

# The Dynamics of Industrial Capitalism

Schumpeter, Chandler, and the New Economy

Richard N. Langlois

THE GRAZ SCHUMPETER LECTURES

# The Graz Schumpeter Lectures

- 1 Evolutionary Economics and Creative Destruction**  
*J. Stanley Metcalfe*
- 2 Knowledge, Institutions and Evolution in Economics**  
*Brian J. Loasby*
- 3 Schumpeter and the Endogeneity of Technology**  
Some American perspectives  
*Nathan Rosenberg*
- 4 Consumption Takes Time**  
Implications for economic theory  
*Ian Steedman*
- 5 Exchange Rates and International Finance Markets**  
An asset-theoretic approach with Schumpeterian perspective  
*Erich W Streissler*
- 6 Unholy Trinity**  
Labor, capital, and land in the new economy  
*Duncan K. Foley*
- 7 Trade and Politics in the European Community**  
*Alan S. Milward*
- 8 Democracy, Education and Equality**  
*John E. Roemer*
- 9 The Dynamics of Industrial Capitalism**  
Schumpeter, Chandler, and the new economy  
*Richard N. Langlois*

# The Dynamics of Industrial Capitalism

Schumpeter, Chandler, and the New Economy

Richard N. Langlois



## ***Table of Contents.***

<i>Chapter 1 Progressive Rationalization</i> .....	2
The discovery of the corporation.....	2
Explaining the corporation. ....	9
The seventh sense.....	15
<i>Chapter 2 The Obsolescence of the Entrepreneur</i> .....	21
The Schumpeterian dichotomy. ....	21
The Schumpeterian tension. ....	26
The Schumpeterian irony. ....	30
<i>Chapter 3 Personal Capitalism</i> .....	33
Back to Weber.....	33
The rationality of the personal element.....	37
From Friedrich Hayek to Nicolas Hayek.....	40
Plausible personal capitalism.....	46
<i>Chapter 4 The Rise of the Corporation</i> .....	51
The evolutionary design problem. ....	51
Antebellum organization. ....	52
The managerial revolution.....	55
From scale to scope: the corporate century.....	61
<i>Chapter 5 The Return of the Entrepreneur</i> .....	66
From internal to external capabilities: the new economy.....	66
The end and the beginning of history. ....	72
<i>References.</i> ....	81

# *Chapter 1*

## *Progressive Rationalization*

### *The discovery of the corporation.*

In the early 1930s, Adolf Berle and Gardiner Means made an interesting discovery. While no one was looking, the American economy had ceased to be driven by small, owner-operated businesses, but had come to be dominated by the large corporation<sup>1</sup> (Berle and Means 1932). Alarming, they noticed, corporations were coming increasingly to be managed by salaried professionals rather than by their equity owners. From this Berle and Means concluded that one could no longer count on markets to discipline corporations and that one could expect managers to “plunder” stockholders for personal gain. Here at once were fanned the two great populist fears about the corporation: concentrated power and the separation of ownership from control. Berle and Means were long on seemingly ominous statistics but short on analysis of the corporation as an institution. What was its rationale, its logic, its dynamic? What was its role in the economic process? Neoclassical economic doctrines were not much help. Like Berle and Means, they started from the assumption of small owner-managed firms as a normative standard, and thus what light they could shed revealed the same dark possibilities of concentration and plunder.<sup>2</sup> On the whole, indeed, the Depression decade of the 'thirties was an ideological low-point for the large corporation, an institution never blessed in any era with favorable press.

But the corporation was not entirely without its defenders. Perhaps the most important was Joseph Schumpeter, Harvard economist by way of Vienna, whose *Capitalism, Socialism, and Democracy* appeared a decade after Berle and Means. If one takes the trouble to look at economic history, Schumpeter observed, one cannot conclude that the development

---

<sup>1</sup> Actually, Thorstein Veblen had noticed, though his concern was with a different separation: the separation of the pecuniary from the industrial or technological. The financier's interest in making money Veblen saw as antagonistic to technological advance and the sound running of the industrial enterprise. One might consider the work of Berle and Means as a development of this Veblenian line (Rutherford 2001).

<sup>2</sup> Mainstream industrial-organization theory still addresses the issue of concentration in much the same static way it did in the 1930's. On the issue of the separation of ownership from control, however, modern theory has produced a spirited and persuasive defense of the corporate form (Jensen and Meckling 1976). It is true, the theory holds, that such separation creates costs, what are now termed the agency costs of managers pursuing goals different from those of the owners. But such costs are in fact mitigated by a number of devices, including stock markets (in which stockholders vote with their feet); the market for managerial talent (which rewards conscientious managers and penalizes bad); boards of directors; and the market for corporate control (that is, the threat of a takeover). More telling, however, is the observation that Berle and Means neglected the *benefits* of the separation of ownership from control. Unbundling the two functions allowed efficient specialization into management and risk-bearing. The first of these specializations is an important theme of this essay. The latter — specialization in ownership — lowered the cost of capital dramatically by tapping the funds of the many potential investors uninterested in management. It also reduced risk for all investors by permitting them more easily to diversify their portfolios.

of the large enterprise has brought monopolistic restriction of output or corporate plunder. Quite the reverse.

As soon as we go into details and inquire into the individual items in which progress was most conspicuous, the trail leads not to the doors of those firms that work under conditions of comparatively free competition but precisely to the doors of the large concerns – which, as in the case of agricultural machinery, also account for much of the progress in the competitive sector – and a shocking suspicion dawns upon us that big business may have had more to do with creating [the modern] standard of life than with keeping it down. (Schumpeter 1950 [1976, p. 82].)

To Schumpeter, the power of the corporation, over which Berle and Means had fretted, was in fact what turned the engine of capitalist growth. The competition that drives the large enterprises is not – and ought not be – the polite competition of a large number of small powerless firms. For, “in capitalist reality as distinguished from its textbook picture,” what matters for growth is

the competition from the new commodity, the new technology, the new source of supply, the new type of organization (the largest-scale unit of control for instance) — competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives. This kind of competition is as much more effective than the other as a bombardment is in comparison with forcing a door, and so much more important that it becomes a matter of comparative indifference whether competition in the ordinary sense functions more or less promptly; the powerful lever that in the long run expands output and brings down prices is in any case made of other stuff. (Schumpeter 1950 [1976, p. 83].)

Notice the importance of organization – notably large-scale organization – in the capitalist arsenal.

Schumpeter provided a provocative vision of the large corporation and its role in history. But, despite his appeal to the past, he did not actually provide us with much history. The same cannot be said of Alfred D. Chandler, Jr., the dean of modern business historians, who has indeed taken the trouble to look at economic history. And what he sees is Schumpeter's corporation, not that of Berle and Means or the neoclassical economists.

In a series of major works that emerged over the course of more than four decades, Chandler offered a distinctive and influential vision of the corporation, one that moved against the grain of the Robber Baron accounts that had long dominated professional as well as popular history. In his Pulitzer-Prize-winning *Visible Hand* (1977) and its follow-on *Scale and Scope: The Dynamics of Industrial Capitalism* (1990), Chandler offers a voluminous set of “collective histories” of corporate enterprise through World War II. Despite the encyclopedic detail, however, his objective is persuasive not antiquarian. As the 1990 subtitle suggests, Chandler is out to distill the essence of the modern corporate enterprise and demonstrate its role in economic growth. Those enterprises, he writes, “whose collective histories are presented in this study – those enterprises that were most *responsible for the economic growth* of the world's three largest industrial nations – have provided a

fundamental dynamic or force for change in capitalist economies since the 1880s” (Chandler 1990, p. 4, emphasis added).

Notice that there are actually two claims embedded in the Schumpeter-Chandler thesis (if I may call it that), both of which are provocative. Behind the specific claim that the large corporate form of organization is a driver of economic growth is the more general implication that organizational change *of any kind* can be an important factor in economic growth.

Of course, central strands of economic thought had long taken on board the idea that organizational change, broadly understood, is a crucial manifestation, or perhaps even a cause, of economic growth. One perspective, going back at least to Adam Smith, has focused on those background institutions of civil society that are able to channel the rent-seeking proclivities of individuals into the production of new wealth rather than into the redistribution of existing wealth. For Smith, as for the Nobel Laureate Douglass North (1990) and other present-day economists, a system of well-defined and well-protected rights of private property underlies sustained intensive economic growth.<sup>3</sup> To Smith, the benefits of such institutions arise not from any tendency to allocate given resources efficiently but from the ambit they accord to organizational change and innovation. Institutions may be the ultimate drivers of economic growth, but organizational change is the proximate cause. As Smith tells us in the first sentence of *The Wealth of Nations*, what accounts for “the greatest improvement in the productive power of labour” is the continual subdivision of that labor (Smith 1976, I.i.1). Growth in the extent of the market makes it economical to specialize labor to tasks and tools, which increases productivity – and productivity is the real wealth of nations.<sup>4</sup> As the benefits of the resulting increases in per capita output find their way into the pockets of consumers, the extent of the market expands further, leading to additional division of labor – and so on in a self-reinforcing process of organizational change and learning (Young 1928; Richardson 1975).

Smith’s concern with organizational change lies at a fairly high level of abstraction. He doesn’t seem interested in whether specialization would or should take place within the boundaries of a single firm or be spread across many distinct firms. He tends to think of the division of labor in terms of separate trades or occupations.<sup>5</sup> But how are these occupations coordinated? As one of Smith’s themes is the possibility and desirability of unselfconscious processes of coordination, and the limitations and even hubris of centralized processes, we may presume that he envisioned the division of labor as largely organized through markets and market-like arrangements.

---

<sup>3</sup> Smith referred to this system of institutions as the “obvious and simple system of natural liberty” (Smith 1976, IV.ix.51), though to our modern eyes it doesn’t seem all that obvious, simple, or “natural.”

<sup>4</sup> For a lucid exposition of the reasons the division of labor increases productivity, see Leijonhufvud (1986).

<sup>5</sup> “In every improved society,” he tells us, “the farmer is generally nothing but a farmer; the manufacturer, nothing but a manufacturer. The labour too which is necessary to produce any one complete manufacture, is almost always divided among a great number of hands. How many different trades are employed in each branch of the linen and woollen manufactures, from the growers of the flax and the wool, to the bleachers and smoothers of the linen, or to the dyers and dressers of the cloth!” (Smith 1976, I.i.4).

Like Smith, Alfred Marshall saw organizational change as the handmaiden of growth. “An increase of labour and capital,” he wrote, “leads generally to improved organization, which increases the efficiency of the work of labour and capital” (Marshall 1961, IV.xiii.2). Writing more than a century after Smith, Marshall had had the chance to see the beginnings of the organizational revolution Chandler was to describe.<sup>6</sup> In both his *Principles* (1890) and *Industry and Trade* (1919), he canvassed and catalogued real-world organizational forms in great detail. Yet Marshall did not give the large corporation pride of place among organizational innovations. Rather the opposite. Although he did see advantages to large-scale production, especially in manufacturing, Marshall ultimately held to a life-cycle model of organizational development in which large firms would grow old and give way to small young forms, a process he famously likened to the ecology of a forest (1961, IV.xiii.1).

But Smith and Marshall were not, of course, the inspiration for how the economics profession came to think about economic growth. Far more influential was David Ricardo. Although Ricardo agreed fundamentally with Smith about the nature and causes of the wealth of nations, he was interested in different issues. He wanted to know how the returns to production were distributed among the three very real socioeconomic classes of his age – land, labor, and capital. For what were perfectly good reasons, then, Ricardo chose to abstract from the details of organization and institutions and to examine in a somewhat more formal way the relationships among aggregate variables like capital, labor, and land. Although most nineteenth-century economists paid their obeisances to Smith with a few pages on the division of labor, most followed Ricardo, whose approach came to define what classical economics meant. After 1871, the classical structure did come under attack from what we now call the marginalist revolution. In important respects, however, the ensuing “neoclassical” economics actually completed and reinforced the Ricardian turn. In effect, the revolutionaries directed to consumption the same reasoning “on the margin” that Ricardo had applied to production, thus achieving something the classicals had never managed to pull off: a unified theory of demand and supply. But in so doing, they also diverted the focus of the profession even farther away from the phenomenon of economic growth and toward the mathematics of optimally allocating known-and-given resources.<sup>7</sup> Even Alfred Marshall could not stem the tide.

Post-War “neoclassical” growth theory is the child of this tradition, adopting a formalism – the aggregate production function – that was already virtually implicit in Ricardo. In the production function one dumps aggregate capital, aggregate labor, and possible other factors (appropriately defined and adjusted) into a kind of sausage machine that yields aggregate output. As economists learned after World War II, increases in capital and labor (at least as conventionally measured) do not account for all of economic growth (Abramovitz 1956; Solow 1957). There is an unexplained “residual,” variously associated with homogenized notions of technological change, education (human capital), or

---

<sup>6</sup> Smith was certainly aware of the large corporations of his day, that is, the government-sponsored joint-stock companies like the East India Company. But he considered these artificial contrivances that, although useful in establishing commercial beachheads in new areas of trade, would not long endure in a regime of free entry (Smith 1976, V.i.119).

<sup>7</sup> William Stanley Jevons put the matter starkly. “The problem of economics,” he wrote, “may, as it seems to me, be stated thus: — Given, a certain population, with various needs and powers of production, in possession of certain lands and other sources of material: required, the mode of employing their labour which will maximize the utility of the produce.” (Jevons 1911, p. 267.)



“knowledge” generally – but never , of course, with organizational change, except insofar as organizational change may be thought of as having been pureed into one of the other categories.

Yet, at the outskirts of the profession today there do walk a few economists who dog the footsteps of Smith and Marshall. Prominent among these is Richard Nelson, who, along with his coauthors, has insisted that students of economic growth pay attention not only to changing physical technologies but also to the *social technologies* that coevolve along with the physical<sup>8</sup> (Nelson and Sampat 2000; Metcalfe and Nelson 2006). These latter involve “patterned human interaction rather than physical engineering” (Nelson and Sampat 2000, p. 40). Social technologies are human organization in the broadest sense, corresponding to what Smith and Marshall meant by organization: how people act and arrange themselves to get things done. Social technologies can thus comprehend institutions, organizations in the narrow sense, and even cultural norms and practices. Institutions are those social

<b>Commodity</b>	<b>1860 (millions)</b>	<b>1900 (millions)</b>	<b>Increase (percent)</b>
Anthracite coal (short tons)	11	57.4	422
Bituminous coal (short tons)	9	212.3	2,260
Crude petroleum (barrels)	0.5	45.8	9,060
Pig iron (short tons)	0.9	15.4	1,600
Crude steel (long tons )	0.01	10.2	10,190
Wheat (bushels)	173.1	559.3	223
Wheat exported (bushels)	4	102	2,700
Corn (bushels)	838.8	2662	217
Cotton (bales)	3.8	10.1	170

Table 1

**Source:** U. S. Department of Commerce, *Historical Statistics of the United States*.

technologies that become standardized; and standardized organizational forms – like those associated with the large corporation – are one particular kind of social institution.<sup>9</sup> In this view, economic growth proceeds not through the accumulation of homogenized factors – even factors like “technological knowledge” – but rather through the coevolution of physical

<sup>8</sup> Nelson and his coauthors do not seem to be using the term “social technology” in exactly the way Karl Popper does in *The Poverty of Historicism* (1957), even if all these authors share an evolutionary view of social institutions.

<sup>9</sup> “Thus, to call Chandler’s M-form an institution is a convenient way of referring to the social technology of corporate management associated with it” (Nelson and Sampat 2000, p. 41).

and social technologies. Economic growth is about the evolution of a complex structure (Langlois 2001).

Understood this way, the Schumpeter-Chandler thesis is a claim about the role in economic growth of one particular social technology (or a small related set of social technologies): the large corporation. One can uphold the larger claim that organization matters (as indeed I do) without upholding the more specific claim. Analyzing that more specific claim is what this book is about.

Year	Price of crude	Cost of refining	Cost of wooden barrel	Transport	Price of refined oil
1865	\$6.50	\$0.30	\$2.50	\$4.59	\$24.67
1872	\$3.75	\$0.42	\$1.25	\$1.50	\$9.66
1884	\$0.83	\$0.46	\$1.25	\$0.55	\$3.36

Table 2

Source: Lebergott (1984)

Prices per barrel in nominal dollars.

N. B. Standard Oil's cost of refining: \$0.22

To an economic historian looking back from today, there is certainly a good deal of circumstantial evidence for the Schumpeter-Chandler thesis. The large corporation rose to prominence beginning in the last quarter of the nineteenth century. This was the era of the Trusts and the Robber Barons, a time that the popular mind has been taught to associate with monopolies. But, as Schumpeter points out, monopolies and cartels are supposed to restrict output and raise prices, whereas what we observe is actually a spectacular *increase* in output and a *fall* in prices (Schumpeter 1950, chapter VII). Table 1 presents the relevant output data from a number of important sectors. Note that, as Schumpeter insists, even sectors like agriculture, still the province of small farmers in this period, benefited from the existence of large corporations in agricultural machinery and other support sectors (Schumpeter 1950 [1976, p. 82]). Table 2 presents data for the oil industry, dominated by perhaps the most reviled firm of the era, Standard Oil. Here too prices fell precipitously. We now understand that, although there were certainly trusts and cartels during this period, these were for the most part a side-show. In most important industries, mass production conquered the pool, as the economic historian Margaret Levenstein (1995) put it. That is, the imperative of mass production – and thus lower prices and higher output – always tended to tempt away the more efficient firms and destroy the significance of the cartels. But prices fell even in industries like aluminum in which a single seller was protected for a time by patent, and for much the same reason: Alcoa adopted mass production techniques whose efficiency benefits massively outweighed any costs of any supracompetitive pricing.<sup>10</sup>

<sup>10</sup> As Schumpeter points out, even Alcoa was not technically a monopolist in that, as a new material made economical by the advent of electric power, aluminum had at first to compete with potential substitutes and to create a market in the first place.

(Schumpeter 1950 [1976, p. 101]). Overall, the era of the large corporation coincided with the take-off in output per capita in the United States – with the birth of modern sustained intensive economic growth.<sup>11</sup>

This circumstantial evidence is decisive against the view that large corporations were plunderers who hindered economic growth. But it does not by itself make the case that the large corporation was decisive *for* economic growth. Even less does it make the case that the large corporation will always remain the driver of economic growth. On one reading, the rise of the corporation is simply the response of business institutions to the conditions of a particular historical episode, namely the dramatic increases in population and per capita income in the United States after the Civil War, coupled with the equally dramatic fall in transportation and transaction costs attendant on the railroad, the inland water network, and the telegraph. In this reading – the Smith-Marshall reading, we may say – it is organizational adaptation generally, not any one specific form of organizational adaptation, that drives economic growth. On another reading, however, the managerial revolution represents the emergence of an institutional structure inherently superior for all times and places to that of decentralized ownership and market exchange in all its forms. In this reading, it is the large corporation – and only the large corporation – that is and will remain central to economic growth.

History is never kind to historicists, of course; and the facts of the last quarter century have made life uncomfortable for those who would project the Schumpeter-Chandler model into the present. It has become exceedingly clear that the late twentieth (and now early twenty-first) centuries are witnessing a revolution at least as important as, but quite different from, the one Berle and Means decried and Schumpeter and Chandler extolled. Strikingly, the animating principle of this new revolution is precisely an *unmaking* of the corporate revolution. Rather than seeing the continued dominance of multi-unit firms in which managerial control spans a large number of vertical stages, we are seeing a dramatic increase in vertical specialization — a thoroughgoing “de-verticalization” that is affecting traditional industries as much as the high-tech firms of the late twentieth century.<sup>12</sup> In this respect, the visible hand, understood as managerial coordination of multiple stages of production within a corporate framework, is fading into a ghostly translucence.

Schumpeter and Chandler have given us triumphalist accounts of the rise of the large corporation. But what to do with triumphalist accounts of something no longer triumphant? The menu of intellectual alternatives is short. One could reject the account as having been wrong from the start.<sup>13</sup> One could deny that the large corporation is less successful and superior today than it was in the past.<sup>14</sup> Or, most interestingly, one could attempt to

---

<sup>11</sup> On the trend in U. S. GDP per capita, see Johnston and Williamson (2002). Again, of course, the era of the Great Depression was an exception, as measured output per capita dipped between 1929 and 1936. But economic historians – albeit not yet the general public – understand that the fall in output was not the work of “plundering” corporations but rather the result of gross mismanagement of the money supply by the Federal Reserve (Friedman and Schwartz 1963; Eichengreen 1992; Bernanke 1993).

<sup>12</sup> Chapter 5 will confront the evidence for this assertion.

<sup>13</sup> An alternative that some writers have long been suggesting. See, for example, Sabel and Zeitlin (1985).

<sup>14</sup> It may not be entirely unfair to suggest that Chandler himself has taken this approach. For example, his account of the rise of the electronics industry after World War II (Chandler 2001) is at pains to stress the contribution of large firms like IBM, and it invites us to see the rise of this industry as akin to, if not

reinterpret Schumpeter and Chandler in a way that preserves the essence of their contributions while placing those contributions in a frame large enough to accommodate both the rise and the (relative) fall of the large managerial enterprise. This last alternative – if done right – has the great advantage of preserving many of the insights of these remarkable and profound authors while at the same time extending our understanding of economic growth and of the economic theory of organization.

### ***Explaining the corporation.***

Inevitably, one has to understand the “large corporation” in contrast to its historical and conceptual alternative, the small owner-managed firm. Size itself is certainly of some significance, especially for Schumpeter.<sup>15</sup> Of more importance, however, is the “corporation” part. As Chandler tells us on the first page of *The Visible Hand*, two characteristics set the managerial corporation apart from earlier modes: (1) it is overseen by salaried professionals rather than by owners, and (2) it comprises multiple units or stages of production each of which could in principle have stood on its own as a separate organization. The last characteristic is really the essential one. In the large corporation, management supersedes the price system as a method of coordinating stages of production.

The market remained the generator of demand for goods and services, but modern business enterprise took over the functions of coordinating flows of goods and services through existing processes of production and distribution, and of allocating funds and personnel for future production and distribution. As modern business enterprise acquired functions hitherto carried out by the market, it became the most powerful institution in the American economy and its managers the most influential group of economic decision makers. The rise of modern business enterprise in the United States, therefore, brought with it managerial capitalism. (Chandler 1977, p. 1.)

---

identical to, the original Chandlerian revolution of the late nineteenth century. What this fails to stress is that preeminent large firms today – like Intel and Microsoft – are far less vertically integrated than traditional Chandlerian firms and are imbedded in thick market-like networks more akin to traditional industrial districts. IBM is one of the few genuinely Chandlerian firms to make the transition to the New Economy, but it did so by radically de-verticalizing and by emulating its more specialized competitors. For my own account of the rise of the electronics industry, see Langlois (2002a).

<sup>15</sup> In fact, it is not so much size as market power – “monopoly” – that matters for Schumpeter: “there are superior methods available to the monopolist which either are not available at all to a crowd of competitors or are not available to them so readily: for there are advantages which, though not strictly unattainable on the competitive level of enterprise, are as a matter of fact secured only on the monopoly level, for instance because monopolization may increase the sphere of influence of better, and decrease the sphere of influence of the inferior, brains, or because the monopoly enjoys a disproportionately higher financial standing. ... There cannot be any reasonable doubt that under the conditions of our epoch such superiority is as a matter of fact the outstanding feature of the typical large-scale unit of control, though mere size is neither necessary nor sufficient for it” (Schumpeter 1950, p. 101). I will suggest later that market power matters to Schumpeter because it is a method of *buffering* uncertainty and environmental variability.

The question, then, is clear: *why* did managerial coordination supersede the price system? Why did “managerial capitalism” supersede “market capitalism” in many important sectors of the American economy beginning in the late nineteenth century?

There are, of course, a variety of answers to the question, which we can group into two classes roughly analogous to what I just called the two readings of the Schumpeter-Chandler thesis. One class of explanations we can call *contingent* in that they see the success of multi-unit enterprise as dependent on various external conditions. Absent those conditions, multi-unit enterprise is not at all superior to market coordination of more vertically specialized enterprises. The other class we can think of as *absolute* in that these see the managerial enterprise as inherently superior to market coordination of specialized organizations in all times and places – or at least in all times later than the late nineteenth century and in all places as developed as the America of that period. In this class of explanations, the managerial enterprise represents a unidirectional evolution and improvement of economic organization. To put it another way, the corporation epitomizes what Schumpeter called the progressive rationalization of economic activity (Schumpeter, 1934, p. 85).

Contingent explanations of the corporation have been the bailiwick of economists. Of course, economists had long been preoccupied with the *alternative* to the corporation, that is, with price-mediated spot transactions among anonymous individuals – “the market” in the narrow sense of the term. But, in what amounts to a kind of Gestalt switch, Ronald Coase (1937) at once noticed the problem of explaining the existence of firms and saw the solution to the problem within the existing toolkit of economics. Formulating his ideas at about the same time as the publication of Berle and Means – during the Depression and the early decades of the Soviet experiment – Coase (1988, pp. 7-8) was struck by the contrast between the economist’s exaltation of spontaneous decentralization and Lenin’s insistence that, in the socialist future, the “whole of society will have become one office and one factory” (Lenin 1992, p. 91). At least with respect to the firm, Coase reasoned, the truth must lie in between. Firms do represent a supersession of the prices system; they are indeed a kind of central planning. But the optimal amount of supersession is neither zero nor 100 per cent: it is somewhere in the middle. Firms supersede the market, quite simply, because “there is a cost to using the price mechanism” (Coase 1937, p. 390). The optimal degree of supersession is then a matter of equating costs at the margin.<sup>16</sup> And firms do not expand to Leninesque extremes because eventually there set in diminishing returns, including those to management itself as a fixed factor. What are these costs of using the price mechanism – what we now call transaction costs? Answering that question has been the research agenda of the economics of organization since Coase. Notice, however, that, whatever these sources turn out to be, they are contingent factors. When the right factors are present, transaction costs will be high, and it will pay to coordinate multiple stages of production within the organization; when these factors are not present, it will pay to delegate more stages to “the market.”

Coase himself had some ideas about what the relevant factors were. As I have argued elsewhere, a close reading of Coase (1937) will demonstrate that he saw transaction

---

<sup>16</sup> “A firm will tend to expand until the costs of organising an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market or the costs of organising in another firm” (Coase 1937, p. 395).

costs as costs of coordination arising out of uncertainty (Langlois and Foss 1999; Langlois 2005). In this respect, Coase's explanation for the firm is rather close to a slightly earlier one by Frank Knight, who wrote that when "uncertainty is present and the task of deciding what to do and how to do it takes the ascendancy over that of execution, the internal organization of the productive group is no longer a matter of indifference or a mechanical detail. Centralization of this deciding and controlling function is imperative, a process of 'cephalization,' such as has taken place in the evolution of organic life, is inevitable, and for the same reasons as in the case of biological evolution"<sup>17</sup> (Knight 1921, III.ix.8). To anticipate language I will use later, management sometimes has advantages over the price system because it is sometimes a superior way to *buffer uncertainty*.

This is an explanatory strand I will tug on with some force in the ensuing chapters. But it is not the strand that has been woven by the mainstream of the economics of organization. That literature has focused instead on the misalignment of incentives that arises when performance cannot be costlessly monitored or contracts cannot be costlessly enforced. Imperfections in the system of property rights allow enough plasticity or "wobble room" for contracting parties to deviate in cost-creating ways from what was agreed upon or even to threaten to renege on the agreement altogether<sup>18</sup> (Alchian and Woodward 1988). This latter possibility is amplified by the extent to which the contract involves assets that are highly specific in that they have low value outside of the transaction (Klein, Crawford, and Alchian 1978; Williamson 1985). In all these cases, managerial coordination may sometimes prove a superior "governance structure" when it reduces the costs of incentive misalignment.<sup>19</sup> Here again, the factors that might explain the supersession of markets by managerial coordination are contingent ones. The extent of managerial coordination should depend on, and fluctuate with, changes in non-systematic factors like the nature of the goods and services transferred between stages; institutions and technologies of monitoring and enforcement; and the degree of asset specificity. As a result, this apparatus would seem ill suited to explaining (what Schumpeter and Chandler claim to be) the secular ascendancy of managerial capitalism, although some authors have tried to use this body of theory to do just that (Williamson 1985, especially ch. 11; Lamoreaux, Raff, and Temin 2003).

Of course, one can always use a contingent approach to explain a secularly changing phenomenon if one can point to corresponding secular changes in the contingent factors one considers most powerful and salient; and I will in fact rely on this technique to a considerable extent in chapter 4, when I take my shot at explaining the rise of managerial

---

<sup>17</sup> Coase (1937, pp. 398-401) expends considerable effort disagreeing with Knight. But I argue that the real disagreement is not about the source of the costs that give rise to managerial coordination but rather about the definition of a firm. For Knight, it is the "cephalization" part that matters, even if that cephalization is exercised through market contracts. For Coase, however, a firm implies both "cephalization" and the transformation of contracts for output into contracts for effort (Langlois 2005).

<sup>18</sup> Of course, what makes it costly to monitor or enforce is ultimately a lack of information of some kind (Dahlman 1979), so incentive misalignment theories are related at some level to the uncertainty theories of Knight and Coase. But they arguably involve much narrower and often highly selective imperfections of knowledge while simultaneously assuming perfect knowledge along other dimensions (Foss and Foss 2001; Pagano 2000).

<sup>19</sup> More formally, we should observe internal organization of potentially separable stages when that governance mode yields lower total costs – the sum of all production costs and transaction costs (Williamson 1985, p. 103).

capitalism. But the problems of the Coasean approach for this particular enterprise run deeper. As I emphasized, Coase and his followers use a particular contingent theory based on equilibrium comparative statics. As a result, they tacitly assume that whatever organizational structure they are trying to explain is in equilibrium (as defined by the explaining economist's model) – even if it isn't. And they thus see the choice of firm versus market in terms of a snapshot – “*ex visu* of a point of time,” as Schumpeter (1950 [1976, p. 84]) would have sneered – uninfluenced by past or future. But both the shadow of the past and the glimmer of the future may be crucial for explaining why we observe one mode of organizing rather than another (Langlois 1984). This is not to say that the kinds of transaction-cost problems featured in the economics of organization are never important. Biologists understand that, to avoid a tautological theory, evolutionary explanation must mean showing how the biological structure in question would meet “an engineer's criterion of good design” (Gould 1977, p. 42); and transaction-cost stories can sometimes serve a similar function in the explanation of organizational evolution, at least so long as we keep them embedded in an evolutionary context and are attentive to the additional issues that economic change thrusts upon us (Langlois 1986).

A more significant problem, perhaps, is that equilibrium transaction-cost approaches provide us with insufficient material for understanding the causes of organizational *change* and how that change affects economic growth. If there is learning and adaptation in an equilibrium account, it occurs behind the scenes, and it has all been tidied up by the time we get to the equilibrium calculation of costs. For the question of growth, the original ideas of Knight and Coase are arguably more helpful than later theories, in that they focus on uncertainty. But we need to keep in mind that uncertainty is also a kind of snapshot concept. What is really happening is an evolutionary process of organizational learning and adaptation; but from the perspective of the participant, the future of that process looks “uncertain.” So, although it is not nonsensical to talk about the organization we observe at any time as solving a problem of “uncertainty,” we need to keep in mind that uncertainty is the experiential counterpart of what the organization is really attempting to solve: an evolutionary design problem.

Once again, however, we can find along the margins of present-day scholarship an alternative better suited to the issue of organizational evolution and economic growth: the *capabilities* literature – or, more grandiosely, the *evolutionary capabilities* literature. This approach has its roots in Smith, Marshall, and Schumpeter, takes its recent inspiration from the works of Edith Penrose (1959) and G. B. Richardson (1972), and was first clearly developed by writers like Nelson and Winter (1982) and David Teece (1980, 1982).<sup>20</sup> In a sense, the capabilities approach extends the insight of Coasean transaction-cost economics into the realm of production. Coase noticed that there can be costs of transacting because of limitations of knowledge and information; capabilities theory insists that limitations of knowledge and information are the key to understanding *everything* an organization does (Langlois and Foss 1999). Indeed, transacting is just one of the many activities an organization undertakes – one of many activities requiring capabilities (Winter 1988).

---

<sup>20</sup> There is a parallel literature in strategic management called the Resource Based View, often traced to Wernerfelt (1984). More recently, Teece and his coauthors (Teece, Pisano, and Shuen 1997) have begun to tout what they call the *dynamic capabilities* approach, where by “dynamic” capabilities they mean those capabilities within the organization that allow it to adapt and innovate.

Richardson (1972, p. 888) describes capabilities as “the knowledge, experience, and skills” of the firm. Taking issue with the representation of knowledge in the production-function approach, which had come to dominate price theory much as it had the theory of economic growth, Richardson writes:

Of course I realise that production functions presume a certain level of managerial and material technology. The point is not that production is thus dependent on the state of the arts but that it has to be undertaken (as Mrs. Penrose has so very well explained) by organisations embodying specifically appropriate experience and skill. It is this circumstance that formal production theory tends to put out of focus, and justifiably, no doubt, given the character of the optimisation problem that it is designed to handle; nevertheless, it seems to me that we cannot hope to construct an adequate theory of industrial organization and in particular to answer our question about the division of labour between firm and market, unless the elements of organisation, knowledge, experience and skills are brought back to the foreground of our vision (Richardson 1972, p. 888).

Richardson’s ideas connect to the evolutionary theory of Nelson and Winter, who have formulated a more microanalytic account of the nature of capabilities: namely, the habits and routines that individuals and organizations acquire through practice. “Routines,” as they put it (1982, p. 124), “are the skills of an organization.” In the course of its development, a firm acquires a repertoire of routines that derives from its activities over the years. Note that *routines* refer to what an organization actually does, while *capabilities* also include what it may do if its resources are reallocated. Thus a firm’s routines are a subset of its capabilities that influence but do not fully determine what the firm is competent to achieve. In essence, capabilities and routines are forms of knowledge about how to carry out productive tasks. Some of this knowledge may be tacit (Polanyi, 1958) and not easily articulated or transferred to others, but other capabilities may be generally available to those willing to make the investment necessary to acquire them.

It is clear how these notions might connect to economic growth, for they suggest that organizational adaptation and the acquisition of new productive knowledge are in fact the same process. But how does the notion of capabilities lead to a theory of the boundaries of the firm? In Richardson’s system, production can be broken down into various stages or *activities*. Some activities are *similar*, in that they draw on the same general capabilities. Activities can also be *complementary*, in that they are connected in the chain of production and therefore need to be coordinated with one another. The central problem of economic coordination lies in the fact that what is complementary need not be what is similar: “Where activities are both similar and complementary they could be co-ordinated by direction within an individual business. Generally, however, this would not be the case and the activities to be co-ordinated, being dissimilar, would be the responsibility of different firms.” (p. 895). Notice, with Brian Loasby (1991), that Richardson here stands on its head a principal presumption of the mainstream economics of organization, namely that contractual relationships among firms must be fraught with hazards and thus that integration must be widely desirable. For Richardson, the dissimilarity among capabilities makes integration costly, to such an extent that, even when there are transaction costs, market transactions may typically prove a cheaper alternative.



These considerations would seem to suggest a world of narrowly focused concerns, each concentrating on a set of relatively similar activities. But, as Paul Robertson and I have argued, explaining organizational structure requires understanding not only how capabilities are arrayed within organizations but also the “fit” between those capabilities and the changing structure of the economic problem organization must solve (Langlois and Robertson 1995). Economic growth is fundamentally about the emergence of new economic opportunities. The problem of organization is that of bringing existing capabilities to bear on new opportunities or of creating the necessary new capabilities. Thus, one of the principal determinants of the observed form of organization is the character of the opportunity – the innovation – involved. The second critical factor is the existing structure of relevant capabilities, including both the substantive content of those capabilities and the organizational structure under which they are deployed in the economy.

One pattern typical in the history of business institutions emerges when taking advantage of a profit opportunity demands a *systemic* innovation, that is, an innovation requiring simultaneous change in several activities or stages of production.<sup>21</sup> This would likely render obsolete some existing assets and, at the same time, call for the use of capabilities not previously involved in the chain of production. If, in addition, the existing capabilities are under separate ownership — or, to put it loosely and somewhat inaccurately, the existing production system is coordinated through market mechanisms — then we arrive at one important rationale for the institution of the multi-unit firm. Under this scenario, the multi-unit firm arises because it can more cheaply redirect, coordinate, and where necessary create the capabilities necessary to make the innovation work. Because control of the necessary capabilities in the firm would be relatively more concentrated than in the earlier organizational structure, such a firm could overcome not only the recalcitrance of asset-holders whose capital would have creatively to be destroyed but also the “dynamic” transaction costs of informing and persuading new input-holders with necessary capabilities<sup>22</sup> (Silver 1984; Langlois 1992). Chapter 3 will attempt to bring this scenario to life with a detailed case study.

This pattern of change arguably describes the creation and growth of many of the enterprises Chandler chronicled in *The Visible Hand*. With the lowering of transportation and communications costs in the America of the nineteenth century, there arose profit opportunities for those who could create mass markets and take advantage of economies of scale in mass production. Examples range from steel and farm machinery to cigarettes and branded goods. In all these cases, profitable improvements in product attributes and costs required the creative destruction of existing decentralized systems of production and distribution in favor of systems involving significantly different capabilities. Chapter 4 will add considerable texture to this argument and confront it more carefully with organizational history.

Notice the contingent character of this explanation. The superiority of the firm rested on its ability cheaply to redeploy, coordinate, and create necessary capabilities in a situation in which (1) the entrepreneurial opportunity involved required systemic change and

---

<sup>21</sup> This usage follows Teece (1986). The opposite of a systemic innovation is an *autonomous* one, in which change can proceed in one stage of production without requiring coordination with other stages.

<sup>22</sup> More generally, dynamic transaction costs — or, more generally still, dynamic *governance* costs — are the costs of not having the capabilities you need when you need them (Langlois 1992).

(2) the necessary new capabilities were not cheaply available from an existing decentralized or market network. In situations, however, in which one or both of these conditions is missing, the benefits of the multi-unit firm are attenuated, and its rationale slips away. In many circumstances, change, even sometimes rapid change, may proceed in *autonomous* fashion, that is, within the confines of an existing division of labor or set of organizational boundaries. In highly developed economies, moreover, a wide variety of capabilities is already available for purchase on ordinary markets, in the form of either contract inputs or finished products. When markets are thick and market-supporting institutions plentiful, even systemic change may proceed in large measure through market coordination. At the same time, it may also come to pass that the existing network of capabilities that must be creatively destroyed (at least in part) by entrepreneurial change is not in the hands of decentralized input suppliers but is in fact concentrated in existing large firms. The unavoidable flip-side of seeing firms as possessed of capabilities, and therefore as accretions of habits and routines, is that such firms are quite as susceptible to institutional inertia as is a system of decentralized economic capabilities. Economic change has in many circumstances come from small innovative firms relying on their own capabilities and those available in the market rather than from existing firms with ill-adapted internal capabilities. Chapter 5 will reconstruct the New Economy of the late 20<sup>th</sup> and early 21<sup>st</sup> centuries along exactly these lines, once again adding nuance and historical texture. If the antebellum period reflected the Invisible Hand of market coordination, and if the late 19<sup>th</sup> and early 20<sup>th</sup> centuries saw the rise of the Visible Hand of managerial coordination, then the New Economy is the era of the Vanishing Hand.

### ***The seventh sense.***

The theory of economic organization I just sketched offers a contingent explanation for the multi-unit enterprise. But there are others who see managerial capitalism not as an adaptation to particular historical circumstances but rather as a stage – and perhaps even the final stage – in a process of economic rationalization. If contingent theories are the bailiwick of economics, then rationalization accounts are the province of economic sociology.

Among the most famous such accounts, of course, is that of Marx. Lenin's version of this we have already heard; but perhaps the clearest exposition is that of Engels in the *Anti-Dühring* (Engels 1966, III.2). In the view of (Marx and) Engels, the internal managerial coordination of economic activity is always superior to market coordination for the simple reason that the former is rational whereas the latter is anarchy. Capitalists themselves sought to combat the anarchy of the market by managerial coordination within firms, “the increasing organisation of production, upon a social basis, in every individual productive establishment.” Although this gambit had been successful in blowing away earlier market forms of organization, it was and would continue to be unable to solve the problem of anarchy, since “socialized production” (producing for other people rather than for oneself) is necessarily at odds with capitalism and the market; and there is an “antagonism between the organisation of production in the individual workshop, and the anarchy of production in society generally.” This antagonism would lead to deepening crises, the result of which would be the Darwinian consolidation of more and more stages of production into fewer and fewer large organizations. Only when the proletariat takes over title to the means of production, which capitalists will have conveniently centralized and organized for them, will this antagonism be resolved, for only then will all of production be planned in the manner of

the firm. “Anarchy in social production is replaced by systematic, definite organisation.”<sup>23</sup> This view is remarkable along a number of dimensions, not merely for its historicism (Popper 1957) but for its commitment to a super-strong conception of rationality and rationalization as involving conscious, deliberate planning of complex economic activity.

Another, equally famous, account of rationalization is that of Max Weber (1947). For Weber, rationalization is “the disenchantment of the world,” that is, the disappearance of the supernatural and the metaphysical in favor of a hard-headed concern with the here-and-now. In Weber’s schema, economic organization coheres through a system of authority. The most basic, creative, and volatile form is *charismatic authority*, as wielded by a religious prophet or military leader. But organization relying on personal authority has its limits, and increasing organizational complexity requires that charismatic authority give way to an impersonal set of rules of conduct. Throughout most of history, this has meant *traditional authority*, in which past practices provide the guide for action and traditional (supernatural) beliefs provide their justification. In the modern world – indeed as a kind of definition of the modern world – *bureaucratic authority* has come to replace both charismatic and traditional authority. Bureaucratization involves the substitution of rules for personal authority, the creation of abstract offices divorced from their individual holders, and the increasing preeminence of specialized knowledge and spheres of competence (Weber 1947, pp. 330-334). This process is “rationalization” in that the rules and structure of organization justify themselves on mundane pragmatic grounds rather than in terms of extra-natural systems of belief.

And it is in Weber’s theory of progressive rationalization that we can locate the accounts of both Schumpeter and Chandler. Indeed, Weber is at the nucleus of a dense nexus that connects the two scholars. Schumpeter and Chandler overlapped at Harvard, at the very end of Schumpeter’s career and the beginning of Chandler’s.<sup>24</sup> The two were both heavily involved in the Center for Entrepreneurial History at Harvard, which Schumpeter had helped found (McCraw 1988, pp. 6-7; Swedberg 1991, p. 172). Of course, Schumpeter had known Weber personally. The economic sociologist Richard Swedberg holds that, especially in his youth, Schumpeter worked within what was fundamentally a Weberian paradigm of “social economics” (Swedberg, 1991, p. 2). Schumpeter’s German-language work was certainly filled with references to Weber; and, even though – always attentive to his audience – the American Schumpeter disembarrassed himself of much of the tone and flavor of German-language social science, his work arguably retained the stamp of Weber’s ideas<sup>25</sup> (Csontos 1991). At Harvard Schumpeter tended to hang out with graduate students and younger faculty rather than with the established lions of his department (Allen 1991, vol. 1, pp. 247, 267-8). Among these younger scholars was one Talcott Parsons, who had written a Ph.D. thesis at Heidelberg on the treatment of capitalism in Weber and Werner Sombart. Parsons would of course become arguably the preeminent American sociologist of his day as well as the principal American interpreter of Weber. As early as 1927, when Schumpeter was

---

<sup>23</sup> Roberts and Stephenson (1973, p. 25n) point out that the term “organization of labor,” in Marx and Engels, and in contemporary socialist writing generally, referred to complete central planning.

<sup>24</sup> Chandler was an undergraduate at Harvard from 1936-40 and a graduate student there from 1946-1952 (McCraw 1988). Schumpeter died in 1950.

<sup>25</sup> But see Faucci and Rodenzo (1998), who see a substantive as well as a rhetorical shift in Schumpeter’s methodology. (For what it’s worth, I don’t buy it.)

still a visiting professor at Harvard, Parsons had attended, and was greatly influenced by, Schumpeter's course in economic theory (Swedberg 1991, p. 279n8). In turn, Parsons came to exert a strong influence on a young graduate student in history called Alfred Chandler. "In one way or another, for the next forty years, Parsonian and especially Weberian sociology informed the corpus of nearly all of Chandler's studies. Equally important, it guided him toward the broad, systematic generalizations that characterized his work and which the sub-discipline of business history so badly needed" (McCraw 1988, p. 6). Indeed, the influence of Weber and Parsons was crucial to the innovative character of Chandler's histories: rather than writing about individual entrepreneurs or individual companies – let alone about Robber Barons – as most Americans did, Chandler sought to write the history of an entire institution (Chandler 1971), an undertaking far more in the spirit of economic sociologists like Weber, Parsons, and Schumpeter.<sup>26</sup>

Weber's version of rationalization, and thus the versions of Schumpeter and Chandler, are rather different from that of Marx. I will sidestep the question of whether Weberian accounts are historicist, though I believe they ultimately are not, and in any event they are surely less blatantly historicist than that of Marx. The more interesting issue is that rationality and rationalization have different meanings in Weberian accounts. In Marx, economic society is (or could be or will be) somehow held together by strong conscious rationality – or else it is anarchy; in Weber and his followers, it is held together by a system of rules of conduct, at least in the cases of traditional and bureaucratic authority. Rationalization consists not in the progressive replacement of unselfconscious processes of coordination by conscious "rational" ones but rather in a progressive reexamination of, tinkering with, and improvement in the rules of conduct. (Note the obvious affinities, at a general level at least, with the evolutionary capabilities view of economic organization: both are about the way rules of behavior evolve.) In fact, this process might actually be better described as having to do with the empirical than with the rational. At the beginning of Chapter 2 of the English translation of his *Theory of Economic Development*, Schumpeter uses the word "rationalize." In a footnote he explains.

This is used here in Max Weber's sense. As the reader will see, "rational" and "empirical" here mean, if not identical, yet cognate, things. They are equally different from, and opposed to, "metaphysical," which implies going beyond the reach of both "reason" and "facts," beyond the realm, that is, of science. With some it has become a habit to use the word "rational" in much the same sense as we do "metaphysical." Hence some warning against misunderstanding may not be out of place. (Schumpeter 1934, p. 57n.)

Indeed it may not.

When we think of those for whom the term "rational" has become "metaphysical," Marx stands in the forefront. It is hard to forget Schumpeter's marvelous characterization in *Capitalism, Socialism, and Democracy* of Marx as a (Weberian?) prophet. "Observe," writes Schumpeter, "how supreme art here succeeds in weaving together those extra-rational cravings which receding religion had left running about like masterless dogs, and the rationalistic and materialistic tendencies of the time, ineluctable for the moment, which

---

<sup>26</sup> In Chandler's view, "Weber's two most important interpreters were Joseph Schumpeter and Talcott Parsons, both of whom taught at Harvard. Schumpeter was Weber's most noteworthy successor as an economic sociologist and historian" (Chandler 1971 [1988, p. 304]).

would not tolerate any creed that had no scientific or pseudo-scientific connotation” (Schumpeter 1950 [1976, p. 6]). In Marx, the rationalistic and the anti-rational unite. How can this be? Needless to say, the problem lies with the meaning of the word *rational*. Philosophers like Karl Popper (1957, 1966) and F. A. Hayek (1967) have argued that rationality ought to be understood as a *critical* faculty rather than as a generative or creative one. Critical rationality is indeed as much empirical as it cogitative: it is a limited, skeptical, probing, tinkering kind of reason that uses the observable world as its touchstone. By contrast, defining rationality in terms of conscious deliberation and logical deduction from explicit premises leads to the kind of excess that Marx represents. Hayek labels this latter kind of rationalism “constructivist,” and, rightly or wrongly, he blames it on René Descartes. “The ascendancy of this view in the seventeenth century implied in fact a relapse into an earlier naïve way of thinking, into a view which habitually assumed a personal inventor for all human institutions, be it language or writing, law or morals. It is no accident that Cartesian rationalism was completely blind to the forces of historical evolution” (Hayek 1967, p. 85). To believe that human reason alone can invent complex institutions out of whole cloth or can coordinate complex economies unaided is indeed metaphysical not genuinely rational.

I have argued that Weberian economic sociology is all about the forces of historical evolution, and, as Schumpeter’s footnote suggests, its notion of rationality is very much the critical kind. The disenchantment of the world is a skeptical and empirical process, one that can demystify the pretensions of rationalism as easily as the traditional and the supernatural. The problem, however, is that there remains considerable scope for confusion in the meaning of rationality and rationalization. The *Oxford English Dictionary* has this to say.

**Rationalization.** Econ. and Sociol. The process of applying rational (sense 7) methods, esp. of standardization and simplification, to the planning and organization of economic enterprises or the administration of social groups in order to achieve a particular result such as maximum profit or efficiency.

What is the seventh sense of “rational”?

**Rational. 7.** Descriptive of methods of analysis and planning that make use of calculation to bring about a projected result, esp. in economic or social organization.

To the *OED* – surely an authority on how people actually use words – the essence of rationalization lies in “analysis and planning” and “calculation.” Although it clearly fails to rise to the level of Marxian excess, this definition nonetheless suggests a logical and cogitative conception of rationalization rather than a critical or empirical one. So, where do we locate the rationalization accounts of Schumpeter and Chandler? That is what the next two chapters are mostly about.

Schumpeter’s account of progressive rationalization takes the form of a contrast between two modes of economic organization, modes roughly cognate to the difference between the small owner-managed firm and the large multi-unit enterprise. Characteristically, however, the issue in Schumpeter is a dynamic one: he is concerned with the respective merits of these two modes of organization not in the static allocation of existing resources but in generation of economic change and growth. The paradox of Schumpeter is that he famously defended, and has come to be associated with, *both* of these modes as drivers of economic growth. Schumpeter has returned to prominence today as champion of the role of bold entrepreneurs in creating new combinations and redirecting the

means of production into new channels, to such an extent that he is revered as an inspiration to the present-day field of entrepreneurship studies (Shane and Venkataraman, 2000). In this (Schumpeterian) literature, the force behind economic growth comes from individuals or small groups of individuals who work mostly outside the established structure of organization rather than from within it.<sup>27</sup> During the three or so decades after Schumpeter's death in 1950, however, a quite different set of Schumpeterian ideas had entered public consciousness, largely through the popular writings of John Kenneth Galbraith.<sup>28</sup> Far from exalting the role of individual initiative in economic change, this literature foretold, or even claimed to be chronicling, the obsolescence of the entrepreneur. Innovation would become, or even had become, a matter of routine in the large bureaucratic corporation. Galbraith saw the matter as clear-cut: "With the rise of the modern corporation, the emergence of the organization required by modern technology and planning and the divorce of the owner of capital from control of the enterprise, the entrepreneur no longer exists as an individual person in the mature industrial enterprise" (Galbraith 1967, p. 71). Perhaps astoundingly, these two seemingly incompatible sets of ideas do both emanate from Schumpeter.

Chapter 2 will trace this paradox back to the meanings of "rational" and "rationalization." As his footnote in the *Theory of Economic Development* suggests, Schumpeter does at times see rationalization as a critical, empirical process. Some of his passages about the limits to human cognition, the following of tacit rules, and the dynamic nature of competition have given inspiration to present-day writers in the evolutionary-capabilities literature, to such an extent that this literature is sometimes described as "neo-Schumpeterian." At the same time, however, Schumpeter was also the champion of rationalization as "calculation," a word on which his vision arguably turns. Chapter 2 will argue that there is in fact a fundamental and irreconcilable tension in Schumpeter's account of progressive rationalization and the obsolescence of the entrepreneur – a tension between the empirical and the rational – that Schumpeter not only fails to resolve but perhaps actually encourages in the service of his larger economic sociology.

Chapter 3 takes both Schumpeter and Chandler back to Weber, in an attempt to reconstruct Schumpeterian entrepreneurship as a form of charismatic authority. Always attentive to the sources of economic change, Schumpeter needed a mechanism by which new knowledge enters the economic system. Like Weber, he found that source in charisma, which, by relying on the personal authority of a leader, was capable of ignoring and thus breaking free from existing systems of rules of conduct. But the freedom charisma brings is not without order. As the sociologist James Coleman (1990) argued, charismatic authority serves to provide a system of orientation and a guide to action in a world in which the old

---

<sup>27</sup> "New combinations are, as a rule, embodied, as it were, in new firms which generally do not arise out of the old ones but start producing beside them; ... in general it is not the owner of stage-coaches who builds railways" (Schumpeter 1934, p. 66).

<sup>28</sup> Lest we think Galbraith too easy a target today, it is well to remember that he was not always so – that, in the day, he epitomized the phrase he so often hurled in sarcasm at others: the conventional wisdom. In August 2000, at the height of the New Economy boom and a decade after the fall of socialism, President Bill Clinton awarded Galbraith the Presidential Medal of Freedom (Lacey 2000), even as Galbraith's predictions about the large corporation and the viability of central economic planning lay in shambles at his feet. This is testimony to something, but I'm not sure what. For a more thorough thrashing of Galbraith with evidence from the New Economy, see Alcala (2003), who concludes that Galbraith "seems to have adopted the least insightful part of Schumpeter's work" (p. 16).

rules no longer apply. And what of Chandler? Whereas Schumpeter is concerned with the end-points, if you will, of progressive rationalization – its charismatic beginnings and its rationalist end-game – Chandler is more concerned with the details of the process of bureaucratization. Where Schumpeter sees dynamic entrepreneurs, Chandler sees “personal” capitalists who resist the desirable march into managerial capitalism by retaining the structure of charismatic authority (that is, of personal control of day-to-day managerial activities) long after the complexity of the economic structure begins to call for an impersonal managerial hierarchy. And, like Weber, Chandler seems to consider the system of rules of an extended bureaucracy to be the inevitable outcome of economic complexity – as against the system of rules of an extended market economy.

Chapters 2 and 3, then, are about economic sociology. But, as both Schumpeter and Chandler would insist, it is in the end history that validates theory, even as theory gives meaning to history.<sup>29</sup> Chapters 4 and 5 are history. They apply the theory of economic capabilities in an effort to understand both the rise of the large multi-unit enterprise and its more recent (relative) decline. In so doing, those chapters attempt to reflect off and perhaps even illuminate the limitations of the grand systems of Schumpeter and Chandler.

---

<sup>29</sup> “Personally,” wrote Schumpeter, “I believe that there is an incessant give and take between historical and theoretical analysis and that, though for the investigation of individual questions it may be necessary to sail for a time on one tack only, yet on principle the two should never lose sight of each other” (Schumpeter, 1951, p. 259).

## *Chapter 2*

# *The Obsolescence of the Entrepreneur*

### *The Schumpeterian Dichotomy.*

Every student of Schumpeter knows the famous boast: that Schumpeter had had ambition to become the world's greatest lover, the world's greatest horseman, and the world's greatest economist; but, alas, he had achieved only two of the three. How much the *bon mot* actually reveals about Schumpeter's concerns we will never know. But toward the end of his life he might well have been worried about the last of these hoped-for achievements.<sup>1</sup> His great tome *Business Cycles* (1939) had been trampled in the massive Depression-era stampede toward the theories of the hated Lord Keynes. After World War II, few would have ranked Schumpeter as among the world's greatest economists; and many indeed would have heard of him only through the filter of John Kenneth Galbraith. Strikingly, the situation today has to some extent reversed itself. Keynes is in eclipse. And Schumpeter – the Schumpeter of the bold entrepreneur, dynamic competition, and economic growth – is in the ascent.

During the period of Schumpeter's post-war obscurity, there was, however, one literature that knew and valued him: the (largely Anglo-American) literature of technological change. Given its subject matter, this literature was quite naturally forced to deal with the problem of the obsolescence thesis and its relationship to the theory of entrepreneurship. The result has been a standard interpretation of the mechanization-of-progress thesis that has become an unexamined conventional wisdom. It goes something like this. The argument in Schumpeter's early writings is really quite different from that in his later work. There are, in effect, two Schumpeters: an "early" Schumpeter and a "later" Schumpeter. It was the former who believed in the importance of bold entrepreneurs, while the latter envisaged their demise and replacement by a new mode of economic organization. Moreover, the reason Schumpeter changed his views is that he was reacting to the historical development of capitalism as he saw it taking place around him. As he moved from the world of owner-managed firms in turn-of-the-century Vienna to the world of large American corporations in the 1930s and 1940s, his opinions changed appropriately.

This chapter attempts to make two points. The first is that, as a doctrinal matter, the "two Schumpeters" thesis, as it is understood in the Anglo-American literature on technological change, is clearly wrong. Equally wrong is the idea that the fundamentals of Schumpeter's thought on entrepreneurship was influenced by any observation of large firms in the United States after 1931. Schumpeter's ideas about the obsolescence of the entrepreneur were already set in mature form at least as early as 1926 (before he came to the U. S.) and probably as early as 1920. The obsolescence thesis speaks to a distinction between early capitalism and later capitalism, perhaps, but not to an earlier and later Schumpeter. The second, and more important, point is that the obsolescence thesis is wrong. It rests on a confusion – or perhaps a bait-and-switch – between two quite different kinds of economic knowledge.

---

<sup>1</sup> And, of course, he was (Allen 1991, vol. 2, p. 159).



The conventional-wisdom analysis of Schumpeter's obsolescence thesis is in part a matter of oral tradition among (mostly) English-speaking writers whose interest in Schumpeter traces to a concern with innovation and technical change. But documentation in print is far from lacking. There are, in fact, several related versions of this conventional analysis. One of the clearest and best known traces to Almarin Phillips (1971), who focuses primarily on Schumpeter's view of technological innovation.<sup>2</sup> To Phillips, Schumpeter's early writings – by which he means the 1934 English translation of *The Theory of Economic Development* – present a very different picture of the logic of technological change in industry than do his later writings – by which Phillips means *Capitalism, Socialism, and Democracy*.

In the “early” Schumpeter – Schumpeter I – the innovation process might best be characterized as a linear one. Christopher Freeman (1982) describes it this way. Basic inventions are more or less exogenous to the economic system; their supply is perhaps influenced by market demand in some way, but their genesis lies outside the existing market structure. Entrepreneurs seize upon these basic inventions and transform them into economic innovations. The successful innovators reap large short-term profits, which are soon bid away by imitators. The effect of the innovations is to disequilibrate and to alter the existing market structure until the process eventually settles down in wait for the next wave of innovation. The result is a punctuated pattern of economic development that is perceived as a series of business cycles. “The main differences between Schumpeter II and Schumpeter I,” says Freeman, “are in the incorporation of *endogenous* scientific and technical activities conducted by large firms. ... Schumpeter now sees inventive activities as increasingly under the control of large firms and reinforcing their competitive position. The ‘coupling’ between science, technology, innovative investment and the market, once loose and subject to long time delays, is now much more intimate and continuous.” (Freeman 1982, p. 214, emphasis original.)

There is no doubt that *Capitalism, Socialism, and Democracy* was far more concerned with the large corporation than was *The Theory of Economic Development*. Furthermore, it may even be that the former contains a more developed “model” of the process of technological change in industry than does the latter. But saying this still leaves us with at least two distinct interpretations of the early/late thesis. The weaker interpretation would be that, although Schumpeter's theory of innovation and development remained essentially the same in his later as in his earlier work, the “later” Schumpeter simply chose, for various reasons, to elaborate more fully on the nature of the large corporation and its role in his theory. And this weak form may well be what some writers have in mind. But it also seems quite clear

---

<sup>2</sup> In fact, Schumpeter's concept of innovation goes far beyond technological change in the narrow sense. He is concerned with what he calls “the carrying out of new combinations” interpreted broadly. “The concept,” he writes, “covers the following five cases: (1) The introduction of a new good -- that is one with which consumers are not yet familiar -- or of a new quality of a good. (2) The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially. (3) The opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before. (4) The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created. (5) The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position.” (Schumpeter, 1934, p. 66).

that a good many other writers have a far stronger version of the early/late thesis in mind. The change from the “early” to the “later” Schumpeter reflects not a mere shift in his emphasis but a fundamental alteration of his underlying economic vision.

A principal manifestation of this change is held to be Schumpeter's revised assessment of the role of, and of the necessity for, market competition in the process of innovation. Richard Nelson's discussion is representative.

The early Schumpeter certainly did not view the economic problem as that of the control of clerks. His belief was that not only preferences and resources, but also technologies, change over time. Schumpeter, and Marx before him, saw the real power of a capitalist market system in terms of the ability of that system to spur innovation. He also believed that competitive markets provided an environment (monitored by final consumers and powered by competition) that controls the processes of technological change and spreads benefits widely. In his later writings, he recanted the proposition that market competition was necessary for the generation of innovation, positing that in large corporate enterprises, innovation itself has become largely routinized. Therefore, he foresaw no particular disadvantages from socialization of the innovation process, as well as the more routine activities of the economy. (Nelson 1977, pp. 134-135.)

Moreover, Schumpeter's “recantation” of his earlier position is sometimes traced to or associated with a fundamental shift in philosophical orientation. “As it happens,” writes Burton Klein, “Schumpeter expressed very different views in his later writings than in his earlier works, so much so that one has the impression there were two Schumpeters: Schumpeter the revolter against determinism, and Schumpeter the determinist” (Klein 1977, p. 133).

A corollary to this conventional-wisdom interpretation is the notion that Schumpeter “changed his mind” because of what he saw developing in the contemporary economy. As Freeman puts it, the “shift of emphasis from the early Schumpeter ... to the late Schumpeter ... reflected the real change which had taken place in the American economy between the two World Wars and the rapid growth of industrial R&D in large corporations during that period” (Freeman 1982, p. 8). This is certainly not an implausible interpretation. Schumpeter did believe that economic history influences economic theory, not in a historicist sense but in the sense that some essential theoretical features are always outlined more sharply at some periods than at others.

Ultimately, however, this conventional interpretation – that Schumpeter changed his fundamental position on the nature of innovation, and that he did so because of trends he saw developing in twentieth-century American capitalism – Is, I'm afraid, clearly wrong.

First of all, one can find examples from Schumpeter's work written *after* 1942 that present very much the same theory of entrepreneurship as does *The Theory of Economic Development* (Schumpeter 1947, 1951). More significantly, the idea that the entrepreneur will eventually become “less important” or “obsolete” is already present in the 1934 translation of *The Theory of Economic Development*. The historical trend in favor of large firms that is the theme of *Capitalism, Socialism, and Democracy* also turns up in the earlier book.

And if the competitive economy is broken up by the growth of the great combines, as is increasingly the case today in all countries, then this must become more and more true of real life, and the carrying out of new combinations must become in ever greater measure the internal concern of one and the same economic body. The difference made is great enough to serve as the water-shed between two epochs in the social history of capitalism. (Schumpeter 1934, p. 67.)

The contrast – or, rather, lack of contrast – between the English version of *The Theory of Economic Development* and *Capitalism, Socialism, and Democracy* can perhaps best be seen in the juxtaposition of the following passages. The first is from the “later” Schumpeter.

This social function [entrepreneurship] is already losing importance and is bound to lose it at an accelerating rate in the future even if the economic process itself of which entrepreneurship was the prime mover went on unabated. For, on the one hand, it is much easier now than it has been in the past to do things that lie outside the familiar routine – innovation itself is being reduced to routine. Technological progress is increasingly becoming the business of teams of trained specialists who turn out what is required and make it work in predictable ways. The romance of earlier commercial adventure is rapidly wearing away, because so many *things can be strictly calculated* that had of old to be visualized in a flash of genius. (Schumpeter 1950 [1976, p. 132], emphasis added.)

Schumpeter quickly goes on (p. 133) to liken the changes he foresees in the entrepreneur's role with those that have already taken place in the function of the military commander. Now consider the following passage from the “early” Schumpeter.

The more accurately, however, we learn to know the natural and social world, the more perfect our control of facts becomes; and the greater the extent, with time and progressive rationalisation, within which *things can be simply calculated*, and indeed quickly and reliably calculated, the more the significance of this function decreases. Therefore the importance of the entrepreneurial type must diminish just as the importance of the military commander has already diminished. (Schumpeter 1934, p. 85, emphasis added.)

These passages are important, and I shall return to them presently.

In their translation of Schumpeter's 1928 essay “Entrepreneur,” Becker and Knudsen (2003) show clearly that Schumpeter's mature theory of entrepreneurship was already in place by 1926, when he revised the first German edition of *Theory of Economic Development*. That 1926 edition formed the basis of the 1934 English translation, which, as I have shown, is fully consistent with the obsolescence thesis in *Capitalism, Socialism, and Democracy*. This immediately puts to rest the notion — which has never been based on any textual evidence anyway, as far as I can tell — that Schumpeter was somehow influenced by his observations of large American corporations in the 1930s. Becker and Knudsen see a real change in Schumpeter's theory of entrepreneurship between 1911 and 1926. Rather than conceptualizing entrepreneurship as a psychological characteristic of a subset of the

population, he came to portray entrepreneurship in a “depersonalized” way as an ideal type.<sup>3</sup> In the post-1926 theory, entrepreneurship needn’t fill the vessel of any actual person; it reflects instead a category of action into which individuals (organizations?) may fall at various times and places.<sup>4</sup> To Becker and Knudsen, this change enables the obsolescence thesis, since it makes the entrepreneur less “pushy” and therefore permits an easy movement to an institutionalized version of entrepreneurship. As they put it, the entrepreneur has become a carrier of change rather than a cause of change. However one interprets this transition from the “old” Schumpeter to the “new,” however, it is not the transition that writers in the Anglo-American literature of technological change think they see. That one never happened.

Recently, Alexander Ebner (2006) has argued that most of these ideas were actually in place even earlier, by 1920:

Most arguments on the feasibility of socialism had already been formulated in an essay on the “possibilities of socialism,” published in 1920, following Schumpeter’s political activities as a Member of the German Commission on Socialisation which were followed by his brief intermezzo as an Austrian Minister of Finance in a socialist dominated government. In this essay, institutional changes that altered the character of the market economy, and thereby seemed to prepare the ground for socialism, were not yet described as a specific phase of capitalist development, but as indicators of socialist transformation. Schumpeter argued that industrial concentration and the emergence of corporate trusts would lead to the economic dominance of bureaucratic organisations, accompanied by a rationalisation of economic life, as indicated by the automatising of technological progress. This would imply the replacement of personal entrepreneurship by administrative guidance with managed science dominating the sphere of invention, while the innovative application of inventions would be established as a business routine in large enterprises (Schumpeter 1920/21, p. 318n). Moreover, rationalisation would cut loose the economic sphere from pre-capitalist and non-economic sentiments and ties, illustrated by the decreasing role of family values as a motive for the private accumulation of wealth (Schumpeter 1920/21, p. 312n).

A more detailed study might well discover that the continuity really goes back to 1911 or earlier, not merely to 1926.<sup>5</sup>

---

<sup>3</sup> Becker and Knudsen attempt to explain Schumpeter’s new stance on entrepreneurship in terms of events and tragedies in his personal life. I find far more compelling the possibility, which Becker and Knudsen discount, that, always ambitious and sensitive to intellectual fashion, Schumpeter was simply reflecting the widespread popularity of Max Weber’s approach in the German-speaking world of the 20s, an approach that had pushed into the background the older traditions of Austrian economics and the German Historical School that had influenced the 1911 edition.

<sup>4</sup> Swedberg (1991, p. 173) contends that only in the 1940s, after *Capitalism, Socialism, and Democracy*, did Schumpeter begin to change his theory of entrepreneurship and begin to claim that entrepreneurship could be carried out collectively. But this is exactly the change Becker and Knudsen claim for 1926.

<sup>5</sup> In the 1911 original, Schumpeter toyed with the idea that the state could take over the entrepreneurial role. (See especially Schumpeter 1911, pp. 173ff. Thanks to Wolfgang Gick for help with the German.)

### ***The Schumpeterian tension.***

Why then are so many writers inclined to see “two Schumpeters”? The simple answer is that Schumpeter has the distinction of being a principal source for the notion that entrepreneurship (a word that is shorthand for a complex set of theoretical ideas) is crucial to the economic process and at the same time a principal source for precisely the opposite conception: that entrepreneurship is no longer (or will soon no longer be) of any consequence whatever for the economic process, having been replaced entirely by rational calculation. There are two identifiable strands of thought in Schumpeter; they are self-consistent, but they cannot be reconciled with one another. Reading him is thus a kind of litmus test: picking out one of the strand leads in one direction; picking out the other leads in precisely the opposite direction. Schumpeter I gives you such neo-Schumpeterian writers as Nelson and Winter (1982) and Klein (1977). Schumpeter II gives you John Kenneth Galbraith.

But if, as I've argued, this coexistence does not reflect a change of opinion, then what is the source of Schumpeter's litmus effect? The answer, I believe, is that the “Schumpeterian tension” arises from the unreconciled coexistence in his writings of two incompatible epistemic theories, to use the suggestive term of G. L. S. Shackle (1972) – two inconsistent views of the role of knowledge and ignorance in the economic process.

Perhaps the best way to explicate this claim is to recast it in terms of another, closely related, tension in Schumpeter. It is well known that Schumpeter was a great admirer of Walras. “[S]o far as pure theory is concerned,” he wrote in his *History of Economic Analysis*, “Walras is in my opinion the greatest of all economists.” He goes on to suggest that Walras's work “will stand comparison with the achievements of theoretical physics” (Schumpeter 1954, p. 827). Yet, while his professed scientific attitude and aesthetic sensibilities may have been Walrasian, his own theory is *in substance* very *un-Walrasian*. Indeed, many have portrayed Schumpeter – with a good deal of justification – as representing a theoretical perspective and tradition alternative and antagonistic to the Walrasian approach (Nelson and Winter 1982, pp. 39-40). More precisely, one might say that Schumpeter's theory is in substance *Mengerian* rather than Walrasian.

There are really only two attitudes with which to approach economic doctrine. One can take the position that, beneath the inevitably discordant pronouncements of the various theorists with whom one is concerned, there lies an essential unity; the differences are unimportant, merely epiphenomenal to that underlying unity. Or one can take the position that it is the *differences* that are essential, that whatever superficial similarities may appear among theories are in fact merely a cover for fundamentally divergent views. Schumpeter adopted the former attitude, at least so far as the marginalist revolution – and indeed the economics of his own day – was concerned. “Nobody denies that, numerous differences in detail notwithstanding, Jevons, Menger, and Walras taught essentially the same doctrine”<sup>6</sup> (Schumpeter 1954, p. 952). However true such an assertion might have been in 1950, it is clear that, in the last few decades at least, quite a number of historians of thought have begun to deny just that. The marginalist revolutionaries have been “dehomogenized” (to use

---

<sup>6</sup> Regarding Schumpeter's attitude toward the unity of economic thought in his own day, see Schumpeter (1982). In an article written not long after Schumpeter's death, Fritz Machlup defended this syncretism – “a conciliatoriness which could be misjudged as weak eclecticism” -- as a form of methodological tolerance or methodological pluralism. (Machlup, 1951, p. 146.)

Jaffé's (1976) expression), a development that may say as much about the status of present-day economics as it does about that of the 1870s. And most of the dehomogenizers wish to enlist the syncretist and Walras-admiring – but also Austrian – Schumpeter into the dissident Mengerian camp. “It is just because he admired Walras so much,” writes Erich Streissler, “that Schumpeter is such a bad guide to the real Austrian achievement, which has always been in complete contrast to Walras” (Streissler 1972, p. 430n). One might also say that Schumpeter's admiration for Walras also served to mask the distinctly non-Walrasian character of his own achievement.

There are a number of ways in which Schumpeter's work displays affinities to that of Menger. In one important sense, both were more in the classical than the neoclassical tradition.<sup>7</sup> Like Adam Smith, they were concerned with the problem of economic development – of the creation of wealth – rather than with questions of the simple allocation of resources. “It is in the true tradition of Menger that Schumpeter's treatment of technical progress is so much more inclusive than the Marxian or modern neoclassical treatment” (Streissler 1972, p. 431). Other similarities between Schumpeter and Menger would include an emphasis on disequilibrium processes; a concept of competition very unlike the Walrasian “perfect competition” construct; and a concern with social institutions (Streissler 1972; Jaffé 1976; Kirzner 1979, esp. p. 3; but see also Kirzner 1979, pp. 53-75). For present purposes, though, the most important way in which Schumpeter's theory is Mengerian (or at least non-Walrasian) is in its attitude toward economic knowledge and learning.

Having appropriated Shackle's term “epistemic,” let me now turn it to my own uses. As I implied in Chapter 1, there are two fundamental categories of epistemic theories – two categories of theories about the way economic agents know and learn. One category is that of *rationalist* theories. Broadly speaking, these portray the rationality of economic agents as consisting entirely in logical deduction from explicit premises. In ordinary neoclassical models, which clearly fall into this category, the agent faces a problem of maximization (or minimization). The agent is rational when he or she solves that problem correctly. The data of the problem – what the agent “knows” – is always given, and any learning that takes place is also a matter of logical processing (*e. g.*, Bayesian updating) of given data. The other category is that of *empiricist* theories. In an empiricist theory, the criterion of rationality is less demanding, typically requiring only reasonable behavior in light of the situation the agent faces, not behavior reflecting the substantively correct solution to an explicit (and sometimes quite complicated) problem. More importantly, the nature and source of the agent's knowledge is empirical in character; it is gained from experience rather than deduced. As a result, the agent's knowledge is frequently tacit (Polanyi 1958) or contained inexplicitly in various habits, conventions, and institutions.

In his discussion of the role and importance of entrepreneurship, Schumpeter places himself squarely in the empiricist camp. “The assumption that conduct is prompt and rational,” he says, “is in all cases a fiction. But it proves to be sufficiently near to reality, if things have time to hammer logic into men. ... But this holds good only where precedents without number have formed conduct through decades and, in fundamentals, through hundreds of thousands of years, and have eliminated unadapted behavior” (Schumpeter

---

<sup>7</sup> “Schumpeter is much closer intellectually to Marshall and Smith than he is to Samuelson and Arrow” (Nelson 1977, p. 136). “Schumpeter was well within the classical tradition” (Nelson and Winter 1977, p. 64).

1934, p. 80). This is a conception of behavior as fundamentally rule-governed (p. 83). For Schumpeter, rationality as conscious calculation exists only within a small sphere carved out from and defined by the larger mass of the agent's inexplicit knowledge. Within this sphere, “we can depend upon it that the peasant sells his calf just as cunningly and egotistically as the stock exchange member his portfolio of shares” (p. 80). The other important aspect of an empiricist epistemic theory of the sort Schumpeter adheres to in these passages is the inherently open-ended or evolutionary character of economic knowledge it implies. Since economic knowledge is not a matter of logical deduction from givens, that knowledge is potentially unbounded. There is always new knowledge that is not yet not within the agent's “calculative sphere” or means/ends framework. Indeed, the job of the entrepreneur is precisely to introduce new knowledge.<sup>8</sup> The “Circular Flow of Economic Life” is a state in which knowledge is not changing. Economic growth occurs at the hands of entrepreneurs, who bring into the system knowledge that is qualitatively new – knowledge not contained in the existing economic configuration.

This novelty is what distinguishes the entrepreneurial function from that of manager or the capitalist. This is why one is an entrepreneur only while carrying out new combinations, not once the business is well established. To Schumpeter, “the distinctive element is readily recognized so soon as we make clear to ourselves what it means to act outside the pale of routine. The distinction between adaptive and creative response to given conditions may or may not be felicitous, but it conveys an essential point; it conveys an essential difference” (Schumpeter 1951, p. 253). The crucial point for my argument is that a conception of entrepreneurship (or something very much like it) is essential for any theory that proposes to deal with innovation and economic growth. Conventional neoclassical models tell stories about the adjustment of known means to given ends, but they say very little about how those means and ends change or come into being in the first place. There has to be a mechanism by which new knowledge enters the system. And that mechanism cannot be rational calculation, for as David Hume (1978, p. 164) long ago observed, “no kind of reasoning can give rise to a new idea.”<sup>9</sup>

Schumpeter would seem to agree strongly that a concept of entrepreneurship is a theoretical necessity. In a vibrant passage, he describes the epistemic role of the entrepreneur (if I may put it that way) in a manner that emphasizes the empirical nature of his conception.

What has been done already has the sharp-edged reality of all things which we have seen and experienced; the new is only the figment of our imagination. Carrying out a new plan and acting according to a customary one are things as different as making a road and walking along it.

How different a thing this is becomes clearer if one bears in mind the impossibility of surveying exhaustively all the effects and counter-effects of the projected enterprise. Even as many of them as could in theory be

---

<sup>8</sup> As Schumpeter repeatedly stressed, the knowledge with which he was concerned is new from the economic point of view -- not necessarily from the scientific or technical point of view. For him, an idea becomes an innovation when it is tried out in practice for the first time -- again emphasizing the empirical character of the conception.

<sup>9</sup> Thanks to Brian Loasby (2004) for alerting me to this quotation.

ascertained if one had unlimited time and means must practically remain in the dark. As military action must be taken in a given strategic position even if all the data potentially procurable are not available, so also in economic life action must be taken without working out all the details of what must be done. Here the success of everything depends on intuition, the capacity of seeing things in a way which afterwards proves to be true, even though it cannot be established at the moment, and of grasping the essential fact, discarding the unessential, even though one can give no account of the principles by which this is done. Thorough preparatory work, and special knowledge, breadth of intellectual understanding, talent for logical analysis, may under certain circumstances be sources of failure. (Schumpeter, 1934, p. 85.)

Entrepreneurship – introducing the qualitatively new – is an activity inherently different, it would seem, from the kind of rational calculation portrayed in the imagery of neoclassical modeling.

It is interesting that Schumpeter regards the entrepreneurial act as requiring in fact *greater* conscious rationality than routine activity (Schumpeter 1934, p. 85). This reemphasizes the empirical nature of his conception of economic knowledge. Routine behavior requires less conscious rationality because it is essentially “preprogrammed” through trial-and-error learning. Notice, of course, that, at least in “early” capitalism, the conscious rationality of the entrepreneur is not *adequate* to the task of innovation. This is why entrepreneurship requires intuition, the leap of logic. But – and here we get to the heart of the matter – conscious rationality, for Schumpeter, is in fact becoming increasingly adequate to the job of dealing with the radically new.

The more accurately, however, we learn to know the natural and social world, the more perfect our control of facts becomes; and the greater the extent, with time and progressive rationalisation, within which *things can be simply calculated*, and indeed quickly and reliably calculated, the more the significance of this [entrepreneurial] function decreases. *Therefore* the importance of the entrepreneurial type must diminish just as the importance of the military commander has already diminished. (Schumpeter, 1934, p. 85, emphasis added.)

Notice the syllogism. Because the unknown can be increasingly calculated rationally, the “extra-logical” function of the entrepreneur becomes increasingly unnecessary, and so the importance of the entrepreneurial type must diminish.

What this amounts to is a strange commingling of an empiricist and a rationalist theory of economic knowledge. In “early” capitalism (*not* the “early Schumpeter”) economic rationality derived largely from evolved habit and convention; attempts to step outside this configuration of knowledge could not be accomplished by conscious rationality and explicit calculation. Rationality was “bounded,” in effect. In “later” capitalism (not the “later Schumpeter”) the bounds of rationality are being broken. Conscious rationality is beginning to conquer not merely the entrenched conventions of the past but also the previously unknowable future.

Perhaps the analogy with a more recent writer will make this clearer. Schumpeter's epistemic theory (if I may use that high-blown phrase again) is ultimately very close to that



of Herbert Simon (Langlois 1990, 1998). Simon is, of course, the author of the expression “bounded rationality.” The basic idea is that human information-processing capacity is limited, making conscious rationality of the neoclassical variety quite impossible. The agent must therefore “satisfice” and rely on heuristic approximations. What is typically overlooked in Simon's conception, however, is that it is at base a strongly rationalist theory of knowledge. For Simon, one is rational only when one has reached the substantively correct solution of the explicit choice problem one faces. His preferred imagery includes chess games and complex differential equations, problems that do in fact have substantively correct solutions, even if they are solutions to which we can at present only aspire. His innovation, in short, is to suggest that one may only approximate true rationality; he does not ultimately call the notion itself into question. Moreover, Simon like Schumpeter is convinced that improvements in computational and management technique will provide closer and closer approximations to true rationality and may even unbound rationality in some spheres.

### *The Schumpeterian irony.*

What, then, are we to make of the “Schumpeterian tension”? I contend that it has strong implications for Schumpeter's assessment of the workability of socialism and the eventual demise of capitalism.

Schumpeter's argument, we saw, goes something like this. Entrepreneurship – bringing the radically new into the economic system – has been the province of bold individuals because, in a world of limited knowledge, it is necessarily an unpredictable and extra-rational activity. Notice that this is in effect an argument in favor of a capitalist (or, more correctly, a liberal) social order. For Schumpeter, the relative efficiency of an economic system depends not on how it “administers existing structures” (Schumpeter 1942, p. 84) but on how well it generates innovation. Because of limited knowledge, “planning” is incompatible with innovation; progress depends on the ability of individuals to command resources and direct them in unconventional and surprising directions. But the limits to knowledge are disappearing, Schumpeter believes, and socialism will thus eventually come to be roughly as effective as capitalism in generating economic growth.

But does the argument hold water? Does the growth of economic and technical knowledge in fact imply that innovation is becoming predictable and routine? This is a matter of some dispute. It is certainly true that innovation – or R&D, at any rate – is more organized today than it was in the nineteenth century. This is a manifestation of the growing division of labor, one that would not have surprised Adam Smith and the classicals. But for Smith, the increasing division of labor did not generate innovation because it made the future predictable; rather, the division of labor heightened innovation because it increased the diversity of ideas in society. Innovation remained a matter of empirical trial and error.

We can put the issue somewhat differently. I have argued that Schumpeter's story of a transition from bounded to unbounded rationality actually implies a transition from an empiricist to a rationalist theory of economic knowledge. Is such a transition possible? Or does Schumpeter's account ultimately rest on a *confusion* of two logically distinct *kinds* of knowledge? There is good reason to think that such a confusion is indeed in operation in Schumpeter. If so, the mechanization-of-progress thesis loses much of its force.

In order to see what this would mean, we need to understand the routinization of progress, and thus the passing of the entrepreneur, in the complete context of Schumpeter's sociological argument. "We have seen," he says, "that, normally, the modern businessman, whether entrepreneur or mere managing administrator, is of the executive type. From the logic of his position he acquires something of the psychology of the salaried employee working in a bureaucratic organization" (Schumpeter 1950 [1976, p. 156]). This is not an unfamiliar observation. The conclusion usually drawn from it, especially by writers in the now well-developed tradition of Berle and Means (1932), is that it is therefore a matter of indifference, from a functional standpoint, whether the productive organization is privately or state owned; indeed, state ownership would seem preferable since its motives are "public" and hence purified of the taint of private desire.

Schumpeter draws a much different conclusion from this observation. To Schumpeter, the crucial fact about the modern corporation is that its managers cannot fill the strong social role played by the entrepreneur. Entrepreneurs are pillars of strength, symbols of legitimacy, role models. They provide the new ideas and new blood that refresh the "bourgeois stratum." "Economically and sociologically, directly and indirectly, the bourgeoisie therefore depends on the entrepreneur and, as a class, lives and dies with him, though a more or less prolonged transitional stage – eventually a stage in which it may feel equally unable to die and to live – is quite likely to occur, as in fact did occur in the case of the feudal civilization" (Schumpeter 1950 [1976, p. 134]). Socialism will succeed because, without the entrepreneur to guard it, "the bourgeois fortress ... becomes politically defenseless." It is not the managerial class who are the plunderers; it is a New Class of socialist intellectuals and government officials. "Defenseless fortresses invite aggression, especially if there is rich booty in them. Aggressors will work themselves up into a state of rationalizing hostility -- aggressors always do. No doubt it is possible, for a time, to buy them off. But this last resource [sic] fails as soon as they discover that they can have it all" (Schumpeter 1950 [1976, p. 143]). Schumpeter is thus after bigger game than Berle and Means: nothing less than Marx himself. Schumpeter has no great love for a socialist system (or, in particular, a socialist *culture*); but he does see the similarities between private and state bureaucracy as smoothing the way for socialism. "Thus the modern corporation, although the product of the capitalist process, socializes the bourgeois mind; it relentlessly narrows the scope of capitalist motivations; not only that, it will eventually kill its roots" (Schumpeter 1950 [1976, p. 156]). Like Marx, then, he sees capitalism as leading to its own destruction. But unlike Marx, Schumpeter sees capitalism as the victim of its own economic success not its economic failure. This tale stands Marx on his head, its plot laced with a heavy and self-satisfied irony. The tone is disinterested and the attitude fatalistic; but the message is largely cautionary. At base, Schumpeter is nothing so much as a neoconservative, perhaps the first neoconservative.

How would this story have to change if Schumpeter is wrong about the mechanization of progress? On one level, the effect is significant. An economic system that continues to rely on tacit, empirical knowledge – what F. A. Hayek (1945, p 524) called "the knowledge of the particular circumstances of time and place" – would sacrifice much of its innovativeness, and thus much of its engine of progress, by consigning its industry and commerce to a bureaucratic socialism. This would certainly make the transition to socialism much more painful to the voting population, and thus would likely slow or modify (if not necessarily prevent) its advent. Needless to say, this interpretation seems far more compelling now after 1989 than it did when Schumpeter was writing.

The role of the mechanization-of-progress thesis in the larger sociological theory is to underscore the power of bourgeois capitalism on an economic level: it is so efficient that it has conquered even our ignorance of the unknown; it can stamp out innovation with all the efficiency that it brings to bear on stamping out mass-produced goods. To deny capitalism this power over the future mars the aesthetic of Schumpeter's panorama somewhat, for it makes the inversion of Marx less perfect than otherwise, and it diminishes the fatalism that gives the story much of its color.

In the end, however, taking all this too seriously puts us in danger of reading Schumpeter literal-mindedly. The force of the argument is in the texture of the landscape -- not in its details. Indeed, there is a sense in which the "Schumpeterian tension" -- the tension between the Schumpeter who comes to praise entrepreneurship and the Schumpeter who comes to bury it -- actually enriches the majestic irony of *Capitalism, Socialism, and Democracy*.

## *Chapter 3*

# *Personal Capitalism*

### *Back to Weber.*

The broad outlines of Schumpeter's theory of entrepreneurship are of Weberian provenance (Carlin 1956). Indeed, one might say that Schumpeter's schema is an application of Weber's social theory to the problem of economic growth. Schumpeter's innovation is to associate Weber's category of charismatic leadership with the concept of entrepreneurship.

Weber is principally concerned with the religious leader or prophet, and to a lesser extent with military and political leadership; Schumpeter borrows heavily from that analysis in his characterization of the entrepreneur. Here we begin to see the outlines of Schumpeterian "personal capitalism," which in its pure form is the antithesis of bureaucratic organization. Consider Weber's account of the organization of charisma.

The corporate group which is subject to charismatic authority is based on an emotional form of communal relationship. The administrative staff of the charismatic leader does not consist of "officials"; at least its members are not technically trained. ... There is no hierarchy; the leader merely intervenes in general or in individual cases when he considers the members of his staff inadequate to a task to which they have been entrusted. There is no such thing as a definite sphere of authority and of competence. ... There are no established administrative organs. ... There is no system of formal rules, of abstract legal principles, and hence no process of judicial decision oriented to them. But equally there is no legal wisdom oriented to judicial precedent. Formally concrete judgments are newly created from case to case and are originally regarded as divine judgments and revelations. ... The genuine prophet, like the genuine military leader and every true leader in this sense, preaches, creates, or demands *new* obligations. In the pure type of charisma, these are imposed on the authority of revolution [*sic*] by oracles, or of the leader's own will, and are recognized by the members of the religious, military, or party group because they come from such a source. (Weber 1947, pp. 360-361.)

But the charismatic organization is perhaps best understood in contrast to what it is *not*.

Charismatic authority is thus outside the realm of everyday routine and the profane sphere. In this respect it is sharply opposed both to rational, and particularly bureaucratic, authority, and to traditional authority, whether in its patriarchal, patrimonial, or any other form. Both rational and traditional authority are specifically forms of everyday routine control of action; while the charismatic type is the direct antithesis of this. Bureaucratic authority is specifically rational in the sense of being bound to intellectually analysable rules; while charismatic authority is specifically irrational in the sense of being

foreign to all rules. Traditional authority is bound to the precedents handed down from the past and to this extent is also oriented to rules. Within the sphere of its claims, charismatic authority repudiates the past, and is in this sense a specifically revolutionary force. (Weber 1947, pp. 361-362.)

It is the charismatic, and therefore revolutionary, quality of entrepreneurship that makes it a source of economic growth, that allows it to play the role of “industrial mutation — if I may use that biological term — that incessantly revolutionizes the industrial structure *from within*, incessantly destroying the old one, incessantly creating a new one” (Schumpeter 1950 [1976, p. 83], emphasis original).

Recast in these explicitly Weberian terms, Schumpeter’s theory of entrepreneurship looks something like this. In its undeveloped state, an economy is based largely on traditional behavior, which bounds the possibilities for conscious economic activity. Under the right institutional setting — bourgeois capitalism — charismatic leadership arises, in the form of the entrepreneur, to break the crust of convention and to create new wealth by “lead[ing] the means of production into new channels” (Schumpeter 1934, p. 89). Charisma is personal and revolutionary; “in its pure form charismatic authority may be said to exist only in the process of originating. It cannot remain stable, but becomes either traditionalized or rationalized, or a combination of both” (Weber 1947, p. 364). In the economic sphere, of course, the tendency is toward rationalization. Not only do imitators rush in once the entrepreneur has blazed the trail, but also the problem of succession within the entrepreneurial organization leads (if the organization is to continue) to bureaucratization, that is, to the substitution of rules for personal authority; to the creation of abstract offices divorced from their individual holders; and to the increasing preeminence of specialized knowledge and spheres of competence (Weber 1947, pp. 330-334).

The transformation from the traditional to the rational takes place at two levels. At the level of each entrepreneurial organization, charismatic authority, having destroyed the traditional, must eventually give way to bureaucracy as the problem of succession arises. It is here that we can locate Chandler’s notions of personal and managerial capitalism. What Chandler finds wanting in personal capitalism is precisely the extent of rationalization in the Weberian sense. Compared with the foremost examples of managerial capitalism (*e.g.*, in the United States), the British, he argues, failed adequately to extend hierarchical control and to create management based on abstract rules and spheres of competence.

In most British enterprises senior executives worked closely in the same office building, located in or near the largest plant, having almost daily personal contact with, and thus directly supervising, middle and often lower-level managers. Such enterprises had no need for the detailed organization charts and manuals that had come into common use in large American and German firms before 1914. In these British companies, selection to senior positions and to the board depended as much on personal ties as on managerial competence. The founders and their heirs continued to have a significant influence on top-level decision-making even after their holdings in the enterprise were diminished. (Chandler 1990, p. 242.)

British personal capitalism thus represented a kind of half-way house between the charismatic founders and full rationalization on the American model.

At another level, however, resides the claim that progressive rationalization affects the entire economic society, eventually displacing traditionalism completely. The entrepreneur is both the agent and the victim of this transformation. In uprooting the deeply planted traditional ways of life, the entrepreneur prepares the field for rational authority.<sup>1</sup> But — and this is the heart of Schumpeter’s thesis — once the hard work of crust-breaking has been done, charismatic leadership is no longer necessary, and the entrepreneur must ride into the sunset. As we saw, the entrepreneurial role is then taken up by large bureaucratic firms, organized along rational lines, who can engineer change without need for charisma. The final result of the process of progressive rationalization is a kind of bureaucratic socialism, since, without any substantive function or source of legitimacy, entrepreneurial capitalism as a system must ultimately follow the entrepreneur westward.

At first glance, Schumpeter’s brief in favor of large organizations seems consistent with Weber, who praised the efficiency of rational bureaucracy in the most lavish terms.<sup>2</sup>

Experience tends universally to show that the purely bureaucratic type of administrative organization — that is, the monocratic variety of bureaucracy — is, from a purely technical point of view, capable of attaining the highest degree of efficiency and is in this sense formally the most rational known means of carrying out imperative control over human beings. It is superior to any other form in precision, in stability, in the stringency of its discipline, and in its reliability. It thus makes possible a particularly high degree of calculability of results for the heads of the organization and for those acting in relation to it. It is finally superior both in intensive efficiency and in the scope of its operations, and is formally capable of application to all kinds of administrative tasks. (Weber 1947, p. 337.)

Notice, however, that this *paean* does not portray bureaucracy as innovative. It is precise and reliable, but not necessarily dynamic. “Both rational and traditional authority,” as we saw, “are specifically forms of everyday routine control of action” (Weber 1947, p. 361). Bureaucracy is designed for “imperative control over human beings,” that is, making people do what the boss wants, but not necessarily for performing the multifold tasks of an entire economy. And it produces results that are “calculable” because it reduces internal variance, not necessarily because it (or rationalization more generally) extends the scope of human ability to “calculate” or predict the future.

It is here that Schumpeter goes well beyond Weber — into what, I argued, is illegitimate territory. Recall that, for Schumpeter, progressive rationalization seems to mean more than the Weberian idea of demystification; it seems also to mean that the growth of scientific knowledge will extend the bounds of rationality in the sense of Herbert Simon: with progressive rationalization, our “control of facts” becomes more perfect, and we become able “quickly and reliably” to calculate what had previously required intuition and a

---

<sup>1</sup> “A high degree of traditionalism in habits of life, such as characterized the labouring classes in early modern times, has not sufficed to prevent a great increase in the rationalization of economic enterprise under capitalist direction. ... Nevertheless, this traditionalistic attitude had to be at least partly overcome in the Western world before the further development of the specifically modern type of rational capitalist economy could take place” (Weber 1947, p. 167).

<sup>2</sup> Of course, Weber did not see bureaucracy as therefore good, and he worried about its stultifying effect on humanity (Coleman 1990, p. 95).

“flash of genius.” Schumpeter is thus making a claim about the cognitive, not merely the command-and-control, possibilities of bureaucracy. Interestingly, it is far from clear that Weber would have been on Schumpeter’s side in this matter. For one thing, Weber, as we saw, stressed the static character of bureaucracy. Bureaucracy is about imposing rules, not about changing the rules. It is a way to marshal well-defined means in service of a well-defined end; but, like the ideal type of traditional authority, rational authority is not dynamic. On the matter of bureaucracy replacing entrepreneurial capitalism, we can note that Weber came down explicitly *against* the possibility of socialist calculation, effectively endorsing the views of von Mises.<sup>3</sup>

Someone who *is* on Schumpeter’s side is William Lazonick (1991), who offers what is arguably a historicist account of the progressive development of capitalism, which reaches its apex in “collective capitalism.”<sup>4</sup> As in Schumpeter’s portrayal of later capitalism, large organizations in Lazonick’s collective capitalism are not only effective at managing existing structures but are also prime engines of innovation. And, as in Schumpeter, the basis for the innovativeness and the wealth-creating character of large organizations resides in their ability effectively to break cognitive boundaries and consciously to reinvent the division of labor.

The more technologically complex the innovation, the greater the need for innovative skills and the more extensive the specialized division of labor required to develop and utilize these skills. The organization must not only develop these specialized skills so that they can contribute to the innovation, but also coordinate them so that they constitute a collective productive power. *Organizational capability permits the enterprise to plan* and coordinate the development of these innovative skills, integrating them into an enterprise-specific collective force. As far as the innovation process is concerned,

---

<sup>3</sup> This was not an intellectually fashionable view in the 1930s and 1940s, when Weber’s ideas began filtering into the English-speaking academic world. In a fit of early political correctness, indeed, Talcott Parsons found it necessary to insert into his translation of Weber a footnote apologizing for his author’s failure to hold views in accord with “the principal weight of technical opinion” on the subject (Weber 1947, p. 194n). That weight must not have been tied down very tightly, however, as it has lately shifted decidedly to Weber’s side.

<sup>4</sup> In later work, Lazonick seems to include in collective capitalism — or “organizational integration,” as he terms it — the activities of “individuals and groups who are employed by legally distinct firms that pursue common goals” (Lazonick and West 1995, p. 231). Taken seriously, however, this idea renders unhelpful if not tautological the notion of “collective capitalism,” since it embraces activities that economists have viewed, and ought rightly to view, as reflecting the capabilities of markets (properly understood) rather than of firms, and thereby calls into question any implications in the analysis for the advantages of large firms *per se*. On this point see Loasby (1993) and Langlois (1994). More recently, Lazonick has contrasted the Old Economy Business Model (OEBM) with the New Economy Business Model (NEBM). “As captured in the writings of Joseph A. Schumpeter, Edith T. Penrose, Alfred D. Chandler, Jr., and John Kenneth Galbraith, the power of OEBM coming into the second half of the twentieth century lay in the ability of already successful firms to routinize innovation and thereby to build on their superior capabilities in existing product markets to move into new product markets. In contrast, a characteristic feature of NEBM since the 1950s has been the prominence, and even dominance, of new firms as innovators in the ICT industries. R&D is important in both OEBM and NEBM, but, whereas investments in research drove product innovation in OEBM, investments in development are much more important in NEBM. In the New Economy, firms that can focus quickly on developing products for specialized new markets have an advantage that has favored highly focused new entrants over diversified going concerns” (Lazonick 2005, p. 5). Is it “collective capitalism” that has become obsolete? I offer my own perspectives on the OEBM and the NEBM in chapters 4 and 5.

therefore, *organizational capability permits the planned coordination* of the horizontal and vertical division of labor required to generate an innovation. (Lazonick 1991, p. 203, emphasis altered.)

It is not clear what are the details of how this planning and coordination takes place, but we are left with the strong impression that it is decidedly not the handiwork of some charismatic central individual, or of the firm's owners in any sense, but is instead the product of professional managers.

In this respect, Lazonick has chosen Schumpeter over Chandler. Despite their similar Weberian influences, the Schumpeterian story of the obsolescence of the entrepreneur is not identical to the Chandlerian account of the rise of the visible hand. In Chandler, as in Weber, the emphasis is not on the innovative character of the large bureaucratic organization but on its ability to deliver the goods. The managers “administer, monitor, coordinate, and plan.” They do not carry out new combinations.<sup>5</sup> For Chandler, economic growth is underpinned by an imperative to high-volume throughput; the personal element in organization stands in the way of fully realizing this imperative, for which an abstract and professional structure is required. As we saw, however, Schumpeter's claims are much different. He associates “personal” capitalism with charismatic leadership. It is the entrepreneur who makes dramatic, and often creatively destructive, changes. In Schumpeter, those who come along and fill in the details are important, but it is the changes that really matter. The obsolescence thesis is a claim not that large, fully articulated enterprises may be necessary to realize the vision of an individual entrepreneur; rather, it is a claim that those enterprises will be the sources of change. Let us put it succinctly. In Chandler, large organizations are the result of economic change; in Schumpeterian later capitalism, economic change is the result of large organizations.

### ***The rationality of the personal element.***

In Weber's schema, the functional goals of organizations — carrying out a narrow set of purposes — can best be attained only by a mechanical bureaucratic structure. As we saw, this is the legacy that influenced Chandler: the residual charismatic elements of personal capitalism stand in the way of the full deployment of the articulated, professionally managed structure of modern industrial capitalism. For the late sociologist James Coleman (1990), however, the Weberian approach to organizational analysis and design is both misleading and dangerous, as it fails to understand what economists call the principal-agent problem: agents in a bureaucracy do not act as cogs in a machine but have purposes and interests that may diverge from those of the organization. Coleman uses the theory of principals and agents to suggest why many different kinds of well-functioning organizations — merchant banks, diamond merchants, Japanese manufacturing systems — are not structured as

---

<sup>5</sup> Chandler's claims for the innovativeness of large organizations are limited to the ability of those organizations to take advantage of what he calls economies of scope. As Edith Penrose (1959) discussed in a more theoretical key, organizational capabilities (or resources) come in lumpy bundles. As a result, the firm may find itself with excess resources that can be applied at low cost to activities requiring capabilities that are similar in Richardson's (1972) sense. This is a real and important source of firm growth. But it is far from a conscious reorganization of organizational capabilities; it is more like a path-dependent meander into related diversification.



machine bureaucracies but retain a personal element as a necessary condition of smooth operation.

Most interestingly, perhaps, Coleman (1990, pp. 99-101) suggests that even fully charismatic authority can be a rational (economists would say “efficient”) structure of organization. This is so because charismatic authority solves a coordination problem in a situation of “chaos” in which rights, roles, and responsibilities are in flux. All participants would prefer some structure or constitution; but the costs of coordination are high, as each is willing to constrain himself or herself to a new order only if many others simultaneously agree to do so. Charismatic authority cuts through these costs and establishes a structure, which then presumably evolves in a Weberian way as stability is achieved. The parallel with Schumpeter’s theory of entrepreneurship is clear. Some more recent writers have put a cognitive spin on these ideas (Witt 1998; Loasby 2001; Noteboom 2003). The “constitution” in demand in a world of change is a cognitive one. Those who need to cooperate in such a world need to share a cognitive frame or system of interpretation in order to orient themselves toward one another’s goal’s and actions. The entrepreneur provides this orientation through what Witt calls *cognitive leadership*.

These writers were not, of course, the first to object to the idea that an organization functions best when it is organized like a machine. This was in some ways the theme of Chester Barnard’s *The Functions of the Executive* (1948), even if Barnard does not stray far from Weber in other respects. Barnard’s conception of the executive is essentially Chandler’s — a professional elite running a highly articulated organization.<sup>6</sup> Nonetheless, Barnard objects specifically to the idea of a bureaucracy as a machine, and insists on the personal element of executive leadership. Moreover, he anticipates the modern economics of organization in his discussion of incentives. But, unlike many modern economists, Barnard believes that motivating workers is more than a matter of creating pecuniary incentives. It is also, and perhaps more importantly, a matter of creating what would nowadays be called a corporate culture. “The inculcation of belief in the real existence of a common purpose,” he writes, “is an essential executive function” (Barnard 1948, p. 87).

An organization can secure the efforts necessary to its existence, then, either by the objective inducements it provides or by changing states of mind. It seems to me improbable that any organization can exist as a practical matter which does not employ both methods in combination. In some organizations the emphasis is on the offering of objective incentives — this is true of most industrial organizations. In others the preponderance is on the state of mind — this is true of most patriotic and religious organizations (Barnard 1948, p. 141).

Thus even Chandlerian managers must retain some element of the charismatic.

---

<sup>6</sup> Indeed, Barnard is often portrayed as the inventor of the 1950s corporate man and as the promoter of a managerial ideal that blurred the boundaries of government and private industry (Scott 1992). A recent article in the *Wall Street Journal* (Jenkins 1997) depicts Barnard — at one time president of New Jersey Bell — as the Bell System’s “resident ideologist,” who promoted Theodore Vail’s vision of “a technocratic uberclass to introduce the blessings of technology and corporate bigness in a cautious, orderly way, without any of that messy creative destruction.”

In the end, Barnard too sees the organization as embodying a kind of constitution. Individual motivation is controlled by a hierarchy of moral codes or rules of conduct. The persuasive function of leadership, for Barnard, consists in “the creation of moral codes for others” (Barnard 1948, p. 279). It is not a long leap from here to Coleman’s observation that (in effect) charismatic authority is the creating of a particular kind of moral code, a particularly simple or direct one useful for responding to — or initiating — rapid change.

Philip Selznick (1957) provides a similar account that emphasizes even more clearly the role of the leader in economic change. Like Barnard, Selznick (p. 10) sees the organization as embodying a constitution.<sup>7</sup> Also like Barnard, he considers it a function of administrative leadership to define the organization’s mission and to promote its values (p. 26). Taking inspiration from a passage in Barnard, Selznick goes on, however, to stress that leadership is necessary not for routine administration but for more-or-less radical change, what he calls “dynamic adaptation” (p. 34). Barnard wrote:

The overvaluation of the apparatus of communication and administration is opposed to leadership and the development of leaders. It opposes leadership whose function is to promote appropriate adjustment of ends and means to new environmental conditions, because it opposes change either of status in general or of established procedures and habitual routine. This overvaluation also discourages the development of leaders by retarding the progress of the abler men and putting an excessive premium on routine qualities (Barnard 1948, p. 240, cited in Selznick 1957, p. 36).

For Selznick, the crucial issue is not the personal element *per se* but the non-routine character of leadership. A personal touch can help a static organization function more smoothly; real leadership shows itself when the organization faces a “crucial experience” that requires the making of critical decisions (Selznick 1957, pp. 36-37).

Even in the relatively more arid fields of neoclassical economics, where only incentive models normally grow, one can also find some strains of thought that suggest a rationality to leadership. It is a central insight of the economics of organization, going back to Knight (1921), Coase (1937), and the early Williamson (1975), that a rationale for the firm may be found in its adaptability in a changing world. Production that is organized “internally” — a notoriously slippery idea — may be able to cut through the transaction costs of using arms’-length contracts and thus may be more efficient. Where does leadership fit in? In what I view as a naïve reading, the Coasean theory of the firm can be understood as a vindication of central planning: in superseding market forces, the organization necessarily directs resources consciously. As Coase put it, “[i]f a workman moves from department Y to department X, he does not go because of a change in relative prices, but because he is ordered to do so” (Coase 1937, p. 387). Notice, however, that all the illustrations in the literature are in terms of individuals giving direction, not in terms of organizations “planning.” The economist’s models are usually models of personal capitalism. This may be a limitation of the economist’s approach; but it certainly does not give any credence to the idea that complex organizations are instances of central planning.

---

<sup>7</sup> In this respect Selznick clearly anticipated more recent interest among economists in the idea of organizational constitutions (Gifford 1991, Vanberg 1992, Langlois 1995). Indeed, as Christian Knudsen (1995) has pointed out, Selznick anticipated not only the constitutional idea but also the notion of “distinctive competences” that is at the heart of much present-day theory in management.

In Knight, the superior flexibility of internal organization comes from the need for entrepreneurial judgment in a radically uncertain situation and the costliness of markets for such judgment (Langlois and Cosgel 1993). More recent economists tell a similar tale. In the work of Oliver Hart (1989), the necessary incompleteness of contracts in an uncertain world requires the existence of a residual right of control — that is, a right to make decisions in circumstances unforeseen. The ownership structure of production turns on whose possession of that right minimizes the sum of production and transaction costs.<sup>8</sup> Unlike Knight and Coase, Hart and his coauthors insist on portraying the issue as one of misaligned incentives in the presence of highly specific assets. In my view, however, the real issue is that the holder of the residual rights of control is empowered to redirect the capabilities of the cooperating parties in situations of novelty or change — situations in which contracts are not merely incomplete but often irrelevant (Langlois 1992). In other words, radical change creates situations of constitutional “chaos” (as Coleman put it) that render costly any kind of highly articulated structure, whether it be a fully specified contract or a complex Weberian bureaucracy. The more radical the change — the greater the chaos — the more decision-making must be shifted into the “residual” category. One party must dictate; and of necessity that party’s decision making cannot be based entirely on established procedures, routines, or contractual provisions. It must be in some measure *sui generis*.

Once again, history may be of use in making these ideas clear. Consider a case with some clear Weberian resonances: the development, over more than four centuries, of the watch making industry in John Calvin’s Geneva and the nearby Jura mountains.<sup>9</sup>

### ***From Friedrich Hayek to Nicolas Hayek.***

Calvinism was in one sense responsible for the birth of the Swiss watch industry. Noted jewelry-makers and goldsmiths in the Middle Ages, Genevans found it necessary to apply their capabilities in new directions in the austere climate of Calvinism. Fortunately, “the same puritanical regime that condemned jewelry was willing to make an exception for watches: if Calvinists were not interested in time and its measurement, who was?” (Landes 1983, p. 232). The reconversion was accomplished under the tutelage of immigrant Huguenots who were fleeing persecution elsewhere in Europe.

In the sixteenth century, watch making was a skilled craft carried out in individual workshops. Despite the medieval ideal of the “compleat” craftsman, there was in fact considerable division of labor within the workshop, with various apprentices and journeymen carrying on relatively specialized activities under the supervision of the master (Landes 1983, pp. 206-7). The watch industry was already well established by the time Geneva, a most bourgeois and therefore mercantilist city, got around to forming a guild in 1601. Apart from normal restrictions on entry, the Genevan *fabrique* also sought to keep out immigrants and even their native-born children. In the face of success and growing demand, these restrictions generated an unintended incentive for evasion along with the intended

---

<sup>8</sup> Barzel (1987) offers a similar theory from a slightly different perspective.

<sup>9</sup> This is a case that has attracted significant scholarly attention, which makes the facts relatively easy to assemble. However, most of the best interpretive histories, notably David Landes’s brilliant *Revolution in Time* (1983), stop before certain recent events that will be of considerable interest to the theme of this paper.

economic rents. The result was the birth of the *établissage* system, in which a master watchmaker put out component fabrication to non-guild (and therefore cheaper) subcontractors outside the city gates. Soon the more routine tasks — like the production of the *ébauche*, the basic watch movement lacking finish and adjustment — were sent “offshore” to nearby France and Savoy, with the fine assembly reserved for Geneva (Landes 1983, p. 240-243).

The division of labor under *établissage* thus proceeded within a trajectory of vertical fragmentation and of heavy reliance on arms'-length coordination. Already by 1660 some craftsmen had begun specializing in the production of springs (Jequier 1991, p. 324), and by the end of the eighteenth century the industry could boast some thirty specialized trades (Enright 1995, p. 128). As Adam Smith would have predicted, the system of *fabrication en parties brisées* — separate-parts manufacture — was particularly conducive to the invention of specialized tools<sup>10</sup> (Jequier 1991, *loc. cit.*).

This pattern was reinforced when, in the late eighteenth century, the industry took its next leap, from Geneva to the Jura. Following the lead of one Frédéric Japy, who had learned to mass-produce relatively uniform *ébauches* in nearby France, the Jura began producing watches using techniques of standardization and mechanization. Like the Genevans, the Jurassians relied on specialized tools. “But the Jura makers went their predecessors one better. They bought their tools and improved them; invented their own; and went on from individual tool making (each watchmaker his own) to production by specialist toolmakers for general sale. In so doing, they created for the first time on the continent an equipment branch to match that of Lancashire and generate new devices and techniques” (Landes 1983, p. 261). In short, the Jura had blossomed into a true Marshallian industrial district.

With its center of gravity displaced to the countryside, the Swiss industry bettered the already significant success and reputation that Geneva had earned. By 1790, the Jura had produced some fifty thousand units, a figure that would double by 1817 (Enright 1995, p. 129). The source of this dynamism was arguably the industry’s structure. “That was really one of the great strengths of the Swiss industry: it was really a congeries of subbranches, of local *fabriques* specializing in watches of one or another variety or in one or another stage of manufacture. Whatever you wanted, someone somewhere could make. No run was too small, no order too special. As a result, the industry was able to cater to all markets, to experiment with novelty, to copy and exploit the inventions of others” (Landes 1983, p. 267).

---

<sup>10</sup> In fact, Smith did comment very briefly on watchmaking, in the context of the effect on real prices of the productivity improvements that arise in “consequence of better machinery, of greater dexterity, and of a more proper division and distribution of work” (Smith 1976, I.xi.o.1, p. 260). Real price reductions, Smith says, have been “most remarkable” in industries using the “coarser metals” as materials. “A better movement of a watch, than about the middle of the last century could have been bought for twenty pounds, may now perhaps be had for twenty shillings” (Smith 1976, Lix.o.4, *loc. cit.*). In a passage that probably influenced Smith’s account of the division of labor, Bernard Mandeville also talked about “Watch-making, which is come to a higher degree of perfection than it would have been arrived at yet, if the whole had always remain’d the Employment of one person; and I am persuaded, that even the Plenty we have of Clocks and Watches, as well as the Exactness and Beauty they may be made of, are chiefly owing to the Division that has been made of that Art into many Branches” (Mandeville 1924, part II, Sixth Dialogue, p. 336).

Like the other great Marshallian districts of history, including Lancashire and Silicon Valley, the Swiss watch industry relied on those benefits of decentralization praised by F. A. Hayek (1945). Its diversity permitted the effective use of a far greater amount of dispersed and tacit knowledge than could be contained within the boundaries of even a large organization; and its porousness permitted experiment, adaptation, and innovation. To most minds, moreover, the Swiss watch industry in the eighteenth and nineteenth centuries would represent a classic example of economic progress along the lines of Schumpeterian “early” capitalism. There was certainly plenty of (individual) entrepreneurship, which creatively destroyed older structures (as in the rise of the Jura over Geneva), although without altering the fundamental paradigm of industry evolution. The extent to which the early history of this industry best fits Schumpeter’s account of the entrepreneur is a matter to which I will return. Notice here that, although not at all “rationalized” in the sense of Schumpeter or Chandler — that is, organized along the lines of large, vertically integrated firms — the Swiss watchmakers of this era were certainly already rationalized in Weber’s sense. They were definitely oriented toward the mundane and toward rational ends. As a group, they were hardly tradition bound, welcoming new ideas so long as they promised a profit.

To the extent that traditionalism played a role in the industry, it was traditionalism in the sense of Nelson and Winter not of Weber, that is, the traditionalism of habit and routine oriented toward a particular pattern of productive skill. As is clear in Jequier’s (1991, pp. 324-5) account of one typical firm, that of the Le Coultre family, successive generations were often forced to fight the conservatism of their fathers in introducing new methods and technology, sometime to the point of open secession. But within the larger system, old techniques could disappear and new ones replace them without fundamentally changing the structure of the industry. In the language of Tushman and Anderson (1986), innovation, including mechanization, was competence enhancing for the district as a whole, and usually even for the family firms it comprised. As Jequier (1991, p. 325) tells us, up until the mid nineteenth century, the “division of labor and the introduction of the first machines, operated by the worker’s hand or foot, constituted no threat to the work communities of the Jura.”<sup>11</sup>

The transition from hand-operated machines to machine tools to automatic machines, which necessitated the separation of the workshop from the home and eventually the erection of factories, was somewhat more disruptive (Jequier 1991, p. 326); but in the end the changes were absorbed with considerable success. In part, the transformation was propelled by external competitive forces, notably the rise of American firms employing the so-called American system of mass production and wielding innovations in marketing. At the same time, however, mechanization already lay along the trajectory the Swiss were following; and the Marshallian character of their industry allowed them in the end to outdo the Americans on their own ground.

---

<sup>11</sup> By contrast, artisans in Geneva were more organized, and the Association of Watchcase Workers, founded in 1842, stood in the way of changes in the division of labor. But the result was the establishment of separate factories using the new machines. “Here,” says Jequier (1991, p. 325), “we may note another characteristic of Swiss watchmaking: the appearance of new manufacturing processes did not eliminate old practices, and usually the two systems operated side by side, which explains the extraordinary heterogeneity of this sector, first as a craft and then as an industry.”

The story of the American challenge in watchmaking introduces some bright Chandlerian threads into the tapestry. For the rise of American watch industry followed the pattern of many others discussed in *The Visible Hand*, albeit on a somewhat smaller scale. Lacking the pools of skilled workers and the webs of existing organization available in many European industries (like Swiss watchmaking), America had to create new capabilities administratively within vertically and laterally integrated organizations. Moreover, because of the lack of existing skills, American firms substituted physical for human capital or, to put it more instructively, shifted the locus of skill on the margin away from the workers and into the machines and the organization of production. This indeed is the task that the American system was intended to accomplish: to reduce the need for skilled adjustment by making the parts (relatively more) interchangeable and by using “skilled” machines that could turn out these more-standardized parts in large numbers (Hounshell 1984). We now know that these parts were far less interchangeable than advertised (Clarke 1985; Hoke 1989). But the approach placed American firms on a technological trajectory that spurred mechanization and produced a high rate of productivity improvement. American firms were thus able eventually to overtake and surpass competitors (like the British in some industries) who were not on such a trajectory. As we will see, however, this approach worked less well on the Swiss.

The principal exemplar of the American system in watchmaking was the Waltham Watch Company. In production, the firm moved beyond the relatively versatile machine tools then in use in the industry toward more special-purpose, high-volume devices. This often required Waltham to invent its own machines, as outside tool makers were hard-pressed to meet the tolerances necessary (Landes 1983, p. 315). The results were phenomenal. By 1877, Waltham was producing some 600,000 watches per year, with a cumulative output on the order of 10 million. Moreover, quality equaled or surpassed that of Switzerland, as Swiss representatives discovered to their great shock at the 1876 centennial exhibition in Philadelphia, where American watches and watchmaking were on display (Landes 1983, p. 319; Jequier 1991, p. 326). Waltham operated with a highly integrated structure that contrasted sharply with the Swiss industry. In one reading, this is rationalization à la Chandler (if not necessarily à la Weber) into large, formally articulated organizations. In this reading, Waltham, like so many other American firms in the late nineteenth and early twentieth centuries, succeeded because it represented an organizational structure inherently superior to the market it had replaced. In another reading, however, Waltham’s structure reflected the inadequacies of existing American capabilities rather than the inherent superiority of its form. Because of the need systemically to reinvent the production process, and because of the lack of a ready web of outside suppliers, the Americans were forced to rely on integration as the best of actually available alternatives (Langlois and Robertson 1995).

In the specific case of watchmaking, the fragmented Swiss industry responded quickly to the American threat. “In spite of some inevitable resistance,” Jequier (1991, p. 326) tells us, “the spirit of enterprise asserted itself”; and assemblers began building new factories and introducing the same kind of machinery as the Americans. In 1870, three-quarters of the 35,000 employed in Swiss watchmaking worked at home; by 1905, only a quarter of the more than 50,000 workers did so (Jequier 1991, *loc. cit.*). Nonetheless, when Switzerland regained the technological and market lead toward the end of the nineteenth century, it remained far less vertically integrated than the American industry; relied far more on outwork; and comprised thousands of firms to the dozen or so in America (Landes 1983,

p, 323). Meanwhile, Waltham's highly integrated structure proved far less conducive to the routine administration of its operation than it had to bringing that operation into being, and the firm virtually collapsed under principal-agent problems (Landes 1983, pp. 329-334). Even its better-run competitors lost ground to the Swiss. Indeed, both Waltham and Elgin, Waltham's long-time domestic rival, are now Swiss owned.

By 1910, the Swiss industry dominated the world.

The Swiss controlled the micromechanical export industry by cost competitiveness, superior manufacturing competency, high levels of precision, and extraordinary attention to details and style. The vertically integrated parts manufacturers achieved economies of scale through volume production. This benefit was passed on to assemblers in the form of low-cost movements. In the most labor-intensive aspects of the industry, the vertically disintegrated system of assembly and case manufacture kept overhead charges low (Glasmeier 1991, p. 471).

This happy situation was not, however, to last long. In the years after World War I, incomes declined, protectionist barriers went up, and the large Russian market disappeared; as a result, demand for Swiss watches fell sharply (Glasmeier, *loc. cit.*; Landes 1983, pp. 326-7). Like many other industries around the world, the Swiss watchmakers responded with cartelization, in an attempt to stabilize revenues and — importantly in this case — to halt the practice of *chablonnage*, the exportation of components to countries trying to create their own watch industries behind protectionist walls. The assemblers created the Fédération Horlogère in 1924 to safeguard their interests; the 17 makers of *ébauches* combined into the trust Ebauches, S. A. in 1926; and the component makers grouped into the Union des branches annexes de l'horlogerie (UBAH) in the same year. By 1928, these associations had crafted cartel arrangements to set production, pricing, and export policies, especially, in the last case, with respect to *chablonnage* (Landes 1983, p. 327; Enright 1995, p. 130).

As is normally the case with private cartels, however, these arrangements proved unstable, especially once the Depression hit. The government of the confederation was called in, and, with the help of the banking industry, formed a huge holding company, called ASUAG after the acronym of its German name. The company bought up the majority of shares in Ebauches, S. A. along with a number of component makers (Landes 1983, p. 328; Glasmeier 1991, p. 472; Enright 1995, p. 130). The trust immediately put a halt to *chablonnage*. In 1934, the government obliged further with a statute that put the finishing touches on a cartel that Landes (1983, p. 328) rates as one of the strongest in history. In addition to setting up detailed regulation of output, the statute essentially forbade component import and export, and even prohibited the export of watchmaking machinery. Moreover, ASUAG got in the habit of buying up and subsidizing failing component makers.

By the late thirties, the industry was in recovery. But, as even cartels cannot create rents where none are to be had, this resurgence surely had less to do with cartelization than with the requickening of watch demand upon the end of the Depression and the arrival of the Second World War, during which the neutral Swiss were able to supply both sides. After the war, Switzerland found itself in a position very like that of the United States: standing almost alone as an unscathed competitor amid the devastation of war. And, like the U. S., Switzerland lived well on the resulting rents until the reemergence of German and (especially) Japanese industries by the early 70s.

America had one threat to offer in the post-war years. In the 'forties, a Norwegian immigrant named Lehmkuhl had taken over the near-defunct Waterbury Clock Company with an eye to making fuses for the war effort. At war's end, he refitted the company to make cheap mechanical watches on an updated American system, using newly developed metals in production and following a mass-marketing plan that bypassed the jeweler's shop for the five-and-dime (Landes 1983, p. 339). Timex, as the brand was called, swept the American market and made inroads in Europe. But this was the sort of challenge the Swiss had seen before; and, despite their sluggish cartel structure, it was one to which they could eventually respond.<sup>12</sup> The real challenge to the industry in the late 'sixties and early 'seventies came from a much less familiar source: electronics.

A watch, even a mechanical one, is basically an oscillator: it divides time into pulses in order to calibrate the movement of the hands. By mid century, solid-state electronics was beginning to make possible a different kind of oscillator, one based on piezoelectric crystals that can be made to vibrate precisely and dependably under alternating current. By the late 1960s, microelectronics had proceeded to a point at which the vibration of a crystal (like quartz) could be used to calibrate microcontroller circuitry driving tiny electric stepping motors. Indeed, it became possible to hook the circuits to light-emitting diodes and then liquid-crystal displays, thus eliminating mechanical parts entirely. The quartz watch was born. This change, which took the better part of a decade to work itself out, proved far more competence destroying for the Swiss industry than anything that had come before. Although the Swiss retained many capabilities relevant to analog quartz watches, the mechanical *ébauche*, a core Swiss competence, had been replaced by crystal, circuit, and motor.

The inability of the Swiss watch industry to respond to the electronic challenge represents a clear instance of industrial inertia. The Swiss industry was a well-tuned system of capabilities for producing precise and reliable mechanical watches in all price ranges. But it is the inevitable corollary of having capabilities well adapted for one purpose that those capabilities are not well adapted to other purposes. In this case, it was firms with relevant capabilities in electronics and electromechanical assembly — in America and, especially, Japan — that took up the banner of quartz. Initially, at least, the Swiss played down the threat, which, like most such threats, was far clearer in retrospect than in prospect. When the pressure began to mount, the Swiss industry responded with a burst of improvement in the productivity of mechanical watchmaking. "That," notes Landes, "is a universal characteristic of once-dominant technologies: they make some of their greatest improvements under sentence of obsolescence; the finest days of the sailing ship came after the advent of steam" (Landes 1983, p. 351). But these improvements were too little too late. With quartz technology, firms like Citizen and Seiko could make watches that were just as cheap — and far more accurate.

Although the decentralized character of the Swiss industry and its reliance on Marshallian external economies may have been sufficient cause for some inertia in the face of competence-destroying change (Glasmeier 1991), the rigid cartel structure must also take a good part of the blame for the extent of that inertia (Maurer 1985). By restricting imports

---

<sup>12</sup> In fact, however, the Swiss never really needed to respond. Although market share fell from a post-war high of 80 per cent to 40 per cent in 1970, total demand was growing fast enough to keep capacity utilization and profits high (Enright 1995, p. 133).



and exports, and by tightly controlling what and how much could be produced, the cartel stifled incentives for innovation and closed off the once-porous structure from new ideas. “The result,” as Enright notes, “is that the industry had neither the efficiency of a vibrant decentralized structure, nor the coordination advantages of hierarchy” (Enright 1995, p. 133). Swiss watch exports fell from a peak of 84 million units in 1974 to 51 million in 1980; in that year, Japanese exports, which had been less than 19 million units in 1974, surged past at 68 million units (Landes 1983, pp. 388-389). At the same time, employment in the Swiss watch industry fell almost by half, and the number of Swiss watch-making establishments declined by more than half (Landes 1983, p. 353; Enright 1995, p. 133).

The story does not end here, however. In the early 1980s, when the industry had hit rock bottom, a major, and perhaps even startling, reorganization took place. By that time, the equity of the major family firms — the “watch barons” — had declined to the point that they could not or would not oppose change; and the banks, which had written off hundreds of millions of francs, wanted out (Enright 1995, pp. 133-4). In 1981, the banks engaged Nicolas Hayek, an engineer and management consultant, to find a solution to the industry’s problems (Taylor 1993, p. 99; Zehnder 1994, p. 4). His proposal was to consolidate and radically restructure the industry. At Hayek’s suggestion, the banks, with the help of the confederation and cantonal governments, engineered in 1983 the merger of ASUAG with SSIH, another major holding company that had been founded in the ‘thirties. The new company was called the Société suisse de microélectronique et d’horlogerie (SMH). The banks toyed with the idea of selling Omega, one of SMH’s major brands, to the Japanese, who had offered a considerable sum. Hayek argued against the move, and insisted that the reorganized firm could not only become successful but actually produce a full range of watches competitively from a manufacturing base in Switzerland. The banks insisted in turn that Hayek put his money where his mouth was, which he and a consortium of backers promptly did (Taylor 1993; Zehnder 1994).

Once in charge, Hayek set about reorganizing the firm, which now comprised a significant fraction of the Swiss industry. He centralized manufacturing into a division called ETA, and marshaled existing and developed new capabilities in microelectronics, notably in the specialized 1.5 volt integrated circuits used in watches. He also reorganized and decentralized marketing according to brand, giving each a separate identity and “message.” But the most visible result of the strategy was the creation of the low-end Swatch brand, which married creative marketing with high-tech fabrication. A design shop in Milan began generating as many as 500 models a year. The 70 of these chosen for production were turned out at the rate of one every 67 seconds, some 35,000 a day (Taylor 1993, p. 104; Zehnder 1994, p. 8). By 1991, more than 100 million Swatches had been sold (Enright 1995, p. 135). The result of this reorganization was a startling turn-around, transforming a 1983 loss of \$124 million on \$1.1 billion in revenues into a 1993 profit of \$286 million on \$2.1 billion in revenues (Taylor 1993, p. 99). In 1991, SMH was the largest watch company in the world, controlling some third of the Swiss watch industry by sales and a quarter of its employment (Enright 1995, p. 135). In 1992, it held 10 per cent of the world market (Zehnder 1994, p. 3).

### ***Plausible personal capitalism.***

What can this story teach us about entrepreneurship and rationalization? There is certainly much of the story that has a familiar Chandlerian ring. From the first *établisseurs* to

mechanized production in a Marshallian industrial district, business was a personal and family activity. Beginning with trustification and cartelization in the 1920s, however, this began to change, and the industry set off — perhaps too slowly — on a path of rationalization that led ultimately to a fully articulated and vertically integrated modern corporation. As Enright puts it in describing the emergence of SMH, “[c]oordination through much of the Swiss watch industry had passed from markets, to cartels, to modern corporate management” (Enright 1995, p. 137). This sequence is indeed in keeping with the general pattern Chandler observed in large segments of American industry.

Nearly all enterprises that grew by merger followed the same path. They had their beginnings as trade associations that managed cartels formed by many small manufacturing enterprises. The federations then consolidated legally into a single enterprise, taking the form of a trust or a holding company. Administrative centralization followed legal consolidation. The governing board of the merger rationalized the manufacturing facilities of the constituent companies and administered the enlarged plants from a single central office. The final step was to integrate forward into marketing and backward into purchasing and the control of raw or semifinished materials. By the time it completed the last move, the consolidated enterprise was employing a set of lower, middle, and top managers to administer, monitor, coordinate, and plan for the activities of its many operating units and for the enterprise as a whole. By then the visible hand of management replaced the invisible hand of market forces in coordinating the flow from the suppliers of raw materials to the ultimate consumer. (Chandler 1977, p. 315.)

In this account, the rise of SMH represents the final act in a familiar Chandlerian drama.

One interpretation, then, would run along the following lines. The history of the Swiss watchmaking industry reflects precisely the sort of “progressive rationalization” Schumpeter described. The early history of the industry tells of Schumpeterian “early” capitalism, in which individual entrepreneurs provided the impetus for growth. The Chandlerian sequence, however, tracks an eventual transformation to Schumpeterian “later” capitalism, in which the collective enterprise takes preeminence over the personal element.

As the reader may suspect, I consider such an interpretation not merely wrong but close to backwards. My contention is that, whereas the story of Swiss watchmaking may (with some reservations to be noted) fit the Chandlerian pattern, it does not at all fit the Schumpeterian one. To put it another way, the transformation of the Swiss watch industry in the 1980s is precisely a story of charismatic individual entrepreneurship.

The first, and most obvious, point is that it was an outside individual, not an organization, who was responsible for the reorganization of the industry. Lazonick is right in saying that genuine innovation involves reorganizing or planning (which may not be the same thing) the horizontal and vertical division of labor.<sup>13</sup> But it was not in this case “organizational capabilities” that brought the reorganization about. It was an individual and not at all a “collective” vision, one that, however carefully thought out, was a cognitive leap beyond the existing paradigm. If SMH came to possess organizational capabilities, as it surely did, those capabilities were the result, not the cause, of the innovation. Moreover, the

---

<sup>13</sup> On the notion of “planning” within the firm, see Langlois (1995).

formation and organization of SMH reflects many more elements of genuinely personal capitalism than the Chandlerian account would suggest. First of all, Hayek is the owner, not a manager. “I put my money on the line,” says Hayek, “along with money from our investors. The fact that our group controls a majority of the equity means we could make decisions that other people were scared to make” (Taylor 1993, p. 110). But the enterprise is personal in other ways as well. Even discounting the usual rhetoric of entrepreneurship, Hayek is clearly charismatic in the ordinary sense of the term — the *Harvard Business Review* (Taylor 1993, p. 99) called him “a genuine business celebrity” — and probably in the Weberian sense as well. Consider Hayek’s own words.

It is extremely important to lead by example, while at the same time provide young managers with human and emotional support. You can only really motivate and reward someone by showing that you really are his or her friend. You have to establish an emotional connection. You have to show your employees that you really care for them and that they can count on you. When somebody is in difficulties, I don’t fire him or her, on the contrary I immediately jump at his or her side, provide support, and push him or her to do better. In that sense, I am a leader, one whose leadership extends beyond the usual. (Zehnder 1994, p. 9.)

The visible hand of management here seems to be relying on “an emotional form of communal relationship” (Weber 1947, p. 360).

But is not SMH, however created, now a vertically integrated bureaucratic organization along Chandlerian lines, and is that not the source of its superiority over the Marshallian industrial district it replaced? As I have argued elsewhere (Langlois 1992b), the benefit of centralization lies in the ability to bring about change, not in the ability to administer existing structures. A centralized structure may remain centralized for reasons of path dependency or even of static transaction costs of the familiar sort. But, very often, an imperative of decentralization soon becomes clear even within the centralized organization once it has become well established. This is certainly true of SMH, which has 211 profit centers.<sup>14</sup> “Organizational structure,” in Hayek’s view,

is the most inhuman thing ever invented. It goes against our nature as people. So we have clear boundaries and targets. Our brands work independently of one another. The people at Omega and Rado and Tissot have their own buildings. They have their own managements. They are responsible for their own design, marketing, communications and distribution. They are emotionally connected to their brands, not just to SHM as an entity. I want people at Rado to love Rado. And I want people at Longines to love their brand. (Taylor 1993, p. 110.)

In fact, much of the integration at SMH is what Chandler would call “defensive,” that is, ownership integration aimed at controlling portions of the production process in a world in

---

<sup>14</sup> Moreover, even as highly integrated a structure as SMH remains imbedded in the market. And some of the success of Swatch is arguably attributable to external capabilities in the region, notably injection-molding (for the plastic case) and automated assembly technology that was unique to Switzerland (Taylor 1993, p. 107). Indeed, the Jura remains a Marshallian industrial district today, one that has diversified beyond watchmaking into microtechnologies more generally (Maillat, *et al.* 1995).

which there are only two other producers of movements, Seiko and Citizen (Taylor 1993, p. 109).

But does this case prove that entrepreneurship must always arise from *outside* the firm, or that organizations cannot be sources of innovation? Surely no one case can be decisive. But this story reinforces what is arguably the theoretical conclusion both of organizational sociology and of management theory.

As we saw, Coleman (1990) suggested that charisma of the sort Nicolas Hayek wields may actually be thought of as a “rational” form of authority, one that is especially important in times of crisis and radical change.<sup>15</sup> In his well-known study of bureaucracy, Michel Crozier also stresses the importance of crisis for organizational change. For Crozier,

change in a bureaucratic organization must come from the top down and must be universalistic, i.e., encompass the whole organization *en bloc*. Change will not come gradually on a piecemeal basis. It will wait until a serious question pertaining to an important dysfunction can be raised. Then it will be argued about and decided upon at the higher level and applied to the whole organization, even to the areas where dysfunctions are not seriously felt. ... Crises are important in another way. They exemplify other patterns of action, other types of group relationships — temporary, but of decisive importance. During crises, individual initiative prevails and people eventually come to depend on some strategic individual’s arbitrary whim. (Crozier 1964, p. 196.)

In other words, bureaucracies always respond to crisis with what is in effect a temporary departure from the following of rules and a return to an arbitrary type of authority.<sup>16</sup> Thus, even to the extent that (more or less) radical change does take place within an articulated Weberian bureaucracy, it does so by emulating the cognitive and authority structure of Schumpeterian entrepreneurship.<sup>17</sup>

We find a similar story in the management literature. Consider, for example, the writings of Hamel and Prahalad (1994), who were not only among the more influential gurus of the 1990s but also among the strongest proponents among gurus of an organizational-capabilities view of management. As students of management and corporate consultants, of course, they are primarily interested in the question of how to make firms innovative rather than the question of whether innovation does or should take place within the bounds of firms. So they are in quest of the innovative organization. And surely organizations can be innovative at some level. Even in Nelson and Winter (1982), for example, firms may be bound by routines, but some of those routines can be “higher level” ones that govern the

---

<sup>15</sup> Similarly, Peter Temin (1980) makes a tripartite distinction — among rational, traditional, and command behavior — that is similar to that of Weber. Temin argues that people will behave according to different modes in different times and places. My argument is that entrepreneurship is an instance of command behavior, which is effective in times of radical economic change or opportunity.

<sup>16</sup> Such authority is “personal” in the sense that it reflects the will of an individual at the top of the hierarchy, even if, in Crozier’s account, it is not personal in the sense of being face-to-face or strictly charismatic in Weber’s meaning.

<sup>17</sup> And, as Joseph Berliner (1976) points out in his study of Soviet industry, a bureaucracy that makes individual initiative impossible makes innovation impossible.

search for new lower-level routines. Nonetheless, innovativeness requires more than mechanistically searching for new routines. In Hamel and Prahalad, it essentially involves forcing the firm to take on more of the characteristics of a market: it must develop the kind of genetic diversity Friedrich Hayek praised. “In nature,” they write, “genetic variety comes from unexpected mutations. The corporate corollary is skunk works, intrapreneurship, spinoffs, and other forms of bottom-up innovation” (Hamel and Prahalad 1994, p. 61). In the end, however, they, like Crozier, realize that the most radical kind of change must come from the top down: it requires a Schumpeterian entrepreneurial vision. “Top management cannot abdicate its responsibility for developing, articulating, and sharing a point of view about the future. What is needed are not just skunk works and intrapreneurs, but senior managers who can escape the orthodoxies of the corporation’s current ‘concept of self’” (Hamel and Prahalad 1994, p. 87). Example? Nicolas Hayek’s “crazy” vision that the Swiss could manufacture cheap watches competitively with the Japanese (pp. 98-99).

Economists, of course, must take a slightly different perspective, as they must remain open to the possibility that change might take place not within an already-existing organization but rather in new firms, groups of firms, or “markets” broadly understood. And there is no reason to think that all innovation must come from “re-engineering” existing organizations, even if some surely does. Indeed, one might argue that, the farther an innovation is from the ken of existing firms, the more likely it is that the innovation will be instantiated in new organizations. We can think about this in the imagery of the economics of rugged landscapes<sup>18</sup> (Levinthal 1992). If we think of innovative opportunities as “peaks” in some suitably defined space, then we might expect those who inhabit known peaks to be able perhaps to discover nearby opportunities through relatively myopic search. But “peaks” that are far away — radical innovations — are likely to be discovered and exploited by quite different individuals and organizations.

Whether Schumpeterian entrepreneurship operates from the top of an existing organization or in the creation of new ones, the same conclusion seems unavoidable. The charismatic authority and coherent vision of such entrepreneurship remains an inevitable part of capitalism, however modern. For reasons that have to do with the nature of cognition and with the structure of knowledge in organized society, some essential part of capitalism must always remain personal.

---

<sup>18</sup> I am indebted to Massimo Egidi for this idea.

# *Chapter 4*

## *The Rise of the Corporation*

### *The evolutionary design problem.*

Industrial structure is really about two interrelated but conceptually distinct systems: the technology of production and the organizational structure that directs production. These systems jointly must solve the problem of *value*: how to deliver the most utility to ultimate consumers at the lowest cost. Industrial structure is an evolutionary design problem. It is also a continually changing problem, one continually posed in new ways by factors like population, real income, and the changing technology of production and transaction. It was one of the founding insights of transaction-cost economics that the technological system does not fully determine the organizational system (Williamson 1975). Organizations — *governance structures* — bring with them their own costs, which need to be taken into account. But technology clearly *affects* organization. This is essentially Chandler’s claim. The large-scale, high-throughput technology of the nineteenth century “required” vertical integration and conscious managerial attention. In order to explicate this claim, we need to explore the nature of the evolutionary design problem that industrial structure must solve.

Like a biological organism, an organization confronts an environment that is changing, variable, and uncertain. To survive and prosper, the organization must perceive and interpret a variety of signals from the environment and adjust its conduct in light of those signals. In short, organizations are information processing systems. This is no less true of early nineteenth century production networks than it is of an Internet-enabled firm of today: in a real sense, the economy has long been a knowledge economy. Also like biological organisms, business organizations differ in the mechanisms they use to process information and to deal with variation and uncertainty. Nonetheless, as James Thompson (1967, p. 20) argued, all organizations respond to a changing environment by seeking to “buffer environmental influences by surrounding their technical cores with input and output components.” Understanding the ways in which organizations *buffer* uncertainty is thus crucial to understanding organizational structure. In Thompson’s discussion, buffers seem to take many forms. The “input and output components” he refers to are various kinds of shock-absorbers mediating between a highly variable environment and a more predictable production process. Inventories are a classic example: they can ebb and swell with changes in demand or supply while allowing a smooth flow of product. But Thompson also mentions preventive maintenance, which reduces the number of unplanned outages, as well as the training or indoctrination of personnel, which reduces variability in human performance.<sup>1</sup>

Arthur Stinchcombe (1990) has picked up the human-performance thread and pulled it in a more useful direction. In his interpretation, a skilled human is an information-processing system that can serve as an important element in the process of buffering

---

<sup>1</sup> For a discussion of buffering from an operations research point of view, See Hopp and Spearman (2000, pp. 294-301), who note that there are basically three ways to buffer variability: inventory, capacity, and time.

uncertainty. Human cognition can often interpret the data from a complex environment and translate that data into the kinds of predictable or routine information the productive system can use. For example, a professor translates the complex information on an essay exam into a letter grade that the Registrar's office can process; a physician translates the complex inputs from observation and medical instrumentation into a diagnosis, which results in a relatively unambiguous set of instructions for nurses, pharmacists, patients, etc. (Stinchcombe 1990, chapter 2). Business people serve a similar function. They translate complex data from the economic environment into a more-or-less predictable flow of outputs — contracts signed, products delivered, etc. We might even go so far as to associate the buffering role that human cognition plays in business with the very idea of *management*.

Levinthal and March (1993, p. 98) add a perspective on buffering that is relevant to my argument. They associate Thompson's notion with the late Herbert Simon's (1962) well-known analysis of system decomposition. A *decomposable system* is one that is cut into pieces or "modularized" in such a way that most interactions (which we can think of as flows of information) take place within the modules; interactions among modules are kept to a minimum and are regularized through formal "interfaces."<sup>2</sup> One of the prime benefits of decomposability, in Simon's view, is that it allows for greater stability in the face of environmental uncertainty: a single piece can be altered, replaced, or even destroyed without threatening the survival of the whole. This is already a kind of buffering. Levinthal and March point out that decomposition entails (or at least allows) "loose coupling" between organizational units, which effectively simplifies the information-processing problem the organization faces. Each department can concentrate on the local consequences of the information it receives from the environment without having to contemplate the global implications. Computer scientists would call this distributed processing. And economists would recognize the argument as akin to Hayek's (1945) famous account of the price system as a well-decomposed information-processing system. Indeed, I will suggest before long that the decomposition of organization into market can sometimes confer additional buffering benefits well known to economists, notably the ability to spread risks.

In what follows, I trace the history of how organization in the United States has confronted its evolutionary design problem over the last two centuries. The underlying process, I argue, is the Smithian one of specialization and differentiation of function. But, as expanding markets and technological change altered the economic environment, so were altered the buffering problems industry faced. The managerial revolution of the nineteenth century was one solution to the buffering problem, appropriate to its time and place. But it is by no means the only solution industry has found; and it is certainly not the approach toward which the new economy is gravitating.

### ***Antebellum organization.***

Along one dimension, the American system of production and distribution in the early years of the nineteenth century was indeed coordinated by the invisible hand of the market. The high cost of inland transportation created many isolated local markets, leading to a

---

<sup>2</sup> A perfectly decomposable system is one in which *all* interactions are kept within the subsystems. In reality, however, the best we can probably hope for is a system that is *nearly decomposable*. For a further discussion of these ideas and of the theory of modular systems more generally, see Langlois (2002).

fragmented and decentralized system of production and distribution.<sup>3</sup> To the extent that it was possible to aggregate demands, it was the independent merchant or middleman who did so. Looked at in another way, however, the antebellum value chain reflected a low level of specialization, just as one would expect in a thinly populated country with poorly integrated regional markets. The focus of the economy was not on manufacturing, which was still a matter of local crafts production, but rather on trade. And the central actors were the all-purpose generalist merchants. Merchants always specialized on those margins where specialization made economic sense; but there were relatively few such margins in the antebellum period. Thus, rather than concentrating on a narrow range of commodities or on a single aspect of trade, merchants tended to diversify fairly widely; and they acquired a wide range of skills necessary to trade.<sup>4</sup> The merchants were generalists, of course, because the volume of trade was too small to support specialization. Only by aggregating demands for a variety of types of goods could they generate sufficient scale to employ their overhead resources adequately. This meant in addition that marketing techniques, and in many cases the goods themselves, remained “generic” or nonspecialized in order to permit the necessary diversification.

Since the antebellum industrial system relied heavily on markets to coordinate among stages of production and distribution, there was a certain amount of “loose coupling” that helped to buffer variation. Inventories were no doubt in widespread use. More generally, the system employed as a buffering mechanism what Jay Galbraith (1973, pp. 22ff.) called “slack resources”: the antebellum economy was not a fast-paced, high-throughput system.<sup>5</sup> But it’s also important to notice that, because the system reflected a relatively low level of division of labor in the Smithian sense, much of the coupling, loose or otherwise, was effected by human cognition. Each stage of production encompassed many sub-stages that a larger extent of the market might have transformed into specialties. As a result, buffering by skilled humans played an important role. In crafts production, for example, both parts and finished products could exhibit considerable variation because the artisan, who personally undertook all or most stages of production, was able to buffer the variation in the parts and the variation in the tastes of consumers. Wielding a wide repertoire of skills in a flexible way (Leijonhufvud 1986), a crafts artisan can translate complex information about tastes and technology into a working finished product.

---

<sup>3</sup> The main constraint, of course, was the capacity of horse-drawn wagons and the sorry state of the network of dirt roads. Indeed, as late as the early twentieth century, “economists estimated that it cost more to haul a bushel of wheat along ten miles of American dirt road than it did to ship it across the ocean from New York to Liverpool” (Gladwell 2001, p. 13).

<sup>4</sup> “The merchants’ strength rested not so much on their mastery of the ancillary techniques of shipping, insurance, finance, and the like, as on their ability to use them in support of the fundamental trading function, buying and selling at a profit. The merchants exercised this function over a range of goods as varied as the commercial techniques they employed. The histories of individual firms, as well as merchants’ advertisements in colonial and early national period newspapers, demonstrate the merchants’ willingness to sell anything that offered a profit. Coffee, sugar, iron, cloth — all were grist for the merchants’ mills” (Porter and Livesay 1971, p. 17).

<sup>5</sup> This is also presumably what Hopp and Spearman (2000, p. 294) have in mind when they say that “time” is one of the three ways to buffer variability. (The others are inventories and capacity.) Notice also that, by dealing in a wide variety of commodities, the generalist merchant is also taking advantage of variability pooling (Hopp and Spearman 2000, pp. 279-82).



The most important buffers in the antebellum period (and indeed for centuries before that) were the generalist merchants. It was they who in effect *provided* the (loose) coupling within the market economy. Despite the recurrent features of trading in otherwise diverse goods, the thinness of antebellum markets confronted these merchants with a wide variety of concrete circumstances and special problems to solve on a daily basis. Like crafts artisans, they needed to integrate a wide variety of tasks and process a wide range of signals from the environment. What enabled them to solve these complex information processing problems was the width of their sets of skills and their flexibility in matching skills to problems (Stinchcombe 1990, pp. 33-38). They noticed profit opportunities and solved a myriad practical problems in a way that resulted in the more-or-less smooth delivery of goods and services. In the low-fixed-cost economy of the period, profitability depended not on the ownership of tangible assets but on specialized knowledge and the ability to adapt.

In the years after 1815, population growth, geographical expansion, and international trade (especially in cotton) combined to increase the extent of the market in a classic Smithian way: by an increase in the volume of goods traded but without much change in the nature of those goods (Porter and Livesay 1971, p. 17). And, as one would predict, merchants began to specialize to a somewhat greater extent by commodity or function, almost always by means of specialized firms rather than through intra-firm specialization. But merchants were far from completely specialized. Importantly, many merchants combined the middleman function with a financial function, something that was crucial for the development of American manufacturing before the Civil War (Porter and Livesay 1971, pp. 71ff.). As America began industrializing, the manufacturing sector was chronically undercapitalized, especially with respect to working capital. Investment is always a difficult business because of the problem of asymmetric information: the borrower typically has better information about his or her prospects than does the lender. In the absence of institutions designed to reduce these “agency costs,” lenders will be reluctant to part with their money unless they have good information about the borrower and can cheaply monitor the use of the funds. Many firms in the metals and mechanical trades were forced to rely on the private funds of the owner-manager or on retained earnings. Increasingly, however, merchants became an important source of financing. Since they dealt regularly with the manufacturers, they had knowledge of their operations and could observe the use of funds lent.<sup>6</sup> To the extent that banks of the period helped finance industrial development, they did so not as arms’-length lenders but as inside lenders to the networks of merchants and manufacturers who were their principal stockholders.<sup>7</sup> We can understand this as an instance of using human information processing as a “buffer” on the financial side: closely

---

<sup>6</sup> For example, the merchant James Laughlin bankrolled the Jones and Lauth iron works, which prospered to become the Jones and Laughlin Steel Corporation (Porter and Livesay 1971, p. 67).

<sup>7</sup> As Naomi Lamoreaux (1986, p. 659) has shown in the case of New England, the function of banks in this era “was to serve as the financial arms of the extended kinship groups that dominated the economy. As such, banks provided kinship groups with a stable institutional base from which to raise the capital consumed by their diverse business enterprises. Like their modern counterparts, then, early banks tapped the savings of the surrounding community, but they did so mainly selling shares of stock, not by attracting deposits. This too was an important difference. It meant that these early institutions functioned less like modern commercial banks and more like investment pools through which outsiders could participate in the kinship groups’ diverse enterprises.” The function of banks may have differed somewhat in the South and Mid Atlantic States (Bodenhorn 2000), but the standardization of lending into specialized banks had to await thicker markets.

observing production, or even taking a hand in directing it, is a way of managing the uncertainty of capital provision.

Thus the “value chain” in the U. S. in the early years of the nineteenth century was one dominated by merchant middlemen, who lowered transaction and agency costs by aggregating outputs and demands from widely dispersed producers and consumers as well as providing capital for the growth of manufacturing.

### ***The managerial revolution.***

Is change ultimately a gradual process or is it one that operates through discontinuous jumps or revolutions? This is one of the hoary questions of economic history — and, indeed, of social theory more generally. One’s answer to the question is almost always a matter of perspective. From one viewpoint, for example, the coming of the railroad and telegraph by the time of the Civil War was merely the continuation of a process of decreasing transportation costs already in motion. By 1857, one could travel about twice as far from New York in a day as had been possible in 1830. But the same could be said of the change between 1800 and 1830 (Paullin 1932, plate 138). From another viewpoint, however, the railroad and telegraph had a profound and discontinuous effect on the organization of production and distribution in the United States.

The important consequence of the lowering of transportation and communications costs, of course, was the collapse of geographical barriers and the increasing integration of the domestic market.<sup>8</sup> In effect, nineteenth-century technical change in transportation and communication brought about an all-American version of “globalization,” a topic to which we will return. Larger markets made it possible to adopt new techniques in many transformational and distributional stages in order to take advantage of economies of scale.<sup>9</sup> With larger markets to serve, it became economical to reorganize some stages using a finer and more coordinated division of labor, what Leijonhufvud (1986) calls factory production. It also became economical to use larger and more durable machines that were often capable of integrating multiple stages of production.<sup>10</sup> In both cases, larger markets allowed a shift to higher-fixed-cost methods, which were capable of lowering unit costs — often dramatically — at high levels of output.

All of this altered the value chain in two ways. First, it reduced the number of establishments necessary at some transformation and distribution stages. When market size

---

<sup>8</sup> Some numbers: Between 1869 and 1902, the cost of shipping a quarter of wheat from Chicago to New York by lake and rail fell by 72 per cent; the cost of shipping the same quarter by rail alone fell 71 per cent (Findlay and O’Rourke 2002, p. 31). Between 1870 and 1910, the price spread for wheat between New York City and Iowa fell from 69 to 19 per cent; between New York and Wisconsin it fell from 52 to 10 per cent (Williamson 1974, p. 259).

<sup>9</sup> This is not to say that the rise of large establishments and mass production obliterated specialty producers or the market economy. Small-scale flexible production grew alongside the large firms, provided those firms with many needed inputs, and contributed importantly to economic growth (Atack 1986, Supple 1991, Scranton 1997). Nonetheless, the multi-unit mass-producers represented an important new element to industrial structure, one calling out for economic explanation.

<sup>10</sup> I distinguish these two results of the increasing extent of the market as the *division-of-labor effect* and the *volume effect* (Langlois 1999a, 1999b).

permits economies of scale, a few large plants can operate more cheaply — often far more cheaply — than a larger number of small plants. As Chandler tells the tale, consolidation often played out through a set of typical episodes. First came the cartel, in which previously insulated competitors, having suddenly found themselves operating in the same large market, attempted to manage the allocation of output. Predictably, this met with little success, which prompted the formation of a holding company. By pooling ownership in a single meta-company, in which each individual owner would take a share, the holding company transformed an incentive to cheat on the cartel into an incentive to maximize total capital value. The unintended consequence of this, however, was that the holding company took on a life of its own. Especially as the original owners died out or cashed out, the head office began managing production and investment in increasingly coherent ways, normally with a view to consolidating production in the larger and more efficient plants. The culmination of this was the multidivisional (M-Form) corporation in the twentieth century, in which the old structure of many identical independent producers had been transmogrified into a unified structure with a wholly new functional division of administrative responsibility. Not all cases followed this model, of course. In fields with few incumbent producers, large unified firms grew up more-or-less directly.

The position of the middleman in the value chain also changed dramatically. As transformation and distribution stages grew in size and shrank in numbers, in-house purchasing and marketing units increasingly replaced independent wholesalers. This was so for two reasons. First, the demands of the high-throughput producers began reaching and exceeding the capacities of the middlemen, thus eliminating one of the primary *raison d'être* of wholesalers, the ability to work at higher volumes than one's customers<sup>11</sup> (Chandler 1990, p. 29). Second, standardization of inputs and outputs militated against another of the merchant's comparative advantages, the ability to deal with a diverse set of products (Porter and Livesay 1971). In some cases, like petroleum, producers integrated all the way from raw materials to the final consumer (McLean and Haigh 1954).

Chandler stresses the ways in which this process differed from what the Smithian division of labor would have predicted; that is, he focuses on the ways in which integration bypassed market relations among previously distinct stages. But it is important to notice that, however visible the hand of management had become, the process Chandler describes is at one level a fundamentally Smithian one. The rise of the modern corporation is very much about increased specialization of function. In an owner-managed firm, management is a craft engaged in by amateurs; in the modern corporation, management is a profession.<sup>12</sup> Moreover, the multidivisional structure that modern corporations came to adopt in the twentieth century reflects a decoupling of the strategic functions from the day-to-day

---

<sup>11</sup> As John D. Rockefeller said of Standard Oil, “we had to create selling methods far in advance of what then existed; we had to dispose of two, or three, or four gallons of oil where one had been sold before, and we could not rely upon the usual trade channels then existing to accomplish this.” (Quoted in Chernow 1998, p. 252.)

<sup>12</sup> Take note that, although specialized to management, the manager was a generalist along another important direction: the manager was skilled in general techniques of management independent of any specific firm or industry. I return to this point below.

functions of management in order to cope with the greater demands on managerial attention<sup>13</sup> (Williamson 1985, pp. 279-283).

The clearest and most significant way in which the rise of the modern corporation reflects specialization and division of labor, of course, is on the financial side. The corporation evolved in conjunction with developments in securities markets throughout the late nineteenth and early twentieth centuries (and, as we'll see, beyond). These developments encouraged the separation of ownership from control by creating alienable securities that could be traded on increasingly liquid markets. What made such markets possible was the development of social institutions like the limited liability corporation as well as standardized techniques for accounting and financial reporting. These latter made it easier for investors to ascertain the value of securities without detailed knowledge of the business or geographic proximity to it, thus somewhat attenuating the costs of asymmetric information (Baskin 1988, pp. 227-230). By reducing the entry requirements to capital supply and by permitting unprecedented opportunities for risk diversification, the development of anonymous securities markets lowered the costs of capital for high-throughput projects and allowed managers to lay off some of the risks — that is, the financial risks — on anonymous markets (Jensen and Meckling 1976). In effect, then, the function of “buffering” financial uncertainties was transferred in part from human information processors — generalist managers — to external market institutions armed with the buffering mechanism of portfolio diversification.

Nonetheless, as Chandler insists, along another dimension the rise of the large corporation reflected a process of *reduced* specialization. Whereas distinct sets of managers had once supervised each stage of production, with only the market standing above them, in the era of the large corporation a single set of managers came to supervise multiple stages of production. At the operational level, of course, the division of labor didn't necessarily decrease and may have increased. Each subunit of the large corporation had its specialized managers, the counterparts to the managers of the previously distinct stages. Integration of the management function took place at a “corporate” level higher than the day-to-day managers. The head office oversaw multiple stages of production in much the way a crafts artisan may have overseen multiple stages in the making of an artifact.

Why integration? I have long argued that one can't explain organizational structures without looking at the dynamic processes in which they are created (Langlois 1984). In my view, centralized organization often supplants more decentralized organization when technological and market opportunities call for a systemic reorganization of the structure of production and distribution. This is so for the same reason that decision-making becomes more centralized during a war or other crisis. When many different pieces of the system must be changed simultaneously to create new value, centralized control can often help overcome the narrow visions of the local participants, and centralized ownership can more easily trump the vested interests of those participants (Langlois 1988; Bolton and Farrell 1990). In short, vertical integration often occurs when it can overcome the *dynamic transaction costs* of systemic change (Langlois 1992b).

---

<sup>13</sup> In Chandler's eyes, this progressive specialization and separation of function during the rise of the large corporation is indeed a large part of the secret of that system's success. As you recall, he blames what he perceives to be Britain's lag behind the U. S. and Germany on precisely the British inability to specialize in this way in order to reduce the cognitive demands on the manager.

In many of the nineteenth-century industries Chandler chronicles, the possibilities of economies of scale at various transformation stages called for systemic reorganization in other complementary parts of the system. Consider the story of refrigerated meatpacking (Chandler 1977, p. 299 ff.; Porter and Livesay 1971, pp. 168-173; Fields 2004). In the 1870s, the developing railroad network had permitted the shipment of western meat on the hoof to eastern markets, thus taking advantage of economies of scale in western pasturing. But further economies of scale were possible, and Gustavus Swift realized that, if the system of meat packing, shipping, and distribution were completely redesigned, it would be possible to reduce transportation costs and to take advantage of a number of scale economies, including those of a “disassembly line” in a high-throughput slaughterhouse. Claiming these economies required changing complementary assets and capabilities throughout the system, including the development and production of refrigerated rail cars and the establishment of a nation-wide network of properly equipped branch houses to store and merchandise the meat. Swift found it more economical to integrate into many of these complementary stages than to face the dynamic transaction costs of persuading the various asset owners to cooperate with him through the market.<sup>14</sup> As Porter and Livesay (1971, p. 171) argue, the development of an integrated (non-independent) system of branch houses was “a response to the inadequacies of the existing jobber system.”

But explaining the origins of vertical integration (or any other structure of organization) doesn’t necessarily explain why that structure persists. If integration is temporarily necessary but otherwise grossly inefficient, we would expect the integration to

---

<sup>14</sup> Raff and Temin (1991) have attempted to interpret this episode within the strict confines of the doctrine of asset specificity (Klein, Crawford, and Alchian 1978). According to this doctrine, which has arguably become the dominant explanation of vertical integration in the literature of academic economics, cooperating parties are impelled to merge their operations when one or both hold assets highly specific to the transaction they contemplate. This is because in a market setting one of the parties could threaten the other with “hold-up,” thus putting the specific assets at risk. Raff and Temin make an excellent case. But the case they make is mine. They claim that Swift integrated widely because (and only because) all of the assets he came to own were transaction specific and would have put him at risk of expropriation had he left them in the hands of others. Some of the assets involved – railroad cars, maybe – might fit this profile. But many other things Swift bought – like ice --were clearly generic commodities obtainable in thick markets. Raff and Temin try to explain this away: “But Swift could not rely on independent suppliers to provide ice at the time and place he needed. And the cost to him of being without ice at that time and place was very great. ... Swift could be held up by the owner of an icehouse who had the only ice in the neighborhood” (p. 25). But this won’t do. The theory of asset specificity is an equilibrium proposition. In equilibrium, no ice-house master could have threatened to hold Swift up, since Swift had a credible threat to replace his custom, and none of Swift’s assets would depreciate in equilibrium as a result. Of course, Swift cared not a wit about equilibrium. He was worried about all interruptions in service, which – and here is the point – could happen for many reasons in addition to hold-up threats. The ice-house owner could simply be incompetent, or he could have a bad hair day. (Or Swift had acquired superior capabilities for managing the movement of ice to refrigerated cars because he had specialized in that business, and it was more costly for him to transfer that knowledge to others than to integrate.) Even if the owner is guileless and well intentioned, the high-throughput system would be at risk. Nor does it help to say that, although nonspecific in any ordinary sense, the ice had the character of time specificity or location specificity. Apart from forcing the notion of asset specificity to dance on the head of a pin, this ignores the fact that the costs of time and location specificity – what I call dynamic transaction costs (Langlois 1992b) – do not depend on the threat of holdup but can arise from a multitude of causes. The threat of hold-up in the face of specific assets is but a small subset of the much wider problems of buffering that managers of high-throughput systems face.

be undone over time. And there are certainly examples of this.<sup>15</sup> But it is also possible that a structure of organization can persist because of “path dependence.” A structure can be self-reinforcing in ways that make it difficult to switch to other structures. For example, the nature of learning within a vertically integrated structure may reinforce integration, since learning about how to make that structure work may be favored over learning about alternative structures.<sup>16</sup> A structure may also persist simply because the environment in which it operates is not rigorous enough to demand change. And organizations can sometimes influence their environments — by soliciting government regulation, for instance — in ways that reduce competitive rigors. In the end, however, structures that persist for significant amounts of time may indeed do so because they solve the design problem well — or at least well enough. Surely this is Chandler’s claim: the large vertically integrated managerial corporation persisted because it was the appropriate solution for the design problem of its day. Reading Chandler and his interpreters, we can discern the outlines of that solution.

At the price of high fixed costs, one could create low average costs — at least so long as one could reliably utilize the fixed assets to capacity.

In the capital-intensive industries the throughput needed to maintain minimum efficient scale requires careful coordination not only of the flow through the processes of production but also of the flow of inputs from suppliers and the flow of outputs to intermediaries and final users.

Such coordination did not, and indeed could not, happen automatically. It demanded the constant attention of a managerial team or hierarchy. The potential economies of scale and scope, as measured by rated capacity, are the physical characteristics of the production facilities. The actual economies of scale or of scope, as determined by throughput, are organizational. Such economies depend on knowledge, skill, experience, and teamwork -- on the organized human capabilities essential to exploit the potential of technological processes. (Chandler 1990, p. 24.)

In a world of decentralized production, most costs are variable costs; so, when variations or interruptions in product flow interfere with output, costs decline more or less in line with revenues. But when high-throughput production is accomplished by means of high-fixed-cost machinery and organization, variations and interruptions leave significant overheads uncovered. Chandler would say that uncontrolled variation in work flows lowers the

---

<sup>15</sup> As Chandler (1992, pp. 88-89) notes: “integration ... should be seen in terms of the enterprise’s specific capabilities and needs at the time of the transaction. For example, Williamson (1985, p. 119) notes that: ‘Manufacturers appear sometimes to have operated on the mistaken premise that more integration is always preferable to less.’ He considers backward integration at Pabst Brewing, Singer Sewing Machine, McCormack [sic] Harvester, and Ford ‘from a transaction cost point of view would appear to be mistakes.’ But when those companies actually made this investment, the supply network was unable to provide the steady flow of a wide variety of new highly specialized goods essential to assure the cost advantages of scale. As their industries grew and especially as the demand for replacement parts and accessories expanded, so too did the number of suppliers who had acquired the necessary capabilities.”

<sup>16</sup> See Langlois and Robertson (1989, pp. 367-368) for an example from the early years of the Ford Motor Company. I return to this point in Chapter 5 in the context of arguments about a bias of technological change in information technology in favor of internal organization.

effective economies of scale available. Integration and management are an attempt to control — to *buffer* — product-flow uncertainty.

Employing a finely sliced division of labor or large integrated machines or both, traditional mass production always requires the elimination of variation between stages of production. Although never fully realized until the day in 1908 when three of Henry Leland's Cadillacs emerged perfect from a heap of scrambled parts in Brooklands, Surrey,<sup>17</sup> the promise of interchangeable parts had animated the quest for mass production throughout the nineteenth century (Hounshell 1984). As the Brooklands episode suggests, interchangeable parts create a more modular design: parts can be swapped in and out. At the same time, however, standardization eliminates one form of "loose coupling" possible in crafts production. Variation in the components becomes increasingly intolerable. In the classic form of mass production, so does variation in the final product. Moreover, mass production requires operatives (including, eventually, machines) to carry out an unambiguous sequence of steps — a computer program, in effect. Thus the design of the overall production process becomes more highly structured, while discretion and variation are eliminated from the individual stages, a process that unsympathetic scholars have labeled "deskilling" (Marglin 1974) and "fordism" (Sabel 1982).

One important implication of this is that standardization and high throughput do not eliminate the need to buffer uncertainty; indeed, they make it all the more urgent — for any variation that finds its way into a high-throughput system can bring production to a crashing halt. What buffers uncertainty in Chandlerian managerial capitalism is exactly what buffers uncertainty in crafts production or non-specialized merchandising: the information-processing ability of human managers. Because of the new high-throughput structure of production, however, that buffering is no longer distributed to the individual stages of production — from which standardization has eliminated variation — but has effectively moved "up the hierarchy" to the managers who control the work flow<sup>18</sup> (Stinchcombe 1990, p. 64).

Professional management is specialization in one sense: the manager is manager only and not in any important way a capitalist or anything else. But, like the merchant of yore, the manager is also a generalist: the manager is skilled in general techniques of management independent of any specific firm or industry. The nonspecific training of managers was abetted in the twentieth century by the rise of the business school, which, like other professional schools emerging at the same time, equipped its students with a standardized "toolkit" (Langlois and Savage 2001). This shouldn't be surprising. Chandlerian managers are generalists for the same reason that crafts artisans and merchants are generalists: because

---

<sup>17</sup> For this feat Leland was awarded the Dewar Trophy as winner of the first Standardization Test of the Royal Automobile Club. Cadillac's British operation had in fact instigated the competition as a publicity stunt, and Cadillac was the only contestant; but Cadillac was also the only manufacturer capable of the precise machining tolerances necessary to pass the test (Leland and Millbrook 1966, chapter 1).

<sup>18</sup> Top managers will not be the only buffers, of course. They will be aided by a large number of discretionary workers at multiple levels. "There will generally be a separate set of skilled manual work departments (maintenance, tool and die making, and special departments that vary with the technology, such as the crew who lay firebricks inside steel furnaces) and skilled staff workers at the managerial levels (engineering, quality control and inspection, scheduling and inventory), besides the whole routinized structure of the production line and the 'line' supervisory structure that keeps it running" (Stinchcombe 1990, p. 64).

their function is to buffer uncertainty. They need a wide range of skills that can be applied flexibly in response to an unpredictable array of concrete circumstances.

### ***From scale to scope: the corporate century.***

In setting up managerial structures to buffer high-throughput production, the large corporations of the late nineteenth century created something more: a system of organizational capabilities. Geared initially toward the management of scale, these organizational capabilities soon enabled corporations to expand their scope. In Chandler's words, they "provided an internal dynamic for the continuing growth of the enterprise. In particular, they stimulated its owners and managers to expand into more distant markets in their own country and then to become multinational by moving abroad. They also encouraged the firm to diversify by developing products competitive in markets other than the original one and so to become multiproduct enterprises" (Chandler 1990, pp 8-9).

As Edith Penrose (1959) had suggested, this is an important mechanism by which firms grow. In her theory, firms consist of bundles of "resources," including the managerial resources that Chandler and others call capabilities. Resources are often lumpy, and some are therefore in excess capacity. This means that organizational capabilities developed in one area can spill over to new tasks at low marginal cost. Indeed, economies of scale and scope are ultimately made of the same stuff: they both involve the reuse of a structure of knowledge, in one case to stamp out more of the same product, in the other case to produce something different that requires similar knowledge (Langlois 1999b).

Especially early on, diversification was a matter of taking advantage of byproducts — the classic economies of scope of the textbook. For example, Armour, Swift, and other meatpackers sold fertilizer, leather, glue, soap, and other items made from the byproducts of the slaughterhouse (Chandler 1990, p. 168). Significantly, firms diversified in a modular way by creating for the various products new organizational units that could be dropped into the overall corporate structure. By the twentieth century, however, diversification came to flow more from reusable facilities, knowledge, and business practices. For instance, Swift and his competitors began to distribute butter, eggs, poultry, and fruit using the distribution system originally set up for meat (Chandler 1990, p. 168). Notice that in moving from scale to scope, corporations became generalists to a greater extent, thus reversing the original trend toward product-oriented specialization — and away from generalist merchants — that had created those corporations in the first place. I will suggest soon that the vanishing hand can be understood in part as a continuation of this process of the broadening of capabilities and their decoupling from specific products.

For most of the twentieth century, of course, the process of capability-building that Chandler describes did not challenge the structure of vertically integrated managerial capitalism. Indeed, it reinforced it. As Chandler (1997, p. 64) notes, after world War II especially, "the essential large-scale investments in both tangible and intangible capital were made not by new enterprises as they had been in the past, but primarily by well-established firms whose existing learned organizational capabilities were critical in developing and commercializing the potential the new technologies on a global scale." The large corporations were recreating significant parts of the U. S. value chain along new lines, which led them to grow internally in the path-dependent way implied by Penrose's theory. Such growth placed increasing strain on corporate buffering mechanisms. In part, the firms



responded by decentralizing divisions, a kind of buffering in emulation of the market.<sup>19</sup> But, as Herbert Simon pointed out, buffering mechanisms, which help an organization respond better to variation, are not the only way to attack the problem of environmental uncertainty. “If we want an organism or mechanism to behave effectively in a complex and changing environment,” he wrote, “we can design into it adaptive mechanisms that allow it to respond flexibly to the demands the environment places on it. Alternatively, we can try to simplify and stabilize the environment. We can adapt organism to environment or environment to organism” (Simon 1960, p. 33). In the first century of the managerial revolution, large firms did indeed seek to simplify and stabilize their environments — a phenomenon that has absorbed the ink of legions of economists and pundits over the years.

One class of such attempts falls within the broad purview of antitrust. That Chandler’s large corporations have typically been discussed — and for long periods exclusively discussed — from the perspective of trustification and monopoly is a story too tedious to tell here, and perhaps too trite to be worth telling. Virtually alone among writers on the subject, Schumpeter argued that behavior derided as restrictive or “anticompetitive” actually can serve the function of controlling environmental uncertainty in a way that facilitates high-throughput production — and thus increases rather than decreases output.

Practically any investment entails, as a necessary complement of entrepreneurial action, certain safeguarding activities such as insuring or hedging. Long-range investing under rapidly changing conditions, especially under conditions that change or may change at any moment under the impact of new commodities and technologies, is like shooting at a target that is not only indistinct but moving — and moving jerkily at that. Hence it becomes necessary to resort to such protecting devices as patents or temporary secrecy of processes or, in some cases, long-period contracts secured in advance. But these protecting devices which most economists accept as normal elements of rational management are only special cases of a larger class comprising many others which most economists condemn although they do not differ fundamentally from the recognized ones. (Schumpeter 1950, p. 88.)

Schumpeter also had a more colorful term for what I have blandly called environmental variation or uncertainty: “the perennial gale of creative destruction” (Schumpeter 1950 [1976, p. 84]).

Notice that Schumpeter sees the corporation’s “safeguarding activities” as akin to buffering techniques like insuring and hedging. Let me focus in on a couple of “protecting devices” that will be of significance down the road. Chandler has long maintained that, in effect, vertical integration is itself a mechanism for controlling the environment — by putting large parts of that environment under the influence of managerial buffering. But within the vertically integrated structure, the stages of production with high fixed cost play a special role. Industrial organization economists have laid great stress on the role of sunk costs in deterring competitive entry and generally slowing the competitive environment (Baumol 1982, Sutton 1991). Fixed costs are not always sunk costs, of course; but they tend

---

<sup>19</sup> “Although the transformation from functional to product organizations [the M-Form] has usually been justified as a means to enhance control and coordination (Chandler 1962), it also is a way of segregating experience” (Levinthal and March 1993, p. 98).

to become so when markets for the fixed assets are thin, as will be the case when those and comparable assets are isolated within the internal production of vertically integrated firms. This is relevant to my story: for when markets become thicker, the “sunk” character of assets diminishes, which reduces the benefits of vertical integration.

In some lines of business, vertical integration also threw up transaction-cost problems of a more traditional sort. This was especially true in consumer goods but also in some kinds of producer goods as well. In the days of generalist wholesalers and retailers, merchants were not only purveyors of goods but also guarantors of quality. Soap, flour, butter were undifferentiated products in whose quality the customer trusted because he or she trusted the retailer, whose good name served as a kind of bond. As high-speed continuous-process technology made it dramatically more economical for the producer rather than the wholesaler or retailer to package commodities (Chandler 1977, pp. 289ff.), the role of these latter in guaranteeing quality all but vanished. In principle, this meant that the costs to consumers of verifying quality would increase, perhaps dramatically. The solution to the problem, of course, was branding, which allowed the producer to speak, as it were, directly to the consumer and to utilize some of the same bonding mechanisms that the local grocer had once used<sup>20</sup> (Klein and Leffler 1981). New generalist retailer like Sears and A&P also sprang up to carry a wide variety of branded products, and these were able to add the bonding power of their own names to that of the individual product brands, sometimes even selling the commodities under their own house brand (Kim 2001). In addition, the large multiunit retailers were able to create capabilities, and to exploit scale economies, in quality management and assurance.

Branding did more than solve a transaction-cost problem, of course. It was another method of attempting to control the environment in order to reduce variation and uncertainty. This is clear even from a standard neoclassical textbook. By creating a product differentiated in the eyes of the consumer, a firm can enjoy a more inelastic demand curve, which damps fluctuations in price and quantity. And branding is what makes product differentiation possible. Even if quality is the brand’s only distinguishing characteristic — as was arguably the case for commodities like branded gasoline — branding will still have this damping effect (Klein and Leffler 1981).

---

<sup>20</sup> It is not correct to say, however, as Kim (2001) seems to imply, that the system of branded products supplanted the earlier system because of its superior transaction-cost properties. In Kim’s story, products became more sophisticated because of technological change, making it harder for consumers to judge quality directly. This gave the advantage to big chain stores, which had large amounts of capital with which to bond quality. As Chandler shows, however, the principal innovations in this period were in the nature of process technology. Soap, beans, butter, cigarettes, etc., didn’t change much — but they could be packaged much more quickly by machine. Moreover, even in the early nineteenth century, consumers could not directly discern the quality of products by casual inspection: many of the most famous cases of adulteration involved simple commodities like bread or flour. And small generalist retailers were often perfectly capable of certifying the weight and purity of even sophisticated commodities like pharmaceuticals; only now are pharmacists being supplanted by branding, and that is because of a change in the sophistication of testing equipment as much as by changes in the drugs themselves (Savage 1994). In the end, the system of branding arose to solve a transaction cost problem caused by — but that was arguably small in comparison with — the major production-cost gains from new process technology. Whether branding is superior to local certification and bonding on purely transaction-cost grounds is an open question.

All of these methods of attempting to control the environment pale in comparison with getting the government involved. Economists and political scientists have long since come around to the idea that regulation is something that firms and industries often work hard to bring upon themselves (Kolko 1963; Stigler 1971). Politicians are often anxious to supply regulation, as it earns them the political support they crave. And firms are equally anxious demanders of regulation, as it serves their interests. Those interests are normally understood in terms of increased profits from government-managed cartelization and restrictions on competitive entry. But clearly government can also serve a damping function.<sup>21</sup> It provides an environment alternative to, or at least supplementary to, the market — an environment that is either inherently less variable or that can be more easily dealt with by the buffering mechanisms of management. Of course, not all industries fit this picture: it is doubtful that regulation of taxicabs in major cities or of interstate trucks under the old regime of the Interstate Commerce Commission had much to do with buffering in a world of high fixed costs. But many other industries, often supposed “natural monopolies” in undifferentiated products like electricity, phone service, or natural gas transmission, may have sought regulation in part to help control a complex, internally managed production system containing critical components with high fixed costs.<sup>22</sup> Even in industries not directly regulated by agencies, government action often came in handy as “safeguarding activities” to buffer demand shocks or to provide a cushion of economic rents.

Although the problems of buffering high-throughput production have not made much impression on the mainstream literature on government and business, there is a line of thought along the fringes that takes this problem as central. Running roughly from Thorstein Veblen (1921) to William Lazonick (1991), this literature sees it as crucial that managers be insulated from the vagaries of the environment, especially those caused by financial and other markets. Veblen considered financial markets “industrial sabotage.” The most eloquent voice in this tradition belonged, however, to John Kenneth Galbraith, whose *New Industrial State* distilled through hyperbole the essence of the corporate century he could see stretching behind him in 1967. Galbraith takes it for granted that technological change always leads to greater complexity and scale. This complexity and scale requires “planning”; such is the imperative of technology, an imperative that can only grow stronger in the future. Planning means not only the attempt to foresee and prepare for future contingencies but also the removal of transactions from the market to the realm of managerial authority. “If, with advancing technology and associated specialization, the market becomes increasingly unreliable, industrial planning will become increasingly impossible unless the market also

---

<sup>21</sup> Government may also be enlisted to serve the quality guaranteeing function alluded to earlier. A classic example of this is the institution of federal inspection of meat (Libecap 1992).

<sup>22</sup> I don’t mean this to suggest that such regulation is therefore obviously desirable. Although regulation may indeed serve the function of smoothing the environment, and thus of helping a highly integrated structure to make good use of its high-throughput assets, it also has the effect of freezing the environment and of insulating the organization from the changing configuration of relative scarcities and transaction costs in the economy. Without regulation, firms have to control variation by making themselves more adaptable, which may be a better long-run outcome. At the end of the twentieth century, as we will see presently, even regulation couldn’t protect firms from the need to adapt their structures.

gives way to planning. Much of what the firm regards as planning consists in minimizing or getting rid of market influences”<sup>23</sup> (Galbraith 1967, p. 26).

It is perhaps a fitting reward for the *hubris* this view of planning implies that the not-too-distant future had in store a picture of technology and organization that would be virtually the diametric opposite of the one Galbraith painted.

---

<sup>23</sup> The syllogism continues, of course. Since a little planning is good, a lot must surely be better. So the government should largely replace the market system with central planning.

## *Chapter 5*

# *The Return of the Entrepreneur*

### *From internal to external capabilities: the new economy.*

By the 1980s, the large corporation that had looked inevitable and invincible in the 1950s and 1960s had become an organizational structure increasingly misaligned with economic realities — and an organization in the process of redefining itself. Quite apart from any mechanisms of environmental control they themselves created, the large American corporations after World War II had benefited from the attenuated climate of competition that came with the destruction of the German, Japanese, and other economies. As those economies revived and trade began expanding by the 1970s, the easy life was coming to an end. Indeed, by the 80s and 90s, the image of invincibility had been virtually replaced by its opposite. As Mark Roe notes, “the image of the corporation as a sweating and not-always-successful competitor has become more vivid” (Roe 1996, p. 106).

The American corporation’s mechanisms of environmental control and its charmed life in the 50s and 60s had permitted it largely to ignore ongoing changes in the scale of technology as well as the increasing thickness and realignment of markets. In startling contrast to Galbraith’s (rather nineteenth-century) view of technological change, innovation often — and perhaps mostly — proceeds by simplifying and by reducing scale.<sup>1</sup> Arguably, this has been the dominant trend of the twentieth century.<sup>2</sup> For example, in electricity generation, among the most scale-intensive of fields, the development of aero-derivative combined-cycle generating technology (CCGT) has significantly reduced the minimum efficient scale of new electric capacity (Joskow 1997, p. 123). In telephony, the rise of semiconductor technology in general and the development of the private branch exchange (PBX) in particular turned switching from a centralized to a decentralized-network technology (Victor 1994, p. 188). At the same time, rising populations, rising income, and newly vibrant international trade generated thicker markets. This meant, among other things, that, even where technology was not threatening to reduce scale, existing structures of fixed cost shrank relative to the extent of the market. For example, by the time CCGT had arrived, increases in market size had long since stripped electric power generation of its natural-monopoly character (Joskow and Schmalensee 1983).

---

<sup>1</sup> This seems to have been Adam Smith’s (eighteenth-century) view. What drives innovation is the desire to perform a given set of operations more elegantly and economically. (Smith 1976, I.1.8.)

<sup>2</sup> I mean this as a long-run proposition. In the short run, innovation can certainly increase scale. Moreover, the effect of technological change on scale is sometimes subtle, in that scale reduction in one part of the system can lead to increased scale elsewhere. The advent of the small electric motor (eventually) led to the demise of highly centralized steam power in factories (David 1990); but it also increased the extent of the market for electric power and (initially at least) helped increase the scale of its generation. Indeed, in some cases, the Internet and FedEx have clearly had the same scale-increasing effect as the telegraph and the railroad: think of Amazon.com. But over time, holding all else constant, the scale of a given technology tends to decline. (On this point see also Langlois 1999a, p. 56.)

Ruttan and Hayami (1984) have proposed a theory of institutional change that is relevant to my story of organizational-and-institutional change. As they see it, changes in relative scarcities, typically driven by changes in technology, create a demand for institutional change by dangling new sources of economic rent before the eyes of potential institutional innovators. Whether change occurs will depend on whether those in a position to generate it — or to block it — can be suitably persuaded. Since persuasion typically involves the direct or indirect sharing of the available rents, the probability of change increases as the rents increase. And the more an institutional or organization system becomes misaligned with economic realities, the more the rents of realignment increase. My argument is that these changes in technology and markets opened up attractive rent-seeking possibilities that could be seized only by breaking down or “unbundling” the vertical structure of the managerial corporation. This is perhaps clearest in what most had long considered the intractable cases of vertical integration: regulated utilities. We need only think of long-distance telephony, in which a scale-reducing technical change — microwave transmission — created opportunities for whoever could open up AT&T’s legal hold on the field.<sup>3</sup> Entrepreneur William McGowan of MCI poured resources first into persuading the Federal Communications Commission to alter its policies and then into fomenting the breakup of AT&T (Temin 1987). Analogous tales can be told for the deregulation of electricity (Kench 2000) and other industries. A similar process of unbundling is also underway in less-regulated industries, where the impediments to supplying organizational change are substantially lower though not necessarily absent.

In some respects, the internal dynamic of scale and scope that Chandler chronicles contributed in an almost Hegelian fashion to the corporation’s own undoing. Driven by the Chandler-Penrose imperative to apply existing managerial skills and other capabilities more widely, the corporation in the 1960s took the idea of diversification to new levels.<sup>4</sup> IIT was the paradigm. Originally an international supplier of telephone switching equipment, it bought, among other things, an insurance company, a hotel chain, and the maker of Hostess Twinkies.<sup>TM</sup> In assembling conglomerates, as Mark Roe (1996, p. 113) argues, “managers learned that they could move subsidiaries and divisions around like pieces on a chessboard.”

Conglomerates were assembled from separate firms, with a central headquarters directing the firm. Their widespread use in the 1960s taught managers that it was possible to mix and match corporate divisions. It was only a small leap of an organizational idea for a conglomerate to bring in an outside firm via a hostile acquisition by buying up the target’s stock and tucking the formerly independent firm in as one now managed from the conglomerate headquarters. From there it was only another small mental jump in the 1980s to understand that once the pieces of a conglomerate had been assembled, they could be disassembled as well. (Roe 1996, p. 114.)

---

<sup>3</sup> In this case, the possibilities arose in part because of AT&T’s pricing structure, which for political reasons had subsidized local service at the expense of long distance — a misalignment with relative scarcities made possible by AT&T’s status as a regulated monopoly (Victor 1994, p. 183).

<sup>4</sup> Of course, there were institutional factors as well. Roe (1996) points to the favorable tax treatment of retained earnings relative to dividends. Shleifer and Vishny (1991) argue that stringent antitrust policy in the 1960s discouraged cash-rich firms from acquiring companies in related industries, forcing them into unrelated diversification.

Notice also that the managers could move divisions around like pieces on a chessboard in the first instance because of the modular structure of the M-form.

Aided by innovations in the securities markets, the leveraged-buyout wave of the 1980s disassembled the conglomerate of the 1960s. “By and large,” write Bhagat, Shleifer, and Vishny (1990, p. 2), “hostile takeovers represent the deconglomeration of American business and a return to corporate specialization.” Indeed, specialization became the strategic catchword of the 1990s. Whereas the most influential text on corporate strategy in 1980, that of Michael Porter, had counseled its readers to profit through buffering mechanisms and the control of the environment, the leading gurus of the next decade taught that the keys to success lay within and that firms could prosper only by returning to their *core competences* (Prahalad and Hamel 1990). Shoemaker, stick to your last.

What has been less well observed, however, is that the changes of the 1980s did not amount to a return to the pre-conglomerate days of the 1950s, to the “modern corporation” that Chandler had described. Something fundamental had changed. If a corporation, even a non-conglomerated one, is an amalgam of division-modules, then the logical extension of the idea of corporate specialization would be to hive off not only unrelated divisions but also vertically related divisions as well. As G. B Richardson (1972) pointed out, it is highly unlikely that the various vertical stages of a production process should all call for similar kinds of capabilities. And this is what has happened. “Even a cursory examination of the industrial system of the United States in the 1990s reveals organizational patterns that look not at all like the modern corporation,” writes Timothy Sturgeon.

The largest single employer in the country is not General Motors, but a temporary employment agency called Manpower Inc. The largest owner of passenger jets is not United Airlines, or any other major carrier, but the aircraft leasing arm of General Electric. American automakers have spun-off their in-house parts subsidiaries and outsourced the design and manufacture of entire automotive sub-systems to first-tier suppliers. Since 1992, IBM has literally turned itself inside-out, becoming a merchant provider of the basic components it had previously guarded so jealously for exclusive use in its own products. If what we see today seems to have little relation to the ideal type of the modern corporation, there may be good reason. Perhaps the American industrial system has begun to adapt to the new, more intense global competitive environment that triggered the competitive crisis in the first place. Perhaps we are witnessing the rise of a new American model of industrial organization, and not simply the resurgence of the old (Sturgeon 2002, p. 454).

In many respects, the structure of this new model looks more like that of the antebellum era than like that of the era of managerial capitalism. Production takes place in numerous distinct firms, whose outputs are coordinated through market exchange broadly understood. It is in this sense that the visible hand of management is disappearing. Unlike the antebellum structure, however, the new economy is a high-throughput system, with flows of work even more closely coordinated than in a classic Chandlerian hierarchy.

Vertical disintegration and specialization is perhaps the most significant organizational development of the 1990s. My goal is to explain this development not to document it. But the evidence is clear. Measuring vertical integration is never easy; but,

using trade-flow data, international economists have found that the “rising integration of world markets has brought with it a disintegration of the production process ... . Companies are now finding it profitable to outsource increasing amounts of the production process, a process which can happen either domestically or abroad. This represents a breakdown in the vertically-integrated mode of production — the so-called ‘Fordist’ production, exemplified by the automobile industry — on which American manufacturing was built” (Feenstra 1998, p. 31). Using Canadian census data, Baldwin, Beckstead, and Caves (2002) found that Canadian firms have increased plant and firm specialization in secular fashion as the extent of the market has grown, with increases in commodity specialization accelerating after 1988 as a result of the North American Free Trade Agreement.

The anecdotal evidence is equally compelling. In electronics, firms like Sanmina-SCI, Solectron, and Flextronics specialize in assembling on contract electronic systems of all sorts (Sturgeon 2002). But they neither design nor distribute nor market the systems themselves.<sup>5</sup> In pharmaceuticals, the major integrated companies are increasingly outsourcing manufacturing and marketing to firms like DSM and clinical trials to contract research firms like Quintiles Transnational and Covance (Dolan and Meredith 2001). A major new trend in semiconductor manufacturing has been the rise of so-called fabless semiconductor firms. These firms retain design, development, and marketing functions but do not own their own manufacturing plants (called “fabs” in industry argot); instead, they contract out the actual manufacture of the chips to specialized “silicon foundries” (Langlois and Steinmueller 1999, p. 51). Led by Chrysler in the 1990s, American automobile manufacturers began to modularize their product design and supply chain strategies and to rely more heavily on subcontractors (Fine 1998, pp. 61-62). The American Big Three automakers spun off individual parts units like Delphi and Visteon, and in 2000 they and several other carmakers formed an electronic B2B supplier network called Covisint. If Gustavus Swift were looking to ship ice reliably today, he could call on any number of third-party logistics suppliers like Bax Global, Menlo Worldwide, or Ryder. The litany could continue.

This is specialization, of course. But notice also that these subcontractors are also generalists. Flextronics will put together virtually any kind of electronic device you ask it to; DSM will produce whatever drug you hand it; and the silicon foundries of Taiwan (and elsewhere) will manufacture whatever chip design you send them electronically. In the auto industry, parts suppliers are generalizing their capabilities across major subsystems (Fine 1998, p. 65). This coupling of specialization of function with generalization of capabilities recalls the generalist merchants of the early republic.<sup>6</sup> It is in fact a typical feature of the Smithian process. In his famous analysis of that process, George Stigler (1951, p. 192) referred to what he called “general specialties.” He had in mind activities like railroads,

---

<sup>5</sup> More correctly, they do not *brand* their own systems. These firms will often supply design and engineering services when asked. For example, Flextronics and Solectron not only manufactured the Handspring Visor but were also involved in its design in order to smooth manufacturing and quicken time to market (Dolan and Meredith 2001). On the other hand, design services are a specialty that can also be purchased on the market. Ideo, a specialist design firm, was responsible for another Handspring model, the Visor Edge.

<sup>6</sup> Not to mention Chandlerian managers, who specialized in management but possessed general management capabilities.



shipping, and banking that can benefit a variety of industries; but contract suppliers are clearly examples in the small – microcosmic instances of what economists now call *general-purpose technologies* (Helpman 1998). This trend toward general specialties is a continuation of the process of decoupling capabilities from products that Chandler observed in *Scale and Scope*. It is also a mechanism by which the market system buffers uncertainty. Since a general specialist is not tied to a particular product or brand, taking in work from many purveyors of products and brands, it can diversify its portfolio more effectively. This smoothes demand and facilitates high-throughput production.<sup>7</sup>

Among the most important general-purpose technologies are social institutions. Just as decentralization of the stages of production depends on the extent of the market, so the extent of the market depends on institutions that support specialization and exchange. Secure and alienable property rights are one example, but there are more specific institutions at work in particular markets. Many of these take the form of standards. Decentralization implies an ability to cut apart the stages of production cleanly enough that they can be placed into separate hands without high costs of coordination; that is to say, decentralization implies some degree of standardization of “interfaces” between stages. In an extreme, but far from rare, case, standardized interfaces can turn a product into a modular system (Langlois and Robertson 1992).

Just as did the high-throughput technologies of classical mass production, modular systems require and arise out of standardization. But unlike classical mass-production technologies, which standardize the products or processes themselves, modular systems standardize something more abstract: the rules of the game, or what Baldwin and Clark (2000) call *visible design rules*. So long as they adhere to these rules, participants need not communicate the details of their own activities, which become *hidden design parameters*. By taking standardization to a more abstract level, modularity reduces the need for management and integration to buffer uncertainty. One way in which it does so is simply by reducing the amount of product standardization necessary to achieve high throughput. This is the much-remarked-upon phenomenon of mass customization (Cox and Alm 1998). For example, the highly modular structure of the personal computer as it developed during the 1970s and 1980s made it possible for Michael Dell and others to begin selling PCs to order by assembling them like Legos™ from a set of standardized components. In so doing, PC makers could blanket more fully what economists call the product space (Langlois and Robertson 1992), that is, they could fine tune products more closely to the needs of individual users. When economies of scale no longer require largely identical products to be manufactured *en masse* on spec, a major source of environmental uncertainty disappears, and with it the need to buffer that uncertainty.<sup>8</sup>

---

<sup>7</sup> This results from what operations researchers call *variability pooling* (Hopp and Spearman 2000, pp. 279-82). When independent sources of demand are pooled, the variability in aggregate demand is less than that of the independent sources. Reduced variability means higher utilization of fixed costs and thus lower average costs. This phenomenon lies behind what economists used to call economies of massed reserves (Mulligan 1983).

<sup>8</sup> Lamoreaux, Raff, and Temin (2003) make a similar point from the demand side. As incomes rose in the U. S. after World War II, consumers became less satisfied with undifferentiated products, creating a disadvantage for the large Chandlerian firm and an advantage for smaller, more flexible units. I return to this argument below.

When a modular product is imbedded in a decentralized production network, benefits also appear on the supply side<sup>9</sup> (Langlois and Robertson 1992). For one thing, a modular system opens the technology up to a much wider set of capabilities. Rather than being limited to the internal capabilities of even the most capable Chandlerian corporation, a modular system can benefit from the *external capabilities* of the entire economy. External capabilities are an important aspect of the “extent of the market,” which encompasses not only the number of possible traders but also the cumulative skill, experience, and technology available to participants in the market. Moreover, because it can generate *economies of substitution* (Garud and Kumaraswamy 1995) or *external economies of scope* (Langlois and Robertson 1995), a modular system is not limited by the weakest link in the chain of corporate capabilities but can avail itself of the best modules the wider market has to offer. Moreover, an open modular system can spur innovation, since, in allowing many more entry points for new ideas, it can create what Nelson and Winter (1977) call rapid trial-and-error learning.<sup>10</sup> From the perspective of the present argument, however, the crucial supply side benefit of a modular production network is that it provides an additional mechanism of buffering.

Social institutions, including standards, can support specialization and exchange in other ways. When we think of markets becoming “thicker,” we think of more traders for existing commodities. But liquidity is also a matter of having markets in the first place. To put it another way, the development of markets is often and importantly about the creation of new tradable units. Sometimes these are “new products” in a conventional sense: the Hula Hoop™ or Beanie Babies.™ But often the new products around which markets develop are pieces of some larger system that become standardized and get broken off for arms<sup>2</sup>-length trade. For example, markets for spare parts blossomed in the 1920s as the aging of the automobile fleet encouraged a multitude of third-party manufacturers (Langlois and Robertson 1989, p. 369). At a deeper level, what made this possible was the standardization of the automobile into a “dominant design,” thereby reducing qualitative variation in the list of parts. Even though designs and parts change from year to year, a fleet of cars once on the road is effectively a modular system, many of whose modules are standard enough to trade on markets.

Consider a more recent example (Jacobides 2005). Traditionally, the stages of home mortgage lending – originating, underwriting, holding, and servicing the loan – were integrated within banks and savings-and-loan associations. Vertical control allowed bankers to buffer the default and other risks in the face of asymmetric information and potential moral hazard. In the 1970s, however, the government-sponsored Federal National Mortgage Association (Fannie-Mae) created, for reasons of its own, a mortgage portfolio security that could be traded on financial markets. Originally, the full faith and credit of the U. S. government helped solve the resulting agency problems; but soon standards emerged for quality sorting, and the use of markets spread to other quasi-governmental corporations

---

<sup>9</sup> The supply-side aspect of modular standards has gone largely unnoticed in the economics literature, which has focused almost exclusively on the possibilities of demand-side network effects.

<sup>10</sup> Baldwin and Clark (2000) have recently explicated this last point in the language of finance theory. If we think of each experiment taking place in the system as a *real option*, then an open modular system can create more value than a closed corporation even if the same number of experiments takes place in each system. This is a consequence of the theorem in finance that says that a portfolio of options (the modular system) is worth more than an option on a portfolio (the experiments within the corporation).

and then to fully private financial firms. Now the various stages of the mortgage process are typically undertaken by different organizations.

Although modularity in a deep sense lies behind all decentralization (Langlois 2002), I don't want to be understood as saying that the Chandlerian corporation is giving way to pure modular systems and anonymous arms'-length markets. In many cases, the visible hand has indeed been socialized into technical standards<sup>11</sup> that permit external mechanisms of coordination and reduce the need for rich information transfer. In many other cases, however, products will continue to maintain significant "integrality," and relationships between stages will often be collaborative ones involving trust, permanence, and the transfer of rich information (Helper, MacDuffie, and Sabel 2000). Although the personal computer is the epitome of a modular system, market leader Dell exercises considerable administrative control over stages of production it does not own, effectively creating through contract the kind of tightly integrated logistics system Swift had created through a Chandlerian corporation (Fields 2004). As a central tendency, however, the buffering functions of management are devolving to the mechanisms of modularity and the market — informational decomposition, flexibility, and risk spreading.

### ***The end and the beginning of history.***

So why was the large Chandlerian firm relatively more dominant in the past and relatively less dominant now? Robertson and I have long argued that the process of explaining organizational form is "necessarily complex and historically contingent" (Langlois and Robertson 1995, p. 3). As I suggested in Chapter 1, however, a contingent theory can explain sweeping changes by pointing to sweeping changes in certain crucial contingent factors, that is, to systematic changes in boundary conditions. If the changes in question seem secular — like the rise of the large bureaucratic corporation through the 1950s and 1960s — it is easy to read even contingent explanations as historicist or near historicist: if increasing per capita income and decreasing transportation and transaction costs always lead to large multi-unit enterprise, and per capita income continues to grow while transportation and transaction costs continue to decline, then the continued growth of the multi-unit form seems inevitable. It is the end of history even for a contingent theorist.<sup>12</sup> But the

---

<sup>11</sup> I am indebted to Martin Kenney for this phrase.

<sup>12</sup> According to Popper (1957), historicism is essentially a confusion of a law and a trend. A law is unconditional, whereas a trend is a specific sequence of historical events. Some trends can be powerful and persistent without becoming historicist laws: Popper specifically suggests population growth and scientific and industrial progress as trends not laws. They are contingent and potentially reversible. For example, he writes, scientific progress is dependent on institutions and other factors, and we could imagine a number of ways in which it could be brought to a halt (Popper 1957, pp. 156-157). Economic growth is an extremely durable trend, but when the institutional conditions supporting it are changed appropriately, it too can be reversed. (If you don't believe me, I recommend a nice holiday in Zimbabwe.) Moreover, says Popper, it is perfectly okay to use laws (theoretical propositions) in explaining trends so long as those propositions are accompanied by "specific statements pertaining to the special case in question, called the 'initial conditions'" (Popper 1957, p. 123). The initial conditions may themselves be trends (Popper 1957, p. 128). So if one offers an explanation for a trend that happens to be durable, that explanation is not *ipso facto* historicism — it is just an explanation of a durable trend. Smith's account of the division of labor — and my account of the Vanishing Hand — are attempts to explain trends using both theoretical propositions and appropriate initial conditions. In Smith's case, the division of labor is caused or enabled by the extent of the market, all other things equal. This is a

explanatory problem we now face is a more interesting and complicated one: although the boundary conditions seem to have changed monotonically, organizational form has not. In the antebellum era, the population of organizational arrangements consisted almost entirely of decentralized, market-oriented, and relational forms. In the era Chandler chronicles, the large managerial corporation clustered into an important and perhaps dominant place in that population. In the last quarter century, the relative importance of the large managerial corporation has declined, as has its typical level of vertical integration – which makes the population of arrangements today begin to look a lot more like the antebellum one. Keeping in mind the population logic of this claim, we might loosely say that vertical integration started low, increased, and then decreased again even as the boundary conditions changed monotonically. In a sense, then, we are explaining not a secular trend in vertical integration but a “hump” in vertical integration, even though per capita income continued to increase and transportation and transaction costs continued to decline throughout.

The reader may have noticed that the Internet and other present-day technologies of coordination have played at best a supporting role in my story rather than a starring one. This is somewhat in contrast to the billing technology has received in other venues. In the year 2000, *The New York Times* offered up Ronald Coase as the indisputable if improbable guru of Internet economics (Tedeschi 2000). In his famous 1937 paper, Coase had argued that transaction costs drive the make-or-buy decision; thus, since the Internet has reduced transaction costs, Coase had effectively predicted a principal feature of the new economy: the increasing devolution of transactions from firms to markets. Of course, what Coase actually said is that the scope of the firm is determined in Marshallian fashion at the margin: the firm will expand (in terms of number of activities internalized) until the costs of internalizing one more transaction just balance the costs of an equivalent transaction on the market. And, as Hal Varian reminds us in a more recent *New York Times* article (Varian 2002), the effects on market structure of information-improving innovation are thus ambiguous: they depend on whether the innovation reduces the costs of organizing internally more than it reduces the costs of organizing on markets.<sup>13</sup> Just remember, says Varian, the railroad and the telegraph gave us the large vertically integrated firms of the Nineteenth Century.

Sophisticated arguments must therefore contain an account of why modern technology favors markets over firms. To put it another way, in order to explain the hump in terms largely of the technology of coordination and communication, one would have to argue that such technology “switched” from favoring vertical integration to favoring vertical specialization. In a paper published a bit ahead of the Internet curve, Malone, Yates, and Benjamin present just such a sophisticated argument. They isolate two factors that determine the boundaries between market and hierarchy: asset specificity and the complexity of product descriptions. The latter refers to “the amount of information needed to specify the attributes of a product in enough detail to allow potential buyers ... to make a selection.”

---

potentially reversible process, as when specialization in Europe declined after the fall of the Roman Empire (North 1981; Dahlman 1980).

13 “It should be noted that most inventions will change both the costs of organising and the costs of using the price mechanism. In such cases, whether the invention tends to make firms larger or smaller will depend on the relative effect on these two sets of costs. For instance, if the telephone reduces the costs of using the price mechanism more than it reduces the costs of organising, then it will have the effect of reducing the size of the firm” (Coase 1937, p. 397n).

(Malone *et al.* 1987, p. 486). Modern technology shifts the margin in favor of markets along both dimensions. Flexible manufacturing technology reduces the specificity of assets, and higher-bandwidth communications technology can transmit complex product information more cheaply. Malone and Laubacher (1998, p. 147) make essentially the same argument. Until recently, they contend, virtually all improvements in the technology of coordination favored internal organization. “The coordination technologies of the industrial era — the train and the telegraph, the automobile and the telephone, the mainframe computer — made internal transactions not only possible but advantageous.” It is only with the very recent development of even more powerful coordination technology — personal computers and broadband communication networks — that markets have been favored.<sup>14</sup> “Because information can be shared instantly and inexpensively among many people in many locations, the value of centralized decision making and expensive bureaucracies decreases.”

This may well be part of the story. But the hypothesis I offer here is a bit more subtle, or at least a bit more complicated, and arguably more general. In my view, the phenomenon of the Vanishing Hand is a further continuation of the Smithian process of the division of labor on which Chandler’s managerial revolution was a way station. Thus the Vanishing Hand is driven not just by changes in coordination technology but also by changes in the extent of markets — by increasing population and income, but also by the globalization of markets. Reductions of political barriers to trade around the world are having an effect analogous to the reduction of technological barriers to trade in the America of the nineteenth century (Findlay and O’Rourke 2002). Is this a revolution or the continuation of a long-standing trend? Again, the answer depends on one’s perspective. My argument is that, just as the American “globalization” after the Civil War was revolutionary in its systemic reorganization of production toward standardization and volume, the new era is revolutionary in its systematic de-verticalization in response both to changes in coordination technology and to plain-old increases in the extent of markets.

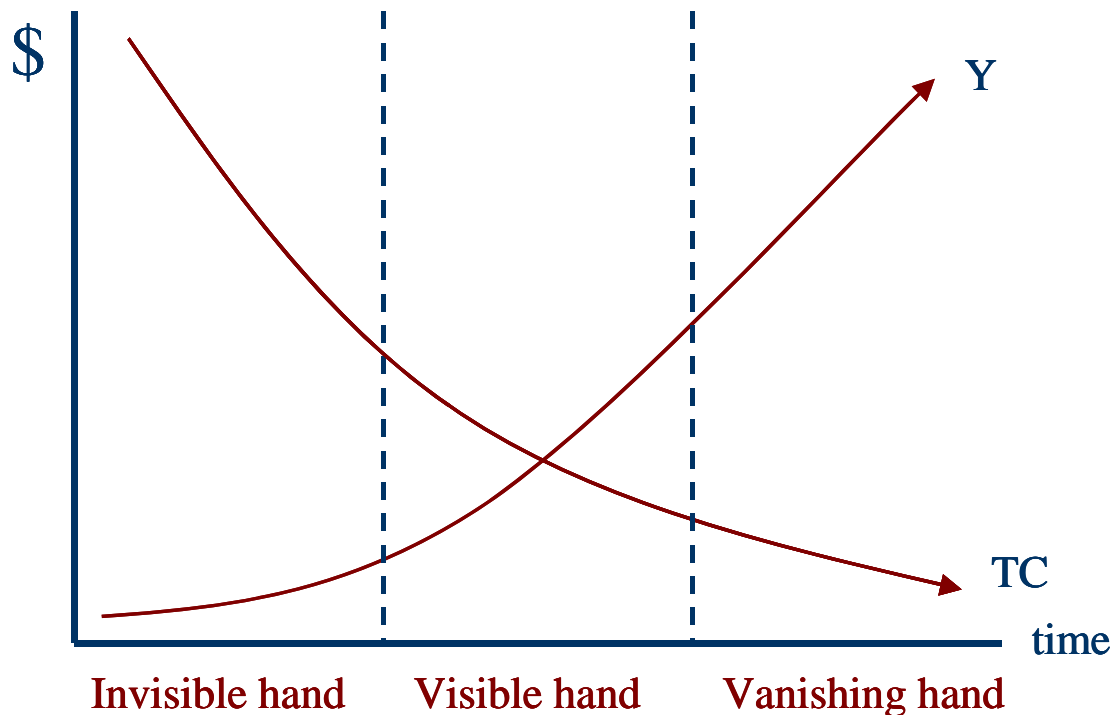
Indeed, it is not clear that we are entitled to see coordination technology as an entirely exogenous influence on organization form. Perhaps we might grant the deployment of the telegraph as an exogenous event that helped to integrate markets and thus helped bring about the managerial revolution. But when we think of much of the rest of the technology employed by managerial organizations — from filing cabinets to carbon paper to typewriters to mimeograph machines— we might more usefully think in terms of the coevolution of technology and organization. A number of studies of technological change in information technology in the era of Chandlerian firms have painted a picture of exactly this kind of coevolution (Yates 1989, 2000; Reinstaller and Hölzl 2004). The needs of the multi-unit enterprise effectively “induced” technical change in directions that lowered the costs of integration, which integration in turn induced further technological change, and so on in cumulative fashion. In the modern era, we may be seeing a similar dynamic of technological change in favor of disintegration. Physical and social technologies influence one another by each throwing up problems the other is challenged to solve. On the one hand, this reinforces the notion that an organizational structure biases technological change in ways that reinforce that structure. On the other hand, it reduces the extent to which we can view such technological change as independently causative. Was the Internet an exogenous event

---

<sup>14</sup> For empirical evidence that information technology now tends to favor vertical disintegration, see Hitt (1999).

like the telegraph that altered organizational form decisively? Perhaps. But it is well to remember that, back when the currency of the digital world was dots and dashes rather than zeroes and ones, the international hub of e-commerce was Manchester, England, where the telegraph served as a vibrant element in one of history's most vertically disintegrated production systems – the British cotton textile industry (Farnie 1979, p. 64). In my view, the relationship among coordination technology, transaction costs, and industrial structure remains an open research agenda.

Lamoreaux, Raff, and Temin (LRT) offer a different “reswitching” explanation of the hump that is also related to my account. Instead of implicating technology directly, they focus on the income variable. As we saw, classic mass production had generated economies of scale by optimizing on a standardized product. That product may have contained no consumer's ideal bundle of attributes; but the price was so low that, on a value-per-dollar basis, the undifferentiated product dominated higher-priced specialty goods. As incomes continued to grow in the twentieth century, however, consumers grew willing to pay for higher-quality and more-individualized goods. Born of the era of classic mass production, Chandlerian hierarchies proved too inflexible to compete against networks of agile specialist firms for the custom of these wealthy buyers (Lamoreaux, Raff, and Temin 2003, p. 430). Of course, transportation and transaction costs must matter, too. For one thing, antebellum consumers had even lower incomes, but they were served by markets and relational



**Figure 1**  
The Lamoreaux, Raff, and Temin explanation?

contracts. LRT appeal here to Paul Krugman's core-periphery model of industrial location. Roughly speaking, the model predicts that, when transportation costs are high, production takes place nearby to consumption; as transportation costs decline, it begins to pay to locate production in a core and ship to the periphery; but as transportation costs decline further, the core-periphery structure starts to become less pronounced<sup>15</sup> (Krugman 1991, p. 111). LRT take from this the message that, when transportation and communications costs are high, "economic activity tends to be local and consequently small in scale. When communication is virtually instantaneous, as on the Internet, and transportation is very cheap, then, all else equal, economic activity can be located virtually anywhere and even tailored to individual needs. When communication and transportation costs are neither prohibitive nor trivial, however, there are advantages to be obtained from concentrating productive activity in specific locations *and in large firms.*" (Lamoreaux, Raff, and Temin 2003, pp. 429-30, emphasis added)

Notice that, taken literally, this is not by itself the explanation we seek. To the extent it addresses the point at all, Krugman's model predicts "large firms" only in the sense of price theory (producing a lot of output) rather than in the sense of Coase (incorporating many activities or stages of production). Krugman's model is about where firms locate, not about how they are organized. Indeed, most of the book cited (and much of Krugman's other work) suggests that the core ought to look like a Marshallian industrial district. But if we take the "reswitching" idea as an analogy, and incorporate the income variable, we can in fact arrive at an approach to the puzzle. See Figure 1, which is my picture not theirs. Early on, high transportation and transaction costs (TC) dominate the story. Production has to be small-scale and relational, and a low level of income (Y) only reinforces that fact. In today's economy, income dominates the story, as consumers demand distinctive and individualized products, which are best supplied by agile market-oriented and relational forms. A low level of transaction and transportation costs either reinforces this tendency or, if it fails to reinforce it, the TC effect is swamped by the demand effect. In the middle, when incomes are still relatively low but transportation and transaction costs are falling, Chandlerian firms work best.

Of course, we still need a theory of *why* Chandlerian firms work best in this intermediate range. LRT are not specific on this point. They seem to take it for granted, as indeed many do, that classical mass production implies large vertically integrated firms and that customization calls for smaller, more flexible, relational firms. But why is this so? Two related facets of classical mass production stand out: (1) the need for dedicated machinery and other specialized assets and (2) the presence of high fixed costs in a high-throughput setting. If we focus on the first alone, we get a story consistent with the Williamsonian tenor of LRT's overall argument. But if we take in both facets, I argue, we are led to an explanation far more in accord with Chandler.

In the mainstream economics of organization, it is the highly specific character of the productive assets that matter. Assets are "specific" here in the sense that they hold value largely or exclusively within the context of a transaction; they need not be specialized to tasks in the sense of Adam Smith, although presumably there is a correlation between contract-specific and task-specific assets. Put simply, specific assets are significant in this

---

<sup>15</sup> At least in the version of the model cited, reswitching never actually occurs, as the value of the key parameter never gets bigger than one even for zero transportation costs.

literature because they make possible a potential threat of expropriation, which can be avoided through internal organization involving common ownership of the specific assets. Assuming in addition that there is a connection between this kind of asset specificity and classical mass production, then we have a Williamsonian prop for the LRT argument.<sup>16</sup> In Chandler, by contrast, what is at issue is the management of a high-throughput system whose assets are specialized in the sense of Smith. Producing an undifferentiated product with dedicated assets (including routines and knowledge) reduces unit costs by spreading overheads over more and more output. For this to work, however, it is crucial that the high-fixed-cost assets be used to capacity. In Chapter 4, I appealed to a notion of *buffering* that I borrowed from the “cybernetic” theory of organization developed in the 1960s and 1970s (Thompson 1967; Galbraith 1973). Buffering mechanism are various features and designs intended to insulate the organization, especially a high-throughput system, from environmental variation. Such environmental variation includes, but goes well beyond, the threat of hold-up because of opportunistic behavior. In this account, the managerial structure Chandler describes arises not as a way of solving a problem of hold-up but as a mechanism of ongoing coordination to “buffer” threats to the system.

Whereas LRT discuss rising incomes and lowered transportation and communications costs, I prefer to talk about *the extent of the market*, which varies positively with population and per capita income, and negatively with transportation and communication costs (political as well as technological). When the extent of the market is small, clearly production will be local, small in scale, and oriented to markets. As extent of the market expands, it pays to take advantage of economies of scale in high-throughput systems. The demand-side certainly matters: because relatively low-income consumers are willing to accept undifferentiated products, this high-throughput production can take the form of classical mass production, which requires a high level of buffering by internal management in order to actualize potential scale economies.<sup>17</sup> But the supply side also matters. It is a major part of my argument that, as the extent of the market grows, markets (and market-supporting institutions) can take over many of the buffering functions of management.

“In the beginning there were markets” is Williamson’s famous heuristic dictum (Williamson 1975, p. 20.) For him, a fair comparison between markets and hierarchies implicitly requires us to assume that the same capabilities are available through contract as would be available to hierarchy. I have been at pains to suggest that, from a historical and evolutionary perspective, this heuristic leads us astray. Especially in times of significant economic transformation, internal organization may arise precisely because the relevant capabilities are not cheaply available through contract. As time passes and the extent of the market grows, however, we should expect markets (that is, “contracting” broadly

---

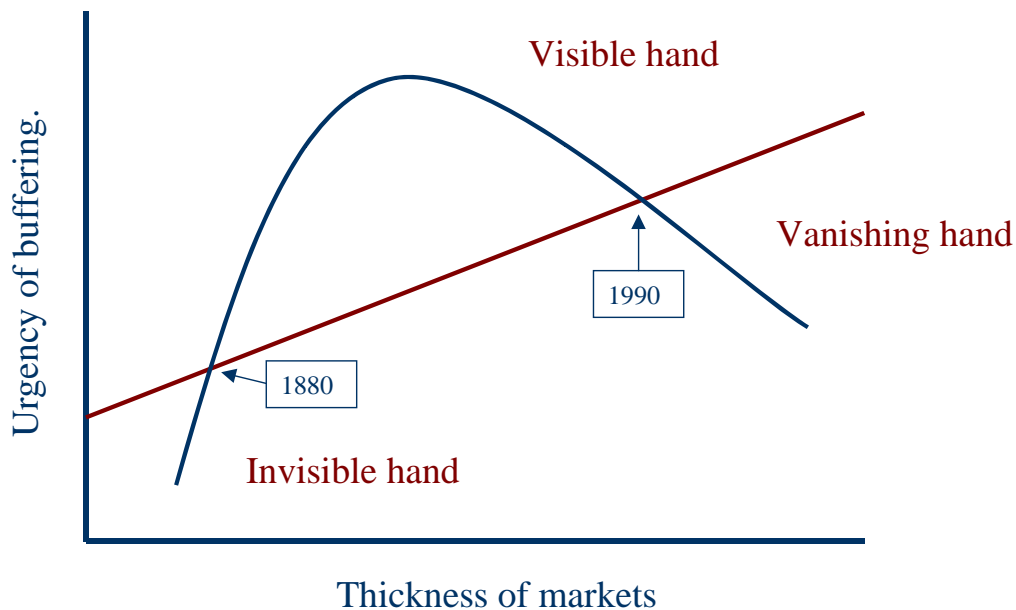
<sup>16</sup> This implies both good news and bad news for Williamson. On the one hand, it endorses his view that asset specificity is the fundamental determinant of vertical integration. On the other hand, it suggests that his key variable is rapidly losing its significance in the modern economy.

<sup>17</sup> Chandler (1992, p. 81) argues that high-throughput facilities “demanded the constant attention of a managerial team or hierarchy. The potential economies of scale and scope, as measured by rated capacity, are the physical characteristics of the production facilities. The actual economies of scale and scope, as measured by throughput, are organizational. Such economies depend on knowledge, skill, experience, and teamwork - on the organized human capabilities essential to exploit the potential of technological processes.”



understood) to become more “capable” (Langlois 1992). As time passes, all other things (including extent of the market) equal, the outlines of new capabilities will become sharper; activities will become more routine and better understood; and capabilities will thus begin diffuse to others.<sup>18</sup> Moreover, economic agents can be expected to discover techniques other than integration for mitigating problems of asymmetric information. As the extent of the market grows, all other things (including knowledge) equal, it will pay to incur the set-up costs that markets and market-supporting institutions (like formal standards) require. Moreover, as markets become thicker, assets are likely to become less transaction specific (because there are many more potentially similar transactions) and relative minimum efficient scale is likely to decline in general. *In the end* there are markets.

In principle, of course, a Chandlerian revolution could happen again if a radical change in technology or exogenous factors creatively destroyed existing market capabilities and rendered existing market-supporting institutions irrelevant. In the small, this is happening all the time: recall the story of the Swiss watch industry told in Chapter 3. But if we are considering the question of dominance within the entire population of organizational forms, then *absolute* levels of the extent of the market have to matter. For one thing, as we saw, larger markets can support more “general specialties” or “general-purpose technologies.” A Chandlerian firm starting up today can plug into modern financial markets, modern banking, containerized shipping, overnight delivery, personal computers, and the



**Figure 2.**  
The Vanishing Hand explanation.

<sup>18</sup> In the terminology of Malone, Yates, and Benjamin (1987), product descriptions will become more standardized and interpersonally shared, thus reducing the complexity of the information that has to be exchanged in transaction.

Internet without having to reinvent those stages of production itself. This suggests that, not only should we expect Chandlerian firms to occupy a smaller niche in the population of firms as the extent of the market grows, but we should also expect those firms to be less vertically integrated on average.

Figure 2 summarizes the Vanishing Hand thesis in visual form. I have called the independent variable “thickness of markets,” which is driven by exogenous factors like population, income, and the height of technological and political trade barriers. The vertical axis is called “urgency of buffering,” by which I mean to capture the degree to which the technology of production is complex, sequential, and high-throughput. Producing cotton cloth under the putting out system would have a low degree of urgency of buffering; producing electricity for the state of California would have a high degree of urgency of buffering. The straight line moving northeast from the vertical axis represents the boundary between firm and market. Above the line, buffering through integration and management is less costly; below the line, buffering through markets (of a thickness given on the horizontal axis) is preferable. That the line slopes upward simply reflects the increased ability of markets to buffer product-flow uncertainty as they thicken. The more-or-less parabolic curve superimposed on this space represents the vanishing-hand hypothesis. Think of it as a path in time, rather like the plot of an explorer’s progress on a map.<sup>19</sup> The possibilities for high-throughput technologies and mass production made possible in the late nineteenth century generated a rapid and sudden increase in the urgency of buffering. This is reflected in the initially steep slope of the curve: markets were insufficiently thick to buffer product-flow uncertainty, just as they were initially too underdeveloped to handle financial risk. Over time, two things happen: (a) markets get thicker and (b) the urgency of buffering levels off and then begins to decline. In part, urgency of buffering declines because technological change begins to lower the minimum efficient scale of production. But it also declines because improvements in coordination technology — whether applied within a firm or across firms — lower the cost (and therefore the urgency) of buffering.

More or less arbitrarily, I have labeled as 1880 the point at which the path crosses the firm-market boundary. This is the start of the Chandlerian revolution. Equally arbitrarily, I label as 1990 the point at which the path crosses back. This is the Vanishing Hand. Rather than being a general historical trend, the managerial revolution — in this interpretation — is a temporary episode that arose in a particular era as the result of uneven development in the Smithian process of the division of labor. Far from encouraging you to see the large corporation as the end of history, I have welcomed you to an episode of *The Twilight Zone* in which the protagonists awaken from the era of large Chandlerian firms to discover that they had actually never left the world of Adam Smith.

Chandler’s great contribution was to provide an intellectual framework for the field of business history. The exercise I have set for myself is to rethink Chandler while remaining a Chandlerian (and a Schumpeterian), that is, while attempting to provide a larger intellectual frame for organizational change. Obviously, casting complex historical transitions in terms of simple diagrams is a dangerous gambit; but it does provide a valuable heuristic and a way of calling attention to the importance of factors like the extent and evolution of the market and the changing nature of the coordination problem organization

---

<sup>19</sup> The technically inclined may want to view it as the projection onto two dimensions of a curve in three-dimensional space, with the third (z) dimension being time.

has faced. For more than 200 years, economic growth has been a durable trend in the United States. The same is true of the expansion in the extent of the market and the elaboration of the division of knowledge. Indeed, these trends may be the most significant facts of modern economic and organizational life, even if we often take them for granted. Using these trends as initial (or boundary) conditions in explaining organizational choice is not historicism. But failing to take them into account is *ahistoricism*.

## ***References.***

- Abramovitz, Moses. 1956. "Resources and Output Trends in the U. S. Since 1870," *American Economic Review* **40**(2): 1-23.
- Alcaly, Roger. 2003. *The New Economy*. New York: Farrar, Straus, and Giroux.
- Alchian, Armen, and Susan Woodward. 1988. "[The Firm Is Dead; Long Live the Firm: A Review of Oliver E. Williamson's \*The Economic Institutions of Capitalism\*](#)," *Journal of Economic Literature* **26**(1): 65-79 (March).
- Allen, Robert Loring. 1991. *Opening Doors: the Life and Work of Joseph Schumpeter*. Two Volumes. New Brunswick: Transaction Publishers.
- Atack, Jeremy. 1986. "Firm Size and Industrial Structure in the United States During the Nineteenth Century," *Journal of Economic History* **46**(2): 463-475.
- Baldwin, Carliss Y., and Kim B. Clark. 2000. *Design Rules: the Power of Modularity*. Volume 1. Cambridge: MIT Press.
- Baldwin, John R., Desmond Beckstead, and Richard E. Caves. 2002. "[Changes in the Diversification of Canadian Manufacturing Firms \(1973-1997\): A Move to Specialization](#)," Statistics Canada, Analytical Studies Branch, Research Paper 179.
- Barnard, Chester I. 1948. *The Functions of the Executive*. Cambridge: Harvard University Press.
- Barzel, Yoram. 1987. "The Entrepreneur's Reward for Self-Policing," *Economic Inquiry* **25**: 103-116.
- Baskin, Jonathan Barron. 1988. "The Development of Corporate Financial Markets in Britain and the United States, 1600-1914: Overcoming Asymmetric Information," *Business History Review* **62**: 199-237 (Summer).
- Baumol, William J. 1982. "Contestable Markets: An Uprising in the Theory of Industry Structure," *American Economic Review* **72**(1): 1-15 (March).
- Becker, Markus C., and Thorbjørn Knudsen. 2003. "The Entrepreneur at a Crucial Juncture in Schumpeter's Work: Schumpeter's 1928 Handbook Entry *Entrepreneur*," *Advances in Austrian Economics* **6**: 199-234.
- Berle, Adolph A., Jr., and Gardiner C. Means. 1932. *The Modern Corporation and Private Property*. New York: Macmillan.
- Berliner, Joseph S. 1976. *The Innovation Decision in Soviet Industry*. Cambridge: MIT Press.

- Bernanke, Ben. 1993. "The World on a Cross of Gold," *Journal of Monetary Economics* **31**: 251-267.
- Bhagat, Sanjay, Andrei Shleifer, and Robert Vishny. 1990. "Hostile Takeovers in the 1980s: The Return to Corporate Specialization," *Brookings Papers on Economic Activity: Microeconomics*, pp. 1-72.
- Bodenhorn, Howard. 2000. *A History of Banking in Antebellum America: Financial Markets and Economic Development in an Era of Nation-Building*. New York: Cambridge University Press.
- Bolton, Patrick, and Joseph Farrell. 1990. "Decentralizaion, Duplication and Delay," *Journal of Political Economy* **98**: 803-826.
- Carlin, Edward A. 1956. "Schumpeter's Constructed Type – the Entrepreneur," *Kyklos* **9**: 27-43.
- Chandler, Alfred D., Jr. 1962. *Strategy and Structure: Chapters in the History of the Industrial Enterprise*. Cambridge: MIT Press.
- Chandler, Alfred D., Jr. 1971. "Business History as Institutional History," in George Rogers Taylor and Lucius F. Ellsworth, eds., *Approaches to American Economic History*. Charlottesville: University Press of Virginia for the Eleutherian Mills-Hagley Foundation, pp. 17-24, reprinted in Thomas K. McCraw, ed., *The Essential Alfred Chandler: Essays toward a Historical Theory of Big Business*. Cambridge: Harvard Business School Press, 1988, pp. 301-306.
- Chandler, Alfred D., Jr. 1977. [\*The Visible Hand: the Managerial Revolution in American Business\*](#). Cambridge: The Belknap Press.
- Chandler, Alfred D., Jr. 1990. *Scale and Scope: the Dynamics of Industrial Capitalism*. Cambridge: The Belknap Press of Harvard University Press.
- Chandler, Alfred D., Jr. 1997. "The United States: Engines of Economic Growth in the Capital-Intensive and Knowledge-Intensive Industries," in Alfred D. Chandler, Jr., Franco Amatori, and Takashi Hikino, eds., *Big Business and the Wealth of Nations*. New York: Cambridge University Press, pp. 63-101.
- Chandler, Alfred D., Jr. 2001. *Inventing the Electronic Century*. New York: The Free Press.
- Chandler, Alfred D., Jr. 1992. "Organizational Capabilities and the Economic History of the Industrial Enterprise," *Journal of Economic Perspectives* **6**(3): 79-100.
- Chernow, Ron. 1998. *Titan: the Life of John D. Rockefeller, Sr.* New York: Random House.
- Clarke, Benjamin Neil. 1985. *Early American Technology: A Reexamination of Some Aspects of Connecticut's Industrial Development*. Unpublished M.A. thesis, University of Connecticut.
- Coase, Ronald H. 1937. "[The Nature of the Firm](#)," *Economica* (N.S.) **4**: 386-405 (November).

- Coase, Ronald H. 1988. "[The Nature of the Firm: Origin](#)," *Journal of Law, Economics, and Organization* 4(1): 3-17 (Spring).
- Coleman, James S. 1990. "Rational Organization," *Rationality and Society* 2(1): 94-105.
- Cox, W. Michael, and Richard Alm. 1998. "[The Right Stuff: America's Move to Mass Customization](#)," Federal Reserve Bank of Dallas Annual Report.
- Crozier, Michel. 1964. *The Bureaucratic Phenomenon*. Chicago: University of Chicago Press.
- Csontos, László. 1991. "Wieser's Influence on Schumpeter," appendix to R. N. Langlois, "Schumpeter and the Obsolescence of the Entrepreneur," Working Paper 91-1503, Department of Economics, University of Connecticut, November. Available at <http://web.uconn.edu/langlois/CSONTOS.HTML>.
- Dahlman, Carl. 1979. "The Problem of Externality," *Journal of Law and Economics* 22: 141-162.
- Dahlman, Carl. 1980. *The Open Field System and Beyond*. New York: Cambridge University Press.
- David, Paul A. . 1990. "The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox," *American Economic Review* 80(2): 355-361 (May).
- Dolan, Kerry A., and Robyn Meredith. 2001. "Ghost Cars, Ghost Brands," *Forbes* (April 30), p. 106.
- Ebner, Alexander. 2006. "Schumpeterian Entrepreneurship Revisited: Historical Specificity and the Phases of Capitalist Development," *Journal of the History of Economic Thought* 28 (September).
- Eichengreen, Barry. 1992. *Golden Fetters: The Gold Standard and the Great Depression, 1919–1939*. New York: Oxford University Press.
- Engels, Frederick. 1966. [Anti-Dühring: Herr Eugen Dühring's Revolution in Science](#), Tr. Emile Burns. New York: International Publishers. [First published in German in 1878.]
- Enright, Michael J. 1995. "Organization and Coordination in Geographically Concentrated Industries," in Naomi R. Lamoreaux and Daniel M. G. Raff, eds., *Coordination and Information: Historical Perspectives on the Organization of Enterprise*. Chicago: University of Chicago Press.
- Farnie, D. A. 1979. *The English Cotton Industry and the World Market, 1815-1896*. Oxford: Clarendon Press.
- Fauci, Riccardo, and Veronica Rodenzo. 1998. "Did Schumpeter Change His Mind? Notes on Max Weber's Influence on Schumpeter," *History of Economic Ideas* 6(1): 27-54.
- Feenstra, Robert C. 1998. "Integration of Trade and Disintegration of Production in the Global Economy," *Journal of Economic Perspectives* 12(4): 31–50.

- Fields, Gary. 2004. *Territories of Profit: Communications, Capitalist Development, and the Innovative Enterprises of G. F. Swift and Dell Computer*. Stanford: Stanford University Press.
- Findlay, Ronald, and Kevin H. O'Rourke. 2002. "[Commodity Market Integration 1500-2000](#)." Center for Economic Policy Research Discussion Paper 3125, January.
- Fine, Charles. 1998. *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*. New York: Perseus Books.
- Foss, Kirsten, and Nicolai J. Foss. 2001. "Assets, Attributes and Ownership," *International Journal of the Economics of Business* **8**: 19-37.
- Freeman, Christopher. 1982. *The Economics of Industrial Innovation*. Cambridge: MIT Press, second edition.
- Friedman, Milton, and Anna Schwartz. 1963. *A Monetary History of the United States, 1867-1960*. Princeton: Princeton University Press.
- Galbraith, Jay. 1973. *Designing Complex Organizations*. Reading: Addison-Wesley.
- Galbraith, John Kenneth. 1967. *The New Industrial State*. Boston: Houghton-Mifflin.
- Garud, Raghu, and Arun Kumaraswamy. 1995. "Technological and Organizational Designs for Realizing Economies of Substitution," *Strategic Management Journal* **16**: 93-109 (Summer special issue).
- Gifford, Adam. 1991. "A Constitutional Interpretation of the Firm," *Public Choice* **68**: 91-106.
- Gladwell, Malcolm. 2001. "Clicks & Mortar," in Henry Finder, ed., *The Price of Everything: an Anthology of Business*. New York: The New Yorker.
- Glasmeier, Amy. 1991. "Technological Discontinuities and Flexible Production Networks: the Case of Switzerland and the World Watch Industry," *Research Policy* **20**: 469-485.
- Gould, Stephen Jay. 1977. *Ever Since Darwin*. New York: Norton.
- Hamel, Gary, and C. K. Prahalad. 1994. *Competing for the Future*. Cambridge: Harvard Business School Press.
- Hart, Oliver D. 1989. "An Economist's Perspective on the Theory of the Firm," *Columbia Law Review* **89**(7): 1757-1774.
- Hayek, F. A. 1945. "[The Use of Knowledge in Society](#)," *American Economic Review* **35**(4): 519-530.
- Hayek, F. A. 1967. "Kinds of Rationalism," in idem., *Studies in Philosophy, Politics and Economics*. London: Routledge and Kegan Paul.

- Helpman, Elhanan, ed. 1998. *General Purpose Technologies and Economic Growth*. Cambridge, Mass.: MIT Press.
- Helper, Susan, John Paul MacDuffie, and Charles Sabel. 2000. "Pragmatic Collaborations: Advancing Knowledge While Controlling Opportunism," *Industrial and Corporate Change* **9**(3): 443-488.
- Hitt, Lorin M. 1999. "Information Technology and Firm Boundaries: Evidence from Panel Data," *Information Systems Research* **10**: 134-49 (June).
- Hoke, Donald. 1989. "Product Design and Cost Considerations: Clock, Watch, and Typewriter Manufacturing in the 19th Century," *Business and Economic History* **18**: 119-28.
- Hopp, Wallace J., and Mark L. Spearman. 2000. *Factory Physics*. Second Edition. New York: McGraw-Hill.
- Hounshell, David A. 1984. *From the American System to Mass Production, 1800-1932: the Development of Manufacturing Technology in the United States*. Baltimore: Johns Hopkins University Press.
- Hume, David. 1978. *A Treatise on Human Nature*, ed. L. A. Selby-Bigge, Second edition. Oxford: Clarendon Press. (First published 1739-40.)
- Jacobides Michael G. 2005. "Industry Change through Vertical Disintegration: How and Why Markets Emerged in Mortgage Banking," *Academy of Management Journal* **48**(3): 465-498.
- Jaffé, William. 1976. "Jevons, Menger, and Walras De-homogenized," *Economic Inquiry* **14**: 511-24.
- Jequier, François. 1991. "Employment Strategies and Production Structures in the Swiss Watchmaking Industry," in Patrice Higonnet, David Landes, and Henry Rosovsky, eds., *Favorites of Fortune*. Cambridge: Harvard University Press, pp. 322-338.
- Jenkins, Holman W., Jr. 1997. "Ma Bell Would Be So Proud of Her Boys," *The Wall Street Journal*, June 3, p. A23.
- Jensen, Michael C., and William H. Meckling. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics* **3**: 305-360.
- Jevons, William Stanley. 1911. *The Theory of Political Economy*. 4th ed. London: Macmillan.
- Johnston, Louis, and Samuel H. Williamson. 2002. "The Annual Real and Nominal GDP for the United States, 1789-Present." Economic History Services, April 2002, URL: <http://www.eh.net/hmit/gdp/>.
- Joskow, Paul L. 1997. "Restructuring, Competition and Regulatory Reform in the U.S. Electricity Sector," *Journal of Economic Perspectives* **11**(3): 119-138.



- Joskow, Paul L., and Richard Schmalensee. 1983. *Markets for Power: An Analysis of Electric Utility Deregulation*. Cambridge: MIT Press.
- Kench, Brian T. 2000. *Three Essays on "Making" Markets in Electric Power*. Unpublished Ph.D. Dissertation, University of Connecticut.
- Kim, Sukkoo. 2001. "[Markets and Multiunit Firms from an American Historical Perspective](#)," *Advances in Strategic Management* **18**.
- Kirzner, Israel M. 1979. *Perception, Opportunity, and Profit*. Chicago, University of Chicago Press.
- Klein, Benjamin, Robert G. Crawford, and Armen Alchian. 1978. "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," *Journal of Law and Economics* **21**(2): 297-326.
- Klein, Benjamin, and Keith Leffler. 1981. "The Role of Market Forces in Assuring Contractual Performance," *Journal of Political Economy* **89**: 615-641.
- Klein, Burton H. 1977. *Dynamic Economics*. Cambridge: Harvard University Press.
- Knight, Frank H. 1921. [Risk, Uncertainty, and Profit](#). Boston: Houghton-Mifflin.
- Knudsen, Christian. 1995. "The Competence View of the Firm: What Can Modern Economists Learn from Philip Selznick's Sociological Theory of Leadership?" in W. Richard Scott and Søren Christensen, eds., *The Institutional Construction of Organizations*. Thousand Oaks: Sage Publications.
- Kolko, Gabriel. 1963. *The Triumph of Conservatism*. New York: Macmillan.
- Lacey, Marc. 2000. "Fifteen Awarded Highest Civilian Honor," *The New York Times*, August 10, p. A12.
- Lamoreaux, Naomi R.. 1986. "Banks, Kinship, and Economic Development: The New England Case," *Journal of Economic History* **46**(3): 647-667.
- Lamoreaux, Naomi R., Daniel M. G. Raff, and Peter Temin. 2003. "Beyond Markets and Hierarchies: Toward a New Synthesis of American Business History," *American Historical Review* **108**: 404-33 (April).
- Landes, David S. 1983. *Revolution in Time*. Cambridge: the Belknap Press of Harvard University Press.
- Langlois, Richard N. 1984. "[Internal Organization in a Dynamic Context: Some Theoretical Considerations](#)," in M. Jussawalla and H. Ebenfeld, eds., *Communication and Information Economics: New Perspectives*. Amsterdam: North-Holland, pp. 23-49.

Langlois, Richard N. 1986. "Rationality, Institutions, and Explanation," in R. N. Langlois, ed., *Economics as a Process: Essays in the New Institutional Economics*. New York: Cambridge University Press.

Langlois, Richard N. 1988. "Economic Change and the Boundaries of the Firm," *Journal of Institutional and Theoretical Economics* **144**(4): 635-657.

Langlois, Richard N. 1990. "Bounded Rationality and Behavioralism: a Clarification and Critique," *Journal of Institutional and Theoretical Economics* **146**(4): 691-695 (December).

Langlois, Richard N. 1992a. "External Economies and Economic Progress: The Case of the Microcomputer Industry," *Business History Review* **66**(1): 1-50 (Spring).

Langlois, Richard N. 1992b. "[Transaction-cost Economics in Real Time](#)," *Industrial and Corporate Change* **1**(1): 99-127.

Langlois, Richard N. 1994. Book review of *Business Organization and the Myth of the Market Economy* by William Lazonick, *Journal of Economic Behavior and Organization* **23**(2): 244-250 (March).

Langlois, Richard N. 1995. "[Do Firms Plan?](#)" *Constitutional Political Economy* **6**(3): 247-261.

Langlois, Richard N. 1998 "[Rule-following, Expertise, and Rationality: a New Behavioral Economics?](#)" in Kenneth Dennis, ed., *Rationality in Economics: Alternative Perspectives*. Dordrecht: Kluwer Academic Publishers, pp. 57-80.

Langlois, Richard N. 1999a. "[The Coevolution of Technology and Organization in the Transition to the Factory System](#)," in Paul L. Robertson, ed., *Authority and Control in Modern Industry*. London: Routledge, pp. 45-72.

Langlois, Richard N. 1999b. "[Scale, Scope, and the Reuse of Knowledge](#)," in Sheila C. Dow and Peter E. Earl, eds., *Economic Organization and Economic Knowledge: Essays in Honour of Brian J. Loasby*. Aldershot: Edward Elgar, pp. 239-254.

Langlois, Richard N. 2001. "[Knowledge, Consumption, and Endogenous Growth](#)," *Journal of Evolutionary Economics* **11**(1): 77-93 (January).

Langlois, Richard N. 2002a. "[Digital Technology and Economic Growth: the History of Semiconductors and Computers](#)," in Benn Steil, David Victor, and Richard R. Nelson, eds., *Technological Innovation and Economic Performance*. Princeton: Princeton University Press for the Council on Foreign Relations, pp. 265-284.

Langlois, Richard N. 2002b. "[Modularity in Technology and Organization](#)," *Journal of Economic Behavior and Organization* **49**(1): 19-37.

Langlois, Richard N. 2005. "[The Entrepreneurial Theory of the Firm and the Theory of the Entrepreneurial Firm](#)," Working Paper 2005-27, Department of Economics, University of Connecticut. To appear in the *Journal of Management Studies*.

- Langlois, Richard N., and Metin M. Coşgel. 1993. "[Frank Knight on Risk, Uncertainty, and the Firm: A New Interpretation](#)," *Economic Inquiry* **31**: 456-465 (July).
- Langlois, Richard N., and Nicolai J. Foss. 1999. "[Capabilities and Governance: The Rebirth of Production in the Theory of Economic Organisation](#)," *Kyklos* **52**(2): 201-18.
- Langlois, Richard N., and Paul L. Robertson. 1989. "[Explaining Vertical Integration: Lessons from the American Automobile Industry](#)," *Journal of Economic History* **49**(2): 361-375.
- Langlois, Richard N., and Paul L. Robertson. 1992. "[Networks and Innovation in a Modular System: Lessons from the Microcomputer and Stereo Component Industries](#)," *Research Policy* **21**(4): 297-313.
- Langlois, Richard N., and Paul L. Robertson. 1995. [Firms, Markets, and Economic Change: A Dynamic Theory of Business Institutions](#). London: Routledge.
- Langlois, Richard N., and Deborah A. Savage. 2001. "[Standards, Modularity, and Innovation: the Case of Medical Practice](#)," in Raghu Garud and Peter Karnøe, eds., *Path Dependence and Path Creation*. Hillsdale: Lawrence Erlbaum, pp. 149-168.
- Langlois, Richard N., and W. Edward Steinmueller. 1999. "The Evolution of Competitive Advantage in the Worldwide Semiconductor Industry, 1947-1996," in David C. Mowery and Richard R. Nelson, eds., *The Sources of Industrial Leadership*. New York: Cambridge University Press, pp.19-78.
- Lazonick, William. 1991. *Business Organization and the Myth of the Market Economy*. New York: Cambridge University Press.
- Lazonick, William. 2005. "[Evolution of the New Economy Business Model](#)," *Business and Economic History Online* **3**.
- Lazonick, William, and Jonathan West. 1995. "Organizational Integration and Competitive Advantage: Explaining Strategy and Performance in American Industry," *Industrial and Corporate Change* **4**(1): 229-270.
- Lebergott, Stanley. 1984. *The Americans: an Economic Record*. New York: Norton.
- Leijonhufvud, Axel. 1986. "[Capitalism and the Factory System](#)," in R. N. Langlois, ed., *Economics as a Process: Essays in the New Institutional Economics*. New York: Cambridge University Press.
- Leland, Otilie M., and Minnie Dubbs Millbrook. 1966. *Master of Precision: Henry Leland*. Detroit: Wayne State University Press.
- Lenin, Vladimir Ilich. 1992. *The State and Revolution*. London: Penguin. [First published in Russian in 1918.]

- Levenstein, Margaret. 1995. "Mass Production Conquers the Pool: Firm Organization and the Nature of Competition in the Nineteenth Century," *Journal of Economic History* **55**(3): 575-611.
- Levinthal, Daniel A. 1992. "Surviving Schumpeterian Environments," *Industrial and Corporate Change* **1**(3): 427-443.
- Levinthal, Daniel A., and James March. 1993. "The Myopia of Learning," *Strategic Management Journal* **14**: 95-112.
- Libecap, Gary. 1992. "The Rise of the Chicago Packers and the Origins of Meat Inspection and Antitrust," *Economic Inquiry* **30**(2): 242-62 (April).
- Loasby, Brian J. 1991. *Equilibrium and Evolution: An Exploration of Connecting Principles in Economics*. Manchester: Manchester University Press.
- Loasby, Brian J. 1993. Book review of *Business Organization and the Myth of the Market Economy* by William Lazonick, *The Economic Journal* **103**: 247-9 (January).
- Loasby, Brian J. 2001. "Organisations as Interpretative Systems," *Revue d'Économie Industrielle* **97**(4): 17-34.
- Loasby, Brian J. 2004. "[Entrepreneurship, Evolution and the Human Mind](#)," paper presented at the tenth meeting of the International Joseph A. Schumpeter Society, June 9-12, Università Bocconi, Milan.
- McCraw, Thomas K.. 1988. "Introduction: the Intellectual Odyssey of Alfred D. Chandler, Jr.," in Thomas K. McCraw, ed., *The Essential Alfred Chandler: Essays toward a Historical Theory of Big Business*. Cambridge: Harvard Business School Press, pp. 1-21.
- McLean, John, and Robert Haigh. 1954. *The Growth of Integrated Oil Companies*. Boston: Division of Research, Graduate School of Business Administration, Harvard University.
- Maillat, Denis, Bruno Lecoq, Florian Nemeti, and Marc Pfister. 1995. "Technology District and Innovation: The Case of the Swiss Jura Arc," *Regional Studies* **29**(3): 251-63 (June).
- Malone, Thomas W., and Robert J. Laubacher. 1998. "The Dawn of the E-Lance Economy," *Harvard Business Review*, September-October, pp. 145-152.
- Malone, Thomas W., JoAnne Yates, and Robert I. Benjamin. 1987. "Electronic Markets and Electronic Hierarchies," *Communications of the ACM* **30**: 484-97 (June).
- Mandeville, Bernard. 1924. [The Fable of the Bees or Private Vices, Publick Benefits](#). Two volumes. With a Commentary Critical, Historical, and Explanatory by F. B. Kaye. Oxford: Clarendon Press. (First published in 1732.)
- Marglin, Stephen A. 1974. "What Do Bosses Do?" *Review of Radical Political Economy* **6**: 33-60 (Summer).

- Marshall, Alfred. 1961. [\*Principles of Economics\*](#), 9th (variorum) ed., vol. I. London: Macmillan. [First Edition 1890.]
- Marshall, Alfred. 1919. *Industry and Trade*. London: Macmillan.
- Maurer, Martin. 1985. "Technological Retardation. The Decline of the Swiss Watch Industry," *Zeitschrift für Wirtschafts und Sozialwissenschaften* **105**(6): 661-82.
- Metcalf, J. Stanley, and Richard R. Nelson. 2006. "[Technology, Organization, and Institutions in Cardiology: Extending the Scope of 'Activity Analysis'](#)," Paper presented at the American Economic Association Annual Meeting, January 7, Boston.
- Mulligan, James G. 1983. "The Economies of Masses Reserves," *American Economic Review* **73**(4): 725-734 (September).
- Nelson, Richard R. 1977. *The Moon and the Ghetto*. New York: Norton.
- Nelson, Richard R., and Bhaven Sampat. 2001. "Making Sense of Institutions as a Factor Shaping Economic Performance," *Journal of Economic Behavior and Organization* **44**: 31-54.
- Nelson, Richard R., and Sidney G. Winter. 1977. "In Search of Useful Theory of Innovation," *Research Policy* **5**: 36-76.
- Nelson, Richard R., and Sidney G. Winter. 1982. *An Evolutionary Theory of Economic Change*. Cambridge: Harvard University Press.
- North, Douglass C. 1981. *Structure and Change in Economic History*. New York: Norton.
- North, Douglass C. 1990. *Institutions, Institutional Change, and Economic Performance*. New York: Cambridge University Press.
- Noteboom, Bart. 2003. "[Elements of a Cognitive Theory of the Firm](#)," Working Paper, Tilburg University.
- Pagano, Ugo. 2000. "[Public Markets, Private Orderings and Corporate Governance](#)," *International Review of Law and Economics* **20** 453-477.
- Paullin, Charles O. 1932. *Atlas of the Historical Geography of the United States*. Washington: Carnegie Institution and American Geographical Society.
- Penrose, Edith T. 1959. *The Theory of the Growth of the Firm*. Oxford: Basil Blackwell.
- Phillips, Almarin. 1971. *Technology and Market Structure: A Study of the Aircraft Industry*. Lexington, Mass.: D. C. Heath.
- Polanyi, Michael. 1958. *Personal Knowledge*. Chicago: University of Chicago Press.
- Popper, Karl R. 1957. *The Poverty of Historicism*. London: Routledge and Kegan Paul.

- Popper, Karl R 1966. *The Open Society and its Enemies*. Two Volumes. Princeton: Princeton University Press.
- Porter, Glenn, and Harold C. Livesay. 1971. *Merchants and Manufacturers: Studies in the Changing Structure of Nineteenth-Century Marketing*. Baltimore: Johns Hopkins University Press.
- Porter, Michael. 1980. *Competitive Strategy*. New York: The Free Press.
- Prahalad, C. K., and Gary Hamel. 1990. "The Core Competence of the Corporation," *Harvard Business Review*, May-June, pp. 79-91.
- Raff, Daniel M. G., and Peter Temin. 1991. "Business History and Recent Economic Theory: Imperfect Information, Incentives, and the Internal Organization of Firms," in Peter Temin, ed., *Inside the Business Enterprise: Historical Perspectives on the Use of Information*. Chicago: University of Chicago Press.
- Reinstaller, A., and W. Hölzl. 2004. "Complementarity Constraints and Induced Innovation: Some Evidence from the First IT Regime," in J. Foster, and W. Hölzl, eds., *Applied Evolutionary Economics and Complex Systems*. Cheltenham: Edward Elgar, 133-54.
- Richardson, G. B. 1972. "The Organization of Industry," *Economic Journal* **82**: 883-96.
- Richardson, G. B. 1975. "Adam Smith on Competition and Increasing Returns," in A. S. Skinner and T. Wilson, eds., *Essays on Adam Smith*. Oxford: Clarendon Press, pp. 350-360.
- Roberts, Paul Craig, and Matthew Stephenson. 1973. *Marx's Theory of Exchange, Alienation, and Crisis*. Stanford: Hoover Institution.
- Roe, Mark J. 1996. "From Antitrust to Corporate Governance? The Corporation and the Law: 1959-1994," in Carl Kaysen, ed., *The American Corporation Today*. New York : Oxford University Press.
- Rutherford, Malcolm. 2001. "Institutional Economics: Then and Now," *Journal of Economic Perspectives* **15**(3): 173-194 (Summer).
- Ruttan, Vernon W., and Yujiro Hayami. 1984. "Toward a Theory of Induced Institutional Change," *The Journal of Development Studies* **20**(4): 203-223.
- Sabel, Charles F. 1982. *Work and Politics: the Division of Labor in Industry*. New York: Cambridge University Press.
- Sabel, Charles F., and Jonathan Zeitlin. 1985. "Historical Alternatives to Mass Production: Politics, Markets, and Technology in Nineteenth-Century Industrialization," *Past and Present* **108**: 133-76 (August).
- Savage, Deborah A. 1994. "[The Professions in Theory and History: the Case of Pharmacy](#)," *Business and Economic History* **23**(2): 130-160 (Winter).

Schumpeter, Joseph A. 1911. *Theorie der Wirtschaftlichen Entwicklung*. München and Leipzig: Verlag von Duncker & Humblot. First edition.

Schumpeter, Joseph A. 1920/21. "Sozialistische Möglichkeiten von heute," *Archiv für Sozialwissenschaft und Sozialpolitik* **48**: 305-360.

Schumpeter, Joseph A. 1926. *Theorie der Wirtschaftlichen Entwicklung*. München and Leipzig: Verlag von Duncker & Humblot. Second edition.

Schumpeter, Joseph A. 1928. "Unternehmer," in L. Elster, ed., *Handwörterbuch der Staatswissenschaften*, Fourth Edition, Vol. 8. Jena: Gustav Fischer, pp. 476-487. Translated by Markus Becker and Thorbjørn Knudsen and reprinted in *Advances in Austrian Economics* **6**: 235-266 (2003).

Schumpeter, Joseph A. 1934. *The Theory of Economic Development*. Tr. Redvers Opie. Cambridge: Harvard University Press. (New York: Oxford University Press, 1961.) Translation based on Schumpeter (1926).

Schumpeter, Joseph A. 1939. *Business Cycles*. Two volumes. New York: McGraw-Hill.

Schumpeter, Joseph A. 1947. "The Creative Response in Economic History," *Journal of Economic History* **7**(2): 149-159.

Schumpeter, Joseph A. 1950. *Capitalism, Socialism, and Democracy*. New York: Harper and Brothers, third edition [Harper Colophon edition, 1976].

Schumpeter, Joseph A. 1951. "Economic Theory and Entrepreneurial History," in R. V. Clemence, ed., *Essays on Economic Topics of Joseph Schumpeter*. Port Washington, NY: Kennikat Press.

Schumpeter, Joseph A. 1954. *History of Economic Analysis*. New York: Oxford University Press.

Schumpeter, Joseph A. 1982. "The 'Crisis' in Economics – Fifty Years Ago," *Journal of Economic Literature* **20**(2): 1049-59. (Manuscript thought to have been written in 1931.)

Scranton, Philip. 1997. *Endless Novelty: Specialty Production and American Industrialization, 1865-1925*. Princeton: Princeton University Press.

Shackle, G. L. S. 1972. *Epistemics and Economics*. Cambridge: Cambridge University Press.

Shane, Scott, and S. Venkataraman. 2000. "The Promise of Entrepreneurship as a Field of Research," *Academy of Management Review* **25**(1): 217-226.

Shleifer, Andrei, and Robert W. Vishny. 1991. "Takeovers in the '60s and '80s: Evidence and Implications," *Strategic Management Journal* **12**: 51-59.

Silver, Morris. 1984. *Enterprise and the Scope of the Firm*. London: Martin Robertson.

Simon, Herbert A. 1960. "The Corporation: Will It Be Managed by Machines?" in M. L. Anshen and G. L. Bach, eds, *Management and the Corporations, 1985*. New York: McGraw-Hill, pp. 17–55.

Simon, Herbert A. 1962. "The Architecture of Complexity," *Proceedings of the American Philosophical Society* **106**: 467-482, repinted in *idem, The Sciences of the Artificial*, 2nd ed. Cambridge: MIT Press, 1981.

Smith, Adam. 1976. *An Enquiry into the Nature and Causes of the Wealth of Nations*. Glasgow edition. Oxford: Clarendon Press. [First published in 1776.]

Solow, Robert. 1957. "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics* **39**(3): 312-20.

Stinchcombe, Arthur L. 1990. *Information and Organizations*. Berkeley: University of California Press.

Stigler, George J. 1951. "The Division of Labor Is Limited by the Extent of the Market," *Journal of Political Economy* **59**(3): 185-193.

Stigler, George J. 1971. "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science* **2**(1): 3-21.

Streissler, Erich. 1972. "To What Extent Was the Austrian School Marginalist?" *History of Political Economy* **4**(2): 426-441.

Sturgeon, Timothy J. 2002. "[Modular Production Networks. A New American Model of Industrial Organization](#)," *Industrial and Corporate Change* **11**(3): 451-496.

Supple, Barry. 1991. "Scale and Scope: Alfred Chandler and the Dynamics of Industrial Capitalism," *Economic History Review* **44**: 500-514.

Sutton, John. 1991. *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration*. Cambridge: MIT Press.

Swedberg, Richard. 1991. *Schumpeter: A Biography*. Princeton: Princeton University Press.

Taylor, William. 1993. "Message and Muscle: an Interview with Swatch Titan Nicolas Hayek," *Harvard Business Review* **71**: 98-103 (March/April).

Tedeschi, Bob. 2000. "A Nobel Prize-winning Idea, Conceived in the 30's, is a Guide for Net Business," *The New York Times*, October 2, p. C12.

Teece, David J. 1980. "Economies of Scope and the Scope of the Enterprise," *Journal of Economic Behavior and Organization* **1**(3): 223-247.

Teece, David J. 1982. "Towards an Economic Theory of the Multiproduct Firm," *Journal of Economic Behavior and Organization* **3**(1): 39-63.



- Teece, David J. 1986. "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing, and Public Policy," *Research Policy* **15**: 285-305.
- Teece, David J., Gary Pisano, and Amy Shuen. 1997. "Dynamic Capabilities and Strategic Management," *Strategic Management Journal* **18**(7): 509-533 (August).
- Temin, Peter. 1980. "Modes of Behavior," *Journal of Economic Behavior and Organization* **1**(2): 175-195.
- Temin, Peter, with Louis Galambos. 1987. *The Fall of the Bell System*. New York: Cambridge University Press.
- Thompson, James D. 1967. *Organizations in Action*. New York: McGraw-Hill.
- Tushman, Michael L., and Philip Anderson. 1986. "Technological Discontinuities and Organizational Environments," *Administrative Science Quarterly* **31**: 439-65.
- Vanberg, Viktor. 1992. "Organizations as Constitutional Systems," *Constitutional Political Economy* **3**(2): 223-253 (Summer).
- Varian, Hal. 2002. "A New Economy with no New Economics," *The New York Times*, January 17, online edition
- Veblen, Thorstein. 1921. *The Engineers and the Price System*. New York: Viking.
- Vietor, Richard H. K. 1994. *Contrived Competition*. Cambridge: Harvard University Press.
- Weber, Max. 1947. *The Theory of Social and Economic Organization*. Trans. A. M. Henderson and Talcott Parsons. Ed. Talcott Parsons. New York: Oxford University Press.
- Wernerfelt, Birger. 1984. "A Resource-based View of the Firm," *Strategic Management Journal* **5**: 171-180.
- Williamson, Jeffrey G. 1974. *Late Nineteenth Century American Development: A General Equilibrium History*. New York: Cambridge University Press.
- Williamson, Oliver E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: The Free Press.
- Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism*. New York: The Free Press.
- Winter, Sidney G. 1988. "On Coase, Competence, and the Corporation," *Journal of Law, Economics, and Organization* **4**(1): 163-180 (Spring).
- Witt, Ulrich. 1998. "Imagination and Leadership: The Neglected Dimension of an Evolutionary Theory of the Firm," *Journal of Economic Behavior and Organization* **35**: 161-177.
- Yates, JoAnne. 1989. *Control through Communication: the Rise of System in American Manufacture*. Baltimore: Johns Hopkins University Press.

Yates, JoAnne. 2000. "Business Use of Information and Technology during the Industrial Age," in Alfred D. Chandler, Jr. and James W. Cortada, eds., *A Nation Transformed by Information: How Information Has Shaped the United States from Colonial Times to the Present*. New York: Oxford University Press, pp. 107-135.

Young, Allyn A. 1928. "Increasing Returns and Economic Progress," *The Economic Journal* **38**: 527-542.

Zehnder, Dominik E. D. 1994. "Nicolas G. Hayek," Harvard Business School Case 9-495-05.