both in-house complementary investments in new product development and the acquisition of other firms that have already developed complementary productive services.

p. 33 From the 1980s many business school academics, working in the strategy area, cited Penrose's 1959 book as an intellectual foundation for a "resource-based" view of the firm. Resource-based theory focused on the characteristics of valuable resources that one firm possessed and that competitor firms found it difficult to imitate. Resource-based theory, however, provided no perspective on why and how some firms rather than others accumulated valuable and inimitable resources, or indeed what made these resources valuable and inimitable (see Lazonick 2002*a*). Independently of the resource-based perspective, however, Richard Nelson and Sidney Winter (1982) fashioned a theory of the persistence of the large industrial corporation based on organizational capabilities, characterized by tacit knowledge and embedded in organizational routines, thus adding a cumulative dimension to the theory of the firm. Drawing on a highly eclectic set of sources from a number of disciplines, Bruce Kogut and Udo Zander (1996: 502) argued that "[f]irms are organizations that represent social knowledge of coordination and learning," thus emphasizing the collective dimension in the theory of the firm.

In "Why Do Firms Differ, and How Does It Matter?" Nelson (1991: 72) argued that "it is organizational differences, especially differences in abilities to generate and gain from innovation, rather than differences in command over particular technologies, that are the source of durable, not easily imitable, differences among firms. Particular technologies are much easier to understand, and imitate, than broader firm dynamic capabilities." David Teece, Gary Pisano, and Amy Shuen (1997: 516) defined "dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." They also argued that the firm's strategy entails choosing among and committing to long-term paths or trajectories of competence development (Teece at al. 1997: 524). Whereas the firm's asset positions determine its competitive advantage at any point in time and its evolutionary path constrains the types of industrial activities in which a firm can be competitive, its organizational processes transform the capabilities of the firm over time.

While Teece et al. (1997: 519) stressed the importance of learning processes that are "intrinsically social and collective," their dynamic capabilities perspective lacks social content. The framework does not ask what types of people are able and willing to make the strategic investments that can result in innovation, how these strategic decision makers mobilize the necessary financial resources, and how they create incentives for those people within the firm's hierarchical and functional division of labor to cooperate in the implementation of the innovative strategy. These questions about the roles of strategizing, financing, and organizing in the innovating firm are at the center of what Mary O'Sullivan and I have called the "social conditions of innovative enterprise" perspective (Lazonick and O'Sullivan 2000; O'Sullivan 2000*b*; Lazonick 2002*b*).

This perspective asks how and under what conditions the exercise of strategic control ensures that the
p. 34 enterprise seeks to grow using the collective processes and ↳ along the cumulative paths that are the

foundations of its distinctive competitive success. The perspective emphasizes the role of human agency in determining whether and how the enterprise accumulates innovative capability, and thus adds an explicitly social dimension to work on "dynamic capabilities." Specifically, strategic control determines how strategic decision makers choose to build on "asset positions"; financial commitment determines whether the enterprise will have the resources available to it to persist along an "evolutionary path" to the point where its accumulation of innovative capability can generate financial returns; and organizational integration determines the structure of incentives that characterize "organizational processes" that can transform individual actions and individual capabilities (including those of strategic managers) into collective learning.

Of central importance to the accumulation and transformation of capabilities in knowledge-intensive industries is the skill base in which the firm invests in pursuing its innovative strategy. Within the firm, the division of labor consists of different functional specialties and hierarchical responsibilities. At any point in time a firm's functional and hierarchical division of labor defines its skill base. In the effort to generate collective and cumulative learning, those who exercise strategic control can choose how to structure the skill base, including how employees move around and up the functional and hierarchical division of labor over the course of their careers. At the same time, however, the organization of the skill base will be constrained by both the particular learning requirements of the industrial activities in which the firm has chosen to compete and the alternative employment opportunities of the personnel for whom the firm must compete.

In cross-national comparative perspective, the skill base that enterprises employ to transform technologies and access markets can vary markedly even in the same industrial activity during the same historical era, with different innovative outcomes. Precisely because innovative enterprise depends on social conditions, the development and utilization of skill bases that occur in one institutional environment may not, at a point in time at least, be possible in another institutional environment. Moreover, even within the same industry and same nation, dynamic capabilities that yielded innovative outcomes in one historical era may become static capabilities that inhibit innovative responses in a subsequent historical era.

The innovative firm requires that those who exercise strategic control be able to recognize the competitive strengths and weaknesses of their firm's existing skill base and, hence, the changes in that skill base that will be necessary for an innovative response to competitive challenges. These strategic decision makers must also be able to mobilize committed finance to sustain investment in the skill base until it can generate higher quality, lower cost products than were previously available. As the following comparative–historical syntheses illustrate, given strategic control and financial commitment, the essence of the innovative firm is the organizational integration of a skill base that can engage in collective and cumulative learning.

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2.3 The British Industrial District

In last half of the nineteenth century, Britain became known as the "workshop of the world." Britain's position in the world economy owed much to its mercantile power, developed through global commerce and related wars with other leading nations over the previous centuries. Mercantilism gave British industry access to world product markets and sources of raw materials, but it was the transformation of production from the late eighteenth century that enabled Britain to emerge as the world's leading (and indeed first) industrial nation.

In the late nineteenth century, Britain's productive power resided in industrial districts that, for building machines and using them to manufacture products as varied as cloth and ships, possessed an immense accumulation of capabilities. Beyond evening courses at local "mechanics' institutes," formal vocational or professional education played no role in the development of Britain's skilled labor force. Nor did British

industry make use of corporate, university, or government research labs to develop new technology. Regionally based on-the-job apprenticeship arrangements, through which craft workers passed on their skills to the next generation, constituted in effect the "national innovation system" of the world's first industrial economy.

What accounts for the importance of the craft worker for Britain's industrial leadership? While the mechanization of the factory was a central feature of the British industrial revolution—and in its time a wonder of the world—the standardization of materials and the automation of machinery that British industry achieved during its industrial revolution were, in historical retrospect, incipient. Skilled craft workers maintained critical roles in keeping imperfect machinery in motion and ensuring high levels of throughput of work-in-progress made from imperfect materials. Within the firm, experienced workers typically were responsible for training younger workers in the craft, supervising their work, and coordinating the flow of work through the production process. In some industries, the central employment relation took the form of an internal subcontract system; for example, in the cotton spinning industry, employers paid piece-rates to senior workers, known as "self-acting minders," who in turn trained, supervised, and paid time wages to junior workers known as "piecers" and "doffers." In the metalworking industries, specialized workers such as "turners" and "fitters" were generally classified as "engineers," an appellation that in the British context signified membership in the "labor aristocracy" of skilled production workers (Lazonick 1990: chs. 1–6).

The localized, on-the-job character of skill formation was the major factor underlying the growth of industrial districts that made use of particular specialized craft skills. As Alfred Marshall (1961: 271) famously put it, in the British industrial districts "mysteries of the trade become no mysteries; but are as it
p. 36 were in the air." In periods of strong product-market demand, the ready availability of specialized craft ↳ labor induced new specialized manufacturing firms, often founded by craft workers themselves, to set up in these districts. The growth of a district induced other firms to invest in regionally specific communication and distribution facilities for the supply of materials, the transfer of work-in-progress across vertically specialized firms, and the marketing of output.

Regional concentration encouraged vertical specialization, which in turn eased firm entry into a particular speciality, thus resulting in high levels of horizontal competition. Firms could be owned and managed by the same people; there was no need to invest in the types of managerial organization that by the late nineteenth century were becoming central to the growth of firms in the United States, Germany, and Japan. In the industrial districts, economies of scale were, as Marshall argued, external, rather than internal, to the firm.

As producers and users of machinery, craft workers constituted the prime source of innovation in a particular region. Over time they devised incremental technological and organizational improvements that, through the local trade press (including workers' newspapers) as well as the movement of workers (especially trained apprentices) to new employers, diffused across firms in the district. Some specialized engineering firms distinguished themselves through in-house learning. But even the strongest of these firms—for example, the textile machinery firm of Platt Brothers based in Oldham—did no in-house R&D, and from the last half of the nineteenth century generated no significant technological innovations. Their strength resided in their employment of craft labor that could flexibly produce customized machines for many different types of users (Farnie 1990).

The importance of localized craft labor to the innovative capabilities of local firms meant that it was the industrial district, and often a particular town within a district, not the individual firm, that constituted the learning entity. At the firm level, craft workers made countless "strategic" decisions to improve products and processes. For both individual firms and the district as a whole, the fixed costs of developing this source of innovation were, in historical and comparative perspective, low. At the same time, craft-oriented

employment systems encouraged a high level of utilization of the plant and equipment in place. Union bargains protected the tenure and remuneration of senior workers who, paid by the piece, were willing to work long, hard, and steady. The inducement for junior workers, typically paid time wages, was that they could eventually join the aristocracy of labor. There is evidence that, within an industrial district, those localities in which negotiated piece-rate bargains shared productivity gains between employees and employers on a stable and equitable basis saw the fastest growth in productivity and market share (Lazonick 1990: chs. 3–5; Huberman 1996).

Based on craft organization, British industrial districts were highly innovative (see also Bruland and Mowery, this volume). The fact that it was the industrial district as a whole, rather than the individual enterprise within it, that was the innovating entity gave rise to the notion that differences among firms in
p. 37 an industrial activity ↳ were unimportant to economic performance, and indeed that they could all be characterized by depicting a "representative firm" that optimized subject to given technological and market constraints. Within the Marshallian perspective, even innovation at the district level did not require strategic direction, since the industrial arts were "in the air." Indeed, Marshall (1919: 600–1) described the organization of the Lancashire cotton textile industry, with its high degrees of horizontal competition and vertical specialization, as "perhaps the present instance of concentrated organisation mainly automatic." Yet just as Marshall was writing these words, the cotton textile industry, which had accounted for one-quarter of British exports on the eve of World War I, entered into a long-run decline from which it never recovered, and the other major British industrial districts suffered a similar fate (Elbaum and Lazonick 1986).

From the late 1970s, however, the notion of the "Marshallian industrial district" as a driver of innovative enterprise saw an academic resurgence, based on the rapid growth during the 1960s and 1970s of many highly specialized and localized districts in what became known as "the Third Italy" (Brusco 1982; Sabel 1982; Becattini 1990). On the basis of this experience, a number of US academics, headed by Charles Sabel, Michael Piore, and Jonathan Zeitlin, posited a new model of "flexible specialization" as an alternative to mass production on the US corporate model (Piore and Sabel 1984; Sabel and Zeitlin 1985). The industrial activities of the districts of the Third Italy focused on, among other things, textiles, footwear, and light machinery, just as the British districts had done. Large numbers of vertically specialized proprietary firms in which craft labor was a prime source of competitive advantage populated each industrial activity, and many entrepreneurs had previously been craft workers.

There were, however, two important differences between the British industrial districts that Marshall had observed in the late nineteenth century and those that experienced rapid growth in the Third Italy more recently. The first difference was the extent to which in Italy collective institutions supported the innovative activities of small firms. Sebastiano Brusco (1992) has emphasized the importance of the "red" local governments in Emilia-Romagna in promoting policies to support the activities of small enterprises, and in particular in facilitating cooperatives that provided these firms with "real services" related to business administration, marketing, and training. While consumer cooperatives sprung up in the British industrial districts of the late nineteenth century, producer cooperatives were rare. The second difference, which became more evident in the 1990s, was the extent to which, in some districts and in some industries, "leading" firms could emerge, drawing on the resources of the industrial districts while, through their own internal growth, transforming the innovative capability of the districts (see, for example, Belussi 1999). In contrast, when in the first half of the twentieth century competitive challenges confronted the British industrial districts, dominant firms failed to emerge to lead a restructuring process.

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2.4 The US Managerial Corporation

Marshall located the limits to the growth of the firm in the problem of succeeding the original owner-entrepreneur. In *The Theory of Economic Development*, Schumpeter (1934: 156) concurred using the same aphorism as Marshall, literally clothed in different garb and specifically identified as a US phenomenon: "An American adage expresses it: three generations from overalls to overalls." Critical to this perspective were two assumptions: first, that the entrepreneur was the essence of the innovative firm, and second, that the integration of ownership and control was a necessary condition for entrepreneurship. Notwithstanding his own important study of comparative trends in industrial organization published in *Industry and Trade*, Marshall (1919) declined to recognize, as ultimately Schumpeter did, that the problem of innovative succession could be resolved by the separation of ownership and control.

Taking place during the same decades in which Marshall wrote his influential books, the separation of share ownership from strategic control was the essence of what Chandler (among others) would call "the managerial revolution" in American business. During this period Germany and Japan also experienced managerial revolutions (Chandler 1990; Chandler et al. 1997; Morikawa and Kobayashi 1986; Morikawa 1997). Many British firms, especially in the science-based chemical and electrical industries also made investments in managerial organization, but in such a constrained manner that it can hardly be said that a managerial revolution occurred in Britain during the first half of the twentieth century (Hannah 1983; Lazonick 1986; Chandler 1990; Owen 2000).

In the United States, the managerial revolution began in the 1890s in industries such as steel, oil refining, meatpacking, tobacco, agricultural equipment, telecommunications, and electric power that owner-entrepreneurs had built up over the previous decades. Wall Street (and especially the firm of J. P. Morgan) organized the merger of the leading companies, and in the process did what would later become known as "initial public offerings" (IPOs) in order to allow the owner-entrepreneurs to cash in on their ownership stakes. Many of them then retired from active management of the company. Taking their places in strategic decision-making positions were salaried managers, most of whom had themselves been recruited years or even decades earlier to help build the innovative firms that they now controlled. Hence, Marshall's "entrepreneurial" limit to the growth of the firm was overcome. By the turn of the century, the separation of ownership and control in many of the most successful industrial corporations served as a powerful inducement for bright young, and typically White, Anglo-Saxon, Protestant, men to consider careers as corporate executives (Lazonick 1986; O'Sullivan 2000*a*: ch. 3).

Also from the beginning of the twentieth century, a four-year undergraduate college degree became
p. 39 important for entry into managerial careers, and in 1908 ↳ Harvard University launched the first graduate school in business administration. In 1900 about 2 per cent of 18–24 year olds were enrolled in institutions of higher education; in 1930 over 7 per cent; and in 1950 over 14 per cent. By the 1920s the top managers of many large industrial corporations had college degrees. As employers of university graduates as well as beneficiaries of university research, big business took an active role in shaping the form and content of higher education to meet its needs for "knowledge assets" (Noble 1977; Lazonick 1986).

As they expanded, US industrial corporations tended to diversify into new lines of business. Capabilities developed for generating goods for one product market could be used as a basis for gaining entry to new product markets. Moreover, as companies were successful, they could use internally generated revenues to finance these new investments. Profitable US corporations generally paid ample dividends to shareholders, but they still generated enough revenues to invest for the future, including growing expenditures on R&D (Mowery and Rosenberg 1989: ch. 4).

Besides transforming technology, a critical role of the managerial organization was to gain access to product markets. Without high levels of sales, the high fixed costs of developing technology and investing in

production facilities would have simply resulted in high levels of losses. The building of national transportation and communications infrastructures—themselves largely put in place by managerial enterprises—created the possibility for manufacturing enterprises to sell on mass markets. To take advantage of this opportunity, however, the industrial corporations had to make complementary investments in distribution capabilities, including sales personnel, sales offices, advertising, and in some cases even customized transportation facilities. As Chandler (1990) has shown, from the late nineteenth century, a "three-pronged" investment in production, distribution, and management was a necessary condition for the growth of the industrial enterprise.

If the social condition for the growth of the US industrial corporation was an integrated managerial organization, a distinguishing feature of the same corporation was a sharp organizational segmentation between salaried managers and what became known as "hourly" workers. This segmentation had its roots in the first half of the nineteenth century when industrial managers faced a skilled labor force that was highly mobile not only from one firm to another but also from one occupation and one locality to another. In contrast, in Britain the local pools of specialized craft labor generated by apprenticeship systems meant that employers had access to ample supplies of skilled labor, even in booms. As a result, there was much less pressure in Britain than in the United States for managers to invest in the development of skill-displacing technologies. In the United States, but not Britain, firms integrated technical specialists into their managerial organizations for precisely that purpose. Hence the emergence by the mid-nineteenth century of the distinctive "American system of manufactures" (Hounshell 1984: chs. 1–2).

The key to this system was the mass production of standardized, precision-engineered parts that could be
p. 40 used interchangeably in a product without the ↳ intervention of a skilled worker to make the parts fit together. As David Hounshell (1984) has shown, it took a century of investment in productive capabilities by many companies in many sectors of US industry before, during the boom of the 1920s, mass production, so defined, became a reality. The productivity of the mass-production enterprise, nevertheless, still relied upon the stable employment of "semi-skilled" production workers who tended high-throughput, and very expensive, machinery (Lazonick 1990: chs. 7–8).

During the Great Depression of the 1930s, such stable employment disappeared, leading semi-skilled workers at the major mass producers to turn to industrial unionism (Brody 1980: ch. 3). The major achievement of mass-production unionism in the United States was long-term employment security for so-called "hourly" workers, with seniority as the governing principle for internal promotion to higher pay grades and continued employment during company layoffs. In return, these unionized employees accepted unilateral managerial control over the organization of work and technological change. During the post-World War II decades, production workers enjoyed employment security and rising wages but they were not in general integrated with managerial personnel into the company's organizational learning processes.

The result was that going into the second half of the twentieth century US industrial corporations had powerful managerial organizations for developing new technology. These corporations also had devised arrangements with their unionized labor forces to ensure the high level of utilization of these technologies. In employing thousands and in some cases tens of thousands of production workers who were not integrated into the company's organizational learning processes, however, this US model of the innovative firm had a fundamental weakness that, in the 1970s and 1980s, would be exposed in international competition. The Japanese in particular would demonstrate the innovative capability that could be created by not only building highly integrated managerial organizations, as the Americans had done, but also, as a complement, developing the skills of shop-floor workers and integrating their efforts into the firm's collective learning processes.

Even the most insightful of the theories of the US managerial corporation could not, without elaboration, account for the Japanese challenge (Lazonick 2002*c*). Both Penrose (1995) and Chandler (1962 and 1977)

focused exclusively on the managerial organization, as did the influential perspective of John Kenneth Galbraith (1967) with its notion of the "technostructure" as the essence of the modern firm. Penrose did not see that, once confronted by the Japanese challenge, the US managerial corporation would have to develop the capabilities of the shop-floor worker to make use of unused managerial resources. Chandler focused on speed or throughput as a basis for achieving economies of scale and scope, but ignored the role of the shop-floor worker in the process of transforming high fixed costs into low unit costs, and hence did not perceive an important limitation of the US managerial model (Lazonick 1990).

2.5 The Japanese Challenge

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Within the new structure of cooperative industrial relations that emerged out the conflicts of the depression years, US industrial corporations were able to take advantage of the post-World War II boom to re-establish themselves as the world's pre-eminent producers of consumer durables such as automobiles and electrical appliances and related capital goods such as steel and machine tools. With the help of US government research support and contracts, US companies also became the leaders in the computer and semiconductor industries.

In the 1970s and 1980s, however, Japanese companies challenged the US industrial corporations in the very mass-production industries—steel, memory chips, machine tools, electrical machinery, consumer electronics, and automobiles—in which even as late as the 1960s US corporations seemed to have attained an insurmountable competitive advantage. During the 1950s and 1960s many Japanese companies had developed innovative manufacturing capabilities, often on the basis of technologies borrowed from abroad to produce mainly for the home market. As Japanese exports to the United States increased rapidly in the last half of the 1970s, many observers attributed the challenge to the lower wages and longer working hours that prevailed in Japan. By the early 1980s, however, with real wages in Japan continuing to rise, it became clear that Japanese advantage was based on superior capabilities for generating higher quality, lower cost products.

The three social institutions that, in combination, formed the foundation for Japan's remarkable success were cross-shareholding, the main bank system, and lifetime employment. Cross-shareholding provided the managers of Japanese industrial corporations with the strategic control to allocate resources to investments that could generate higher quality, lower cost products. The main bank system provided these companies with levels of financial commitment that permitted them to sustain the innovation processes until they could generate returns, first on home and then on foreign product markets. Given this financial support for strategic industries, lifetime employment enabled the companies involved to put in place a new model of hierarchical and functional integration that enabled them to mobilize broader and deeper skills bases for collective and cumulative learning (Lazonick 2001). Let us look briefly at how these institutions became embedded in the functioning of the Japanese industrial enterprise in the post-World War II decades.

In 1948 the Supreme Commander for the Allied Powers (SCAP)—the occupation authority in Japan—began the dissolution of the zaibatsu, the giant holding companies that had dominated the Japanese economy from the Meiji era of the late nineteenth century to World War II. The dissolution process not only dispossessed the families that owned the zaibatsu but also removed from office the top management layers
p. 42 of the zaibatsu holding companies and major affiliated firms (Morikawa ↳ 1997). Taking control of strategic decision making were "third-rank executives," primarily engineers plucked from the ranks of middle management to take leadership positions of companies whose challenge was to find non-military markets for their companies' accumulated capabilities.

With the reopening of the stock market in 1949, these young and ambitious executives feared that the new public shareholders might join forces to demand their traditional rights as owners. To defend themselves

against these outside interests, the community of corporate executives engaged in the practice of cross-shareholding. Commercial banks and industrial companies took equities off the market by holding each other's shares. Though not contractual, cross-shareholding was sustained by the willingness of the entire Japanese business community to accept that one company would not sell its shareholdings of another company.[2] By 1975, according to its broadest, and most relevant, definition as stock in the hands of such stable shareholders, cross-shareholding represented 60 per cent of outstanding stocks listed on the Tokyo Stock Exchange. It peaked at 67.4 per cent in 1988, but by 2000 had declined to 57.1 per cent, mainly because the beleaguered banking sector had been forced to reduce their shareholdings.

During the "era of high-speed growth" from the early 1950s to the early 1970s, most of the financial commitment of Japanese companies came from bank loans, with the companies' debt–equity ratios often at 6:1 or 7:1. Each major industrial company had a "main bank" whose job it was to convince other banks to join it in making loans to the company and to take the lead in restructuring its client company should it fall into financial distress. Some economists (e.g. Aoki and Patrick 1994) have accorded the main banks a major role in monitoring the behavior of Japan's corporate managers. In funding the growth of Japanese companies, however, the Japanese banks were relatively passive agents of government development policy, with "overloans" being made by the Bank of Japan to its member banks for providing highly leveraged finance to growing industrial companies. Japanese banks, that is, played a critical role in providing financial commitment, but no significant role in the exercise of strategic control.

Integrated organizations of managers and workers, not financial interests, monitored the behavior of the top executives of Japanese corporations (Lazonick 1999). The main mode of achieving this organizational integration was the lifetime employment system, which extended from top executives to male (but not female) shop-floor workers. The origins of the lifetime employment system can be found in the widespread employment in industry of university graduates as salaried technical and administrative personnel during the early twentieth century (Yonekawa 1984). Some companies extended the promise of lifetime employment to shop-floor workers as well when dire economic conditions and democratization initiatives of the late 1940s had given rise to a militant labor movement. The goal of the new industrial unions was to implement "production control": the takeover of idle factories so that workers could put them into
p. 43 operation and earn a living (Gordon ↳ 1985). Leading companies such as Toyota, Toshiba, and Hitachi fired militant workers and created enterprise unions of white-collar (technical and administrative) and blue-collar employees. Foremen and supervisors were members of the enterprise unions, as were all university-educated personnel, for at least the first ten years of employment before they made the official transition into "management."

The most important achievement of enterprise unionism was the institutionalization of lifetime employment, a system that, while not contractually guaranteed, gave white-collar and blue-collar workers employment security, at first to the retirement age of 55, then from the 1980s to the age of 60, and currently (in transition) to the age of 65 (Sako and Sato 1997). This employment security both won the commitment of the worker to the company and gave the company the incentive to develop the productive capabilities of the worker. The system did not differ in principle from the organizational integration of technical and administrative employees that was at the heart of the US managerial revolution, except in one extremely important respect. In the United States there was a sharp segmentation between salaried managers and shop-floor workers, whereas the Japanese companies of the post-World War II decades integrated shop-floor workers into a company-wide process of organizational learning.

Through their engagement in processes of cost reduction, Japanese shop-floor workers were continuously involved in a more general process of improvement of products and processes that, by the 1970s, enabled Japanese companies to emerge as world leaders in factory automation (Jaikumar 1989). By the early 1990s the stock of robots in Japanese factories was over seven times that of the United States. Also of great importance was the ability of Japanese manufacturers to eliminate waste in production; by the late 1970s,

for example, Japan's competitive advantage in television sets was not in labor costs or even scale economies but in a savings of materials costs (Owen 2000: 278; Fagerberg and Godinho in this volume). This productive transformation became particularly important in international competition in the 1980s as Japanese wages approached the levels of those in North America and Western Europe and, especially from 1985, as the value of the Japanese yen dramatically strengthened. During the 1980s and 1990s, influenced by not only Japan's export performance but also the impact of Japanese direct investment in North America and Western Europe, many Western companies sought, with varying degrees of success, to implement Japanese high-quality, low-cost mass-production methods.

During the 1980s most Western analyses of the sources of Japanese competitive advantage focused on the hierarchical integration of the shop-floor worker into the organizational learning process. By the early 1990s, however, as Japanese companies captured higher value-added segments of the products markets in which they competed, the emphasis shifted to the role of "cross-functional management," "company-wide quality control," or "concurrent engineering" in generating not only lower cost but also higher quality
p. 44 products within highly accelerated product ↳ development cycles. Much of the discussion of functional integration focused on its role in "new product development" in international comparative perspective, with, as Clark and Fujimoto (1991) showed for the automobile industry, the US managerial corporation performing quite poorly.

Given that the innovative power of the US industrial corporation resided in its integrated managerial organization, why should it have suffered from functional segmentation in competition with the Japanese? One reason was that, given the hierarchical segmentation of shop-floor activities from organizational learning processes in US companies, US engineers were not forced to communicate across their disciplines to solve "real-world" manufacturing problems. Another had to do with the increasing interfirm mobility of US engineers from the 1960s—mobility that, as we shall see, was related to the rise of the "New Economy" high-tech firm. The prospects for interfirm mobility gave scientists and engineers an interest in developing their reputations among their peers within their particular area of specialization, even if it detracted from integrating their specialist knowledge across functional areas within the particular firm for which they were working. By contrast, in the Japanese firm both the hierarchical integration of managers and workers and low levels of interfirm mobility of engineering personnel fostered functional integration.

The evolution of the semiconductor industry provides a vivid example of the competitive power, but also the limits, of Japanese organizational integration. From the late 1970s the Japanese mounted a formidable competitive challenge to US producers in dynamic random access memory (DRAM) chips, forcing most US companies, including Intel, to withdraw from the market after 1985. Already a powerhouse in semiconductors before the Japanese challenge, Intel reemerged even stronger in the 1990s as the leader in microprocessors, a product in which it was the pioneer in the early 1970s and for which during the 1980s it secured the franchise for the IBM PC and the subsequent IBM clones (Burgelman 1994).

Organizational integration was critical to the Japanese challenge in DRAMs. As Daniel Okimoto and Yoshio Nishi (1994) have shown, the most critical interactions in product and process development in Japanese semiconductor companies were between personnel in divisional R&D labs and factory engineering labs, with engineering capability being concentrated in the factory labs. They argue that in Japan "hands-on manufacturing experience ... is almost a requirement for upward career and post-career mobility [whereas] [i]n the United States, by contrast, manufacturing engineers carry the stigma of being second-class citizens" (Okimoto and Nishi 1994: 195).

Value added in microprocessors is in the design that determines the use of the product, an activity for which US skill bases in semiconductors were more suited. Value added in memory chips is in process engineering that reduces defects and increases chip yields, an activity for which Japanese skill bases in semiconductors

p. 45 were more suited. By the 1980s Japanese companies such as Fujitsu, Hitachi, and ↳ NEC were able to achieve yields in the production of DRAMs that were 40 per cent higher than the best US companies.

In the 1990s the Japanese economy as a whole has stagnated, to the point where many Western observers now blame its unique institutional framework, still largely intact, for its lack of innovation. Yet, in industries such as electronics and automobiles, Japanese companies such as Sony and Toyota, among many others, remain leading innovators in those types of products in which, as during the previous decades, their integrated skill bases gave them international competitive advantage. The main microeconomic problems in the Japanese economy are to be found in the financial system and, relatedly, institutions for creation of new innovative firms.

During the boom of the 1980s the leading Japanese manufacturing companies were able to reduce their reliance on bank debt, just as the banks were awash with cash to lend. The banks then channeled funds into speculative investments in land and stocks, thus fuelling the "bubble economy" of the late 1980s. When the bubble burst in 1990, the banks were saddled with mountains of bad debt. Although most of this bad debt has now been written off, the banks remain in fragile condition because most of their loans are being made to smaller companies that do not have anything close to the growth potential that was realized by many Japanese companies in the previous eras of high-speed growth and export expansion (Lazonick 1999). "Growth potential," however, is not exogenous to the "social conditions of innovative enterprise," as illustrated by the emergence of more powerful modes of strategy, finance and organization in the rise of the "New Economy" model of the innovative firm in the United States.

2.6 The New Economy Model

During the 1970s and 1980s while Japanese enterprises were challenging established US managerial corporations in many industries in which they had been dominant, there was a resurgence of the US information and communications technology (ICT) industries, providing the foundation for what by the last half of the 1990s became known as the "New Economy." Historically, underlying the emergence of the New Economy were massive post-World War II investments by the US government, in collaboration with research universities and industrial corporations, in developing computer and communications technologies.

By the end of the 1950s, this combined business–government investment effort had resulted in not only the first generation of computers, with IBM as the leading firm, but also the capability of imbedding integrated
p. 46 electronic circuits on a silicon ↳ chip, with Fairchild Semiconductor and Texas Instruments in the forefront of creating the technology that would become the standard of the semiconductor industry. Through the early 1960s the US government provided virtually all of the demand for semiconductors. From the second half of the 1960s, however, a growing array of commercial opportunities for electronic chips induced the creation of semiconductor startups. A new breed of venture capitalist, many with prior managerial or technical experience in the semiconductor industry, backed so many semiconductor startups clustered in the region around Stanford University that by the early 1970s the district was dubbed "Silicon Valley." Innovation in semiconductors, and especially the development of the microprocessor—in effect a computer on a chip—created the basis for the emergence of the microcomputer industry from the late 1970s, which in turn resulted in the enormous growth of an installed base of powerful "hosts" in homes and offices that made possible the Internet revolution of the 1990s.

As Anna Lee Saxenian (1994) has shown, intense, and often informal, learning networks that transcended the boundaries of firms contributed to the success of Silicon Valley. Like the Marshallian industrial districts of a century earlier, there is no doubt that, in Silicon Valley, "themysteries of the trade ... were in the air." But in its strategy, finance, and organization, the New Economy business model that emerged in Silicon

Valley differed significantly from the Marshallian industrial district. Of particular importance was the extent to which in Silicon Valley organizational learning occurred within the firm, enabling some particularly innovative firms that grew to employ tens of thousands of employees to drive the development of the region. In its early stages this organizational learning tended to be backed by venture capital, a mode of finance that through its success in Silicon Valley from the 1960s evolved into an industry in its own right. Also of great importance in supporting the development of technology and the education of personnel available to firms in this high-tech industrial district were state funding and universities, institutions that for a century had been central to the US managerial model.

The founders of new ICT firms were typically engineers who had gained specialized experience in existing ICT firms, although in some cases they were university faculty members intent on commercializing their academic knowledge. While some of these entrepreneurs came from existing Old Economy companies, where it was often difficult for their new ideas to get internal backing, New Economy companies themselves became increasingly important as a source of new entrepreneurs who left their current employers to start a new firm (Gompers et al. 2003). Typically the founding entrepreneurs of a New Economy startup sought committed finance from venture capitalists with whom they shared not only ownership of the company but also strategic control. Besides sitting on the board of directors of the new company, the venture capitalists would generally recruit professional managers, who would be given company stock along with stock options, to lead the transformation of the firm from a new venture to a going concern. This stock-based
p. 47 compensation gave these ↳ managers a powerful financial incentive to develop the innovative capabilities of the company to the point where it could do an IPO or private sale to an established company. But, both before and after making this transition, their tenure with, and value to, the company depended on their managerial capabilities, not their fractional ownership stakes.

Key to making this transition from new venture to going concern was the organizational integration of an expanding body of technical and managerial "talent." Stock options became an important mode of compensation, usually as a partial substitute for cash salaries, for attracting these highly mobile people to the startup and retaining their services. The underlying stock would become valuable if and when they took the form of publicly traded shares. Shortening the expected period between the launch of a company and its IPO was the practice of most venture-backed high-tech startups of going public on the NASDAQ exchange (founded in 1971), with its much less stringent listing requirements than the Old Economy New York Stock Exchange. If and when the firm did an IPO or was acquired by another publicly listed company, the venture capitalists could sell their shareholdings on the stock market, thereby exiting from their investments in the firm, while entrepreneurs could also transform some or all of their ownership stakes into cash. With the company's stock being publicly traded, employees who exercised their stock options could easily turn their shares into cash.

During the 1980s and 1990s the liberal use of stock as a compensation currency, not only for top executives as had been the case in Old Economy companies since the 1950s, but also for a broad base of non-executive personnel became a distinctive feature of New Economy firms. For example, Cisco Systems, which grew from about 200 employees at the time of its IPO in 1990 to 38,000 employees in 2001, awarded stock options to all of its employees, so that by 2001 stock options outstanding accounted for over 14 per cent of the company's total stock outstanding. Since Cisco did hardly any of its own manufacturing—another distinctive characteristic of many New Economy "systems integrators"—the people in the skill base to whom these options were awarded were almost all highly educated employees who were potentially highly mobile on the labor market.

Besides using their own stock as a compensation currency, during the 1990s some New Economy companies grew large by using their stock, instead of cash, to acquire other, smaller and typically younger, New Economy firms in order to gain access to new technologies and markets. Cisco mastered this growth-through-acquisition strategy; from 1993 through 2002 Cisco made seventy-eight acquisitions (forty-one of

which were during 1999–2000, the peak years of the New Economy boom), with stock providing the currency for over 98 per cent of the total value of these acquisitions.

At the same time Cisco conserved cash by paying no dividends, a mode of financial commitment that also distinguished New Economy from Old Economy companies. As a result, Cisco's astonishing growth in the
p. 48 1990s occurred without the ↳ company taking on any long-term debt. Nevertheless, with the bursting of the New Economy bubble from mid-2000, Cisco spent billions of dollars repurchasing its own stock to support its sagging stock price (Carpenter et al. 2003). Even during the boom, when stock prices were rising, the extent to which New Economy companies issued stock to make acquisitions and compensate employees meant that some of them spent billions of dollars on stock repurchases; during 1997–2000, for example, Intel's stock repurchases totalled $18.8 billion and Microsoft's $13.4 billion. By way of comparison, over these years Intel's total expenditures on R&D were $14.2 billion, while Microsoft's were $11.2 billion.

As in the cases of Intel, Microsoft, and Cisco, by the end of the twentieth century a number of New Economy companies had grown to be formidable growing concerns (Lazonick 2004). In 2002 the top 500 US-based companies by sales included twenty ICT firms founded no earlier than 1965 that had been neither spun-off from nor merged with an Old Economy firm. These twenty companies had revenues ranging from $35.4 billion for Dell Computer to $3.0 billion for Computer Associates International, with an average of $10.4 billion. Their headcounts ranged from 78,700 for Intel to 8,100 for Qualcomm, with an average of 30,084, up from an average for the same twenty companies of 6,347 in 1993. Nine of these twenty companies (and seven of the top ten) were based in Silicon Valley, another two in Southern California, and the other nine in eight states around the country. Compaq Computer, the forty-sixth largest US company in 2001 with $33.6 billion in sales and 70,950 employees, would have been high up on this list in 2002 had it not been acquired by Hewlett-Packard.

Many of these large New Economy companies have become important contributors to the patenting activity of US-based corporations. Samuel Kortum and Josh Lerner (2000) have shown that in the first half of the 1980s a sharp decline in patenting by US corporations was counterbalanced by a massive increase in early-stage venture-capital disbursements. But from the last half of the 1980s patenting picked up again, in part because it became important to the competitive strategy of high-growth New Economy firms. In 2001 Intel was eighteenth in the number of US patents issued to all companies, and seventh among US-based companies. Ahead of Intel were not only Old Economy companies such as IBM, Lucent Technologies, General Electric, and Hewlett-Packard but also two much smaller, but still sizeable, New Economy semiconductor companies, Micron Technology, founded in 1978 in Idaho, in fourth place, and Advanced Micro Devices (AMD), founded in Silicon Valley in 1969, in fourteenth place. In 2002 AMD was the 535th largest US company by sales and had 12,146 employees, while Micron was 554th and employed 18,700.

Innovative New Economy companies have tended to grow large by upgrading and expanding their product offerings within their main lines of business, and thus far at least have not engaged in the indiscriminate diversification into unrelated technologies and markets that characterized, and ultimately undermined the
p. 49 performance of, ↳ many leading Old Economy companies in the 1960s and 1970s. At the same time, New Economy companies have become less vertically integrated than Old Economy companies because equipment manufacturers such as Cisco, Dell, and Sun Microsystems have focused their investment strategies on activities that require organizational learning in their core competencies, while outsourcing activities that, as is the case with semiconductor fabrication, are too expensive and complex to be done inhouse, or, alternatively, as is the case with printed circuit board assembly, have become routine. Some of the largest ICT companies in the United States are upstream electronics components suppliers, most of which are New Economy firms. Among the top 1000 US companies by sales in 2002 were eleven semiconductor companies, with a total employment of 212,354, ranging from Intel with its 78,700 employees to Nvidia (a specialist producer of graphics processors founded in 1993) with 1,513 employees. The world's five largest contract manufacturers—Flextronics, Solectron, Sanmina-SCI, Celestica, and Jabil

Circuit—to whom equipment manufacturers outsource the mass production of printed circuit boards and other components, employed a total of 260,000–270,000 people at the beginning of 2003.

The severe downturn in the ICT industries in 2001 and 2002 raised questions about the sustainability of the New Economy model. A major weakness of the New Economy model lay in the huge personal gains, often amounting to tens of millions and even hundreds of millions of dollars, that top executives could reap from stock based rewards in a volatile stock market. When stock prices were rising, executives had strong personal incentives to allocate resources (or give the appearance of doing so) in ways that encouraged the speculative market. Many of these allocative decisions undermined the innovative capabilities of the firms over which these executives exercised control (Carpenter et al. 2003). When stock prices began falling, the same executives had strong personal incentives to cash in quickly by selling stock, so that they made immense fortunes (in most instances without breaking the law) even as their companies lost money and, in many cases, struggled to survive (Gimein et al. 2002).

A major problem for some of these companies was the way in which the use of stock as a combination and compensation currency in the New Economy boom affected the role of the stock market as a source of cash (O'Sullivan 2003). Seventy years earlier, in the stock market boom of the late 1920s, US corporations had sold stock at speculative prices to pay down debt or bolster their treasuries, thus making them less financially vulnerable when the boom turned to bust. In the boom of the late 1990s corporations did not take advantage of the speculative market by selling stock; if anything, these companies purchased stock to support their already inflated stock prices. While employees, and particularly high-level executives, benefited from these stock price increases, their companies were weakened financially, as became painfully evident for many ICT companies from mid-2000 when the stock market turned down.

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2.7 Understanding the Innovative Firm: Implications for Theory

This chapter has illustrated that the social characteristics of the innovative firm have varied markedly over time and across institutional environments. To study the innovative firm in abstraction from the particular social conditions that enable it to generate higher quality, lower cost products is to forgo an understanding of why it became innovative in the first place and how its innovative capabilities may be rendered obsolete. A comparative–historical analysis enables us to learn from the past and provide working hypotheses for ongoing research.

First, the comparative–historical experience of the innovative firm suggests that, contrary to a common belief that has persisted since the time of Marshall, the form of firm ownership is not the critical issue for understanding the type of strategic control that supports innovative enterprise. Critical are the abilities and incentives of those managers who exercise strategic control. Whether they are majority owners of the firm, state employees, or employees of publicly listed companies, we need to know where and how these strategic managers gained the experience to allocate resources to the innovation process, and the conditions under which their personal rewards depend on the firm's innovative success.

Second, the most fundamental, if by no means the only, source of financial commitment for the innovative firm is to be found in those funds that are generated by the firm itself. When bank finance is used to leverage financial commitment, it requires close relations between financial institutions and innovative firms, as for example in the Japanese model. In certain times and places, the stock market can provide some well-positioned firms with financial commitment. But as a financial institution, the fundamental role of the stock market is to provide liquidity, not commitment. It enables owner-entrepreneurs and venture capitalists to cash out of their investments, and it enables households to diversify their savings portfolios so that they can (hopefully) tap into the yields of the stock market without having to devote time and effort to understanding the innovative capabilities of the companies that have listed their securities on it.

Third, while strategic control and financial commitment are essential to the innovative firm, it is organizational integration that determines the innovative capability that the firm actually possesses. The types of organizational integration that result in innovation vary across industries and institutional environments as well as over time. The hierarchical and functional divisions of labor that, when integrated into learning organizations, generated innovation in the past cannot necessarily be expected to do so in the future when faced with changes in technology, markets, and competition—changes which to some extent successful innovation in itself brings about.

p. 51 When a society's previously innovative firms no longer generate innovative outcomes, there will be pressures on these firms to reallocate resources from investments in existing skill bases to investments in new types of organizations. Such organizational restructuring does not always occur smoothly or successfully, as the historical experiences of British industrial districts, US managerial corporations, and Japanese enterprise groups have shown. Precisely because the innovative firm is a social organization, the reallocation of its resources is a social process in which different groups of people can have very different interests. An understanding of the changing organization of the innovative firm is important for understanding not only how a society innovates but also how a society copes with processes of social disruption in which the gains of some may be the losses of others.

In a theory of innovative enterprise, strategy, finance, and organization are interlinked as a dynamic process with learning as an outcome. To fully comprehend the innovative firm, there is a need to understand the actual learning processes: the relation between tacit knowledge and codified knowledge, between individual capabilities and collective capabilities, and between what is learned at a point in time and how that learning cumulates over time. The prevailing social conditions of innovative enterprise provide the context for those learning processes, shaping the types of learning that are attempted, the extent to which these processes are sustained, and the ways in which people interact both cognitively and behaviorally. The influence of the social context is manifested by the functional and hierarchical integration of skill bases that, as this essay has illustrated, can vary dramatically across industries and institutional environments as well as over time.

A theory of innovative enterprise must be based on an understanding of comparative–historical experience that is broad and deep enough to evoke confidence that the assumptions and relations forming the substance of the theory capture the essence of the reality to which the theory purports to be relevant. The development of relevant theory requires an iterative approach in which theoretical postulates are derived from the study of the historical record and the resultant theory is used to analyze history as an ongoing and unfolding process (Lazonick 2002*a*). The intellectual challenge is to integrate theory and history.

As Edith Penrose (1989: 11) perceptively put it in an article written late in her career:

> "Theory" is, by definition, a simplification of "reality" but simplification is necessary in order to comprehend it at all, to make sense of "history". If each event, each institution, each fact, were really unique in all aspects, how could we understand, or claim to understand, anything at all about the past, or indeed the present for that matter? If, on the other hand, there are common characteristics, and if such characteristics are significant in the determination of the course of events, then it is necessary to analyse both the characteristics and their significance and "theoretically" to isolate them for that purpose.

If we need theory to make sense of history, so we also need history to make sense of theory. As Penrose concluded: "universal truths without reference to time and space are unlikely to characterise economic affairs."

Notes

1. For a comparison of managerial corporations of European nations such as Britain, France, Germany, and Italy with the US model, see Lazonick 2003.

2. When in financial distress, a company might raise cash by selling some of its cross-shareholdings to other companies at the going market price but with an understanding that the shares would be repurchased, also at the going market price, if and when its financial condition improved.

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