

# World of Possibilities

## Flexibility and Mass Production in Western Industrialization

*Edited by*

Charles F. Sabel

*Columbia University School of Law*

and

Jonathan Zeitlin

*University of Wisconsin-Madison*

MAISON DES SCIENCES DE L'HOMME



**CAMBRIDGE**  
UNIVERSITY PRESS

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE  
The Pitt Building, Trumpington Street, Cambridge, United Kingdom

CAMBRIDGE UNIVERSITY PRESS

The Edinburgh Building, Cambridge CB2 2RU, UK  
40 West 20th Street, New York NY 10011-4211, USA  
477 Williamstown Road, Port Melbourne, VIC 3207, Australia  
Ruiz de Alarcón 13, 28014 Madrid, Spain  
Dock House, The Waterfront, Cape Town 8001, South Africa

<http://www.cambridge.org>

© Cambridge University Press 1997

This book is in copyright. Subject to statutory exception  
and to the provisions of relevant collective licensing agreements,  
no reproduction of any part may take place without  
the written permission of Cambridge University Press.

First published 1997

First paperback edition 2002

*Typeface* Plantin 9.5/11.5 pt.

*A catalogue record for this book is available from the British Library*

*Library of Congress Cataloguing in Publication data*

World of possibilities: flexibility and mass production in western industrialization  
/ edited by Charles F. Sabel and Jonathan Zeitlin.

p. cm. – (Studies in modern capitalism = Etudes sur le capitalisme  
moderne)

Papers from an international seminar on “Historical alternatives to mass  
production.”

ISBN 0 521 49555 5

1. Industrialization – History – 19th century – Congresses.

2. Economic history – 1750–1918 – Congresses.

I. Sabel, Charles F. II. Zeitlin, Jonathan.

III. Maison des sciences de l’homme (Paris, France)

IV. Series: Studies in modern capitalism.

HC53.W63 1997

338.09–dc20 96-13016 CIP

ISBN 0 521 49555 5 hardback

ISBN 2 7351 0751 5 (hardback France only)

ISBN 0 521 89443 3 paperback

# Contents

---

<i>List of contributors</i>	page ix
<i>Acknowledgments</i>	x

Stories, strategies, structures: rethinking historical alternatives to mass production	1
CHARLES F. SABEL AND JONATHAN ZEITLIN	

## **Part I The modernity of tradition**

1. Fashion as flexible production: the strategies of the Lyons silk merchants in the eighteenth century	37
CARLO PONI	
2. The fate of collective manufactures in the industrial world: the silk industries of Lyons and London, 1800–1850	75
ALAIN COTTEREAU	
3. The rise and decline of flexible production: the cutlery industry of Solingen since the eighteenth century	153
RUDOLF BOCH	
4. Manufacturing flexibility in nineteenth-century Switzerland: social and institutional foundations of decline and revival in calico-printing and watchmaking	188
BEATRICE VEYRASSAT	

## **Part II The battle of the systems**

5. Between flexibility and mass production: strategic ambiguity and selective adaptation in the British engineering industry, 1830–1914	241
JONATHAN ZEITLIN	
6. The lost paradigm: an Italian metalworking empire between competing models of production, 1900–1920	273
ALAIN DEWERPE	

7.	“Have a heart for the manufacturers!”: production, distribution and the decline of American textile manufacturing PHILIP SCRANTON	310
8.	The small-holder economy in Denmark: the exception as variation PEER HULL KRISTENSEN and CHARLES SABEL	344
 <b>PART III The resurgence of flexible production</b>		
9.	In search of flexibility: the Bologna metalworking industry, 1900–1992 VITTORIO CAPECCHI	381
10.	Local industry and actors’ strategies: from combs to plastics in Oyonnax JEAN SAGLIO	419
11.	Producing producers: shippers, shipyards and the cooperative infrastructure of the Norwegian maritime complex since 1850 HÅKON WITH ANDERSEN	461
Index		501

# Stories, strategies, structures: rethinking historical alternatives to mass production

---

*Charles F. Sabel and Jonathan Zeitlin*

This book grows out of an effort to rethink the history of industry and the writing of history more generally in the light of the vast transformation of the advanced economies that began nearly twenty years ago and may continue for at least as long into the future. Its proximate cause was a Parisian seminar in which economic historians and sociologists, predominantly from Western Europe, responded in studies of their own to our earlier work on artisanal, flexible alternatives to mass production,<sup>1</sup> and we responded in many joint discussions and now in this Introduction to them.

There is nothing novel in such an undertaking, for the most common of historical commonplaces is that every epoch rewrites history according to its own preoccupations. Yet predictable as they are, such efforts often produce results that disconcert by calling into question connections to the past that were among the few fixed points left in a turbulent age.

The essays in this volume may well disconcert in a narrower intellectual sense as well. Most current economic history is meant to show that methods and models for understanding the economy in the present can illuminate the rationality of previously obscure realms of business activity in the past. But our aim is to show that the strategic reflections and deliberate institutional innovations of nineteenth- and early twentieth-century economies are no less instructive than any analysis based on current theory. The participants in the seminar that gave rise to this volume are united by the conviction that these historical economies, be they composed of large firms or small, must be taken figuratively as worthy interlocutors, not, at best, as bright natives who have anticipated one or another result of modern economics and organizational theory. Indeed, because of certain affinities between our age and the formative period of mechanization, it is arguable that we have as much to learn from such a hypothetical exchange as they.

Two experiences, we believe, characterize the economic life of our age and distinguish it from the immediately preceding history that formed the horizon

<sup>1</sup> See Charles F. Sabel and Jonathan Zeitlin. "Historical Alternatives to Mass Production: Politics, Markets and Technology in Nineteenth-Century Industrialization," *Past and Present*, 108 (August 1985), 133–176.

of our deepest expectations. The first is the sense of fragility, and especially of institutional fragility as a continuing, perhaps permanent feature of economic life. It is not so much the idea of progress itself which is at stake here. Like it or not, it is hard to escape the conclusion that our entire economic life is being continually transformed by the introduction of new technologies and organizational forms; and in that minimal sense it is indubitably progressing. Rather the sense of fragility goes to the once commonsensical idea that progress would lead to the gradual consolidation of particular forms of economic organization, and hence to an ever more certain sense of how best to deploy technology, allocate labor and capital, and link supply of particular products to demand. Today, on the contrary, it is commonsensical to believe that the way many of these things are done depends on constantly shifting background conditions whose almost insensible mutation can produce abrupt redefinitions of the appropriate way to organize economic activity.<sup>2</sup> For the economic agents themselves, this perception is expressed in the resigned and monitory truism that nothing is so constant as change itself.<sup>3</sup> For historians, as well as for other social scientists, the study of the economy has become the study of adjustment to ever changing contexts: the principles which explain at once the stability and vulnerability to change of these contexts, and the turmoil characteristic of the transition from one to the next.<sup>4</sup>

The second experience is one of the recombining and interpenetration of different forms of economic organization: the rigid and the flexible, the putatively archaic and the certifiably modern, the hierarchical and the market-conforming, the trusting and the mistrustful. During much of the post-war period, the self-conception and the strategic choices of the economic actors in the advanced countries were firmly rooted in the belief that these distinctions meant something. Indeed, it was precisely by drawing these distinctions that they and the economists, historians and sociologists closest to them came to define their identity in the first place and to establish a vision of historical progress in which they were the heirs and culmination of all that had gone before.<sup>5</sup> Today these

<sup>2</sup> For one of many statements of this perspective, see Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York: Basic Books, 1984).

<sup>3</sup> See for example Tom Peters, *Thriving on Chaos: Handbook for a Management Revolution* (New York: Knopf, 1987); and Rosabeth Moss Kanter, *When Giants Learn to Dance* (New York: Simon and Schuster, 1989).

<sup>4</sup> For examples drawn respectively from the sociology of organizations, accounting and economic history, see Neil Fligstein, *The Transformation of Corporate Control* (Cambridge, MA: Harvard University Press, 1990); H. Thomas Johnson and Robert S. Kaplan, *Relevance Lost: The Rise and Fall of Management Accounting* (Boston: Harvard Business School Press, 1987); and Edward H. Lorenz, *Economic Decline in Britain: The Shipbuilding Industry, 1890–1970* (Oxford: Clarendon Press, 1991).

<sup>5</sup> Important statements of this view include Clark Kerr, John T. Dunlop, Frederick H. Harbison, and Charles Meyer, *Industrialism and Industrial Man* (Cambridge MA: Harvard University Press, 1960); Walt W. Rostow, *The Stages of Economic Growth: A Non-Communist Manifesto* (Cambridge: Cambridge University Press, 1960); Daniel Lerner, *The Passing of Traditional Society* (Glencoe IL: The Free Press, 1958); and Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge MA: Harvard University Press, 1977).

distinctions, to the extent that they are honored at all, are honored in the breach. It is not that the economic actors have set out deliberately to destroy old certitudes and transgress established boundaries, but suddenly the repertoire of economic forms deemed appropriate to current conditions contains types such as the small firm which twenty years ago were viewed as close to extinction and combinations of types – such as the small contractor collaborating as an equal with a much larger customer in the design of a new product – which were quite literally unthinkable. It is as though the prehistoric and imaginary creatures in the industrial bestiary had suddenly come to life.

The central theme of this book is that the experience of fragility and mutability which seemed so novel and disorienting today has been, in fact, the definitive experience of the economic actors in many sectors, countries and epochs in the history of industrial capitalism. Precisely because they have been aware of the complex dependence of every form of economic organization on multiple and shifting background conditions, they have constantly experimented with institutional designs that until recently would have been judged economic solecisms. For the same reasons, they have rarely interpreted economic and technological progress as continual and ineluctable progression towards a single set of practices that in their self-perfection would ultimately pass into a sphere of transhistorical permanency. But this double perception of mutability and fragility, we will argue further, has not led them to exalt catch-as-catch-can muddling through as the organizing principle of reflection and action. What we find instead is an extraordinarily judicious, well-informed and continuing debate within firms, and between them and public authorities, as to the appropriate responses to an economy whose future is uncertain, but whose boundary conditions at least in the middle term are taken to be clear. To anticipate, where many observers in the post-war period saw the economy as steadily increasing in efficiency through the ever more specialized use of resources, and therefore paying an acceptable price in increased rigidity for previously unimaginable increases in well-being, throughout most of the history of industrial capitalism, and again today, the economic actors have tried with considerable success to increase efficiency without jeopardizing and indeed sometimes even increasing flexibility.

To reconnect this experience of the present to a new apprehension of the past is a three-part undertaking. The first step (part I) is to give an analytically disciplined account of the economic actors' sense of the fragility of their world, and the implications of this experience for their strategic choices. Our purpose here is to show that most firms in nineteenth- and early twentieth-century Europe and the United States, neither mired in tradition nor blinded by the prospect of a radiant future, carefully weighed the choices between mass production and what we would now call flexible specialization. Where possible, they developed sophisticated hedges for reducing their risks by avoiding a definitive choice in favor of either alternative. Where choice was obligatory, they hedged again by anticipating in the design of one organization the need to reconstruct it for alternative purposes. Understanding how the actors could engage in this kind of strategic reflection and how their choices influenced the

structure of the economy will require us to rethink the place of the firm in economic history. It will also shed light on a wide range of organizational forms which have either escaped historians' attention or been dismissed as cases of stunted growth, failed transitions or institutional degeneration.

The second step (part II) is to look for some institutional regularities that underpin the frenzied recombination of economic forms both today and in the industrial past. As firms hedge against volatility by adopting new organizational forms, we shall see, they encounter anew problems of economic governance – especially, how to create and police trust without by those very efforts destroying it – that were familiar to their nineteenth-century counterparts. Then as now, the favored solution to these problems was an apparently syncretic combination of organizational features that moots conventional distinctions between the traditional and the modern and between the public or collective and the private. By extending our discussion of hedging responses and the agents' relation to their context upon which these responses depend, we aim here as well to discover the compositional logic which renders orderly and meaningful an otherwise ramshackle assembly of monitoring systems, collective bargaining arrangements and public provision of services which firms normally provide themselves.

Finally, by way of summary and elaboration, we want to indicate how this new way of speaking about economic history changes substantively the way the history of mechanization is told. Most accounts of that history, our own included, have emphasized epochal change. Typically the emphasis has fallen on a transition from a world of decentralized handicraft production to a world of concentrated factories in which specialized machines turn out standard products.<sup>6</sup> Our earlier account placed the emphasis on a seesaw battle between two forms of mechanization, one familiar from the standard accounts and the other employing flexible machines to manufacture a much more diversified range of products. The lesson we draw from this seminar is that the epochs are less epochal and the choices less stark than it once appeared. In the light of the actors' sense of their own vulnerability to a changing environment and their capacity to hedge against that vulnerability by developing complex hybrid forms, the fauna of economic life appear at once more differentiated and more restricted in their range of variation than we previously supposed.

Because firms are good at hedging their organizational bets about future changes in the environment, and because these hedges often require the revitalization of earlier features of economic organization, there are fewer outward manifestations of revolutions or breaks in economic history than analysis of the actors' own perceptions of changing standards of efficiency and their institutional concomitants suggests. Precisely because the agents know how radically views of productive efficiency can change, we found, they tended to build organizations which minimized the disruption of acting on their new

<sup>6</sup> The classic synthesis of this view of the history of mechanization is David S. Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge: Cambridge University Press, 1972).



convictions. Seen this way, each period of economic history anticipates many of the strategies of its successors and ultimately comes to pursue them with means that it has inherited from its predecessors. Hence the very idea of distinguishing radically different epochs of development according to their dominant economic strategy becomes as debatable as the idea of trying unambiguously to distinguish firms within any one period according to their differing strategic orientations. The notions of contrasting strategies and distinct practices do, as we shall see, continue to serve an important analytic role: it is the actors' perception of the advantages and disadvantages of polar possibilities which leads them to hedge their strategies in the first place; and hence it is the appreciation of the full range of possible diversity which provokes the search for ever more various ways of avoiding risky bets on the extreme positions.

To avoid confusion among those readers who, like ourselves, are not fully habituated to the postmodern notion that all texts, being commentaries on preceding ones, are in the end produced by them, and that given such inter-textuality the distinctions between reading and writing or commenting and composing, or even different texts, become negligible, we need to clarify at the outset who we are. Henceforth, as authors and editors, we will speak for ourselves of what we learned in contributing to this volume. As we would like to believe that what we learned is what the other contributors were teaching us and themselves, we will associate our conclusions with theirs. But being ourselves sceptical of the notion that in conversation all ideas are one, we invite scepticism on your part as well, and advise even more cautious comparison than usual of our introductory readings and the essays that follow.

### **Narratives, models and strategies**

Economic agents, we found again and again in the course of the seminar's work, do not maximize so much as they strategize. By this cryptic locution, we mean that they are at least as much concerned with determining, in all senses, the context they are in as they are in pursuing what they take to be their advantage within any context. Self-interested adjustment to conditions taken as given thus proceeds paradoxically yet as a matter of course together with efforts to find or create a more advantageous set of constraints. In short, the decisions of the agents in the cases under consideration here very often disregard Schumpeter's classic distinction between adaptive reactions which accept given constraints as binding and creative ones which do not.<sup>7</sup> This section argues that dichotomies of this sort, whatever their utility in extreme cases, make it difficult to grasp the calculating deliberations of economic agents in a wide range of circumstances. They consequently obstruct interpretation of the organizational designs which

<sup>7</sup> For this distinction see Joseph Schumpeter, *The Theory of Economic Development* (Oxford: Oxford University Press, 1961), especially p. 60; and the discussion of Schumpeter's ideas in William Lazonick, "Industrial Organization and Technology Change: The Decline of the British Cotton Industry," *Business History Review*, 57, 2 (1983), 491-516.

result from their considerations. To formulate a more adequate view, we begin by criticizing the rigid distinction between maximizing actor and constraining context which underlies this and related dichotomies that ramify throughout most of economic history. Our aim is to clear the way for a recharacterization of the actors that takes account both of their capacity for self-reflection and the resulting interplay between the constitution of their interests and identity on the one hand and the context within which they operate on the other.

Economic historians are fond of saying that their work enriches the understanding of the firm as a maximizing agent presented in standard economic theory. Most such claims are wishful thinking, as some recent work in economic history itself acknowledges.<sup>8</sup> As a rule, in fact, economic history merely illustrates how firms or groups of firms take advantage or not of the opportunities for profit presented by particular circumstances. The underlying notion is that one set of circumstances, call them accidental or historical as you will, offer these opportunities and a second, perhaps distantly related set, determine the use to which they are put. Contexts constrain, actors react; and economic history traces the circumstances under which actors come to appreciate and act in accordance with the logic of their situation.

There are, to be sure, important variations on this theme. One trope is simply to demonstrate that however ruinous the outcome, profit-seeking individuals or firms subject to the relevant constraints would have been ill-advised to do otherwise than the historical actors in fact did. The point of the analysis is to show precisely that economic actors are rational in the sense of pursuing their best alternatives however impoverished or disastrous these may be. Like the lawyers who cry *fiat justitia, pereat mundus*, economic historians of this persuasion seem to find it almost ennobling that real persons could pursue the logic of short-term maximization even at the cost of their long-term decline.<sup>9</sup>

A second trope of analysis, often favored by those scornful of the first, looks beyond instances of adjustment to local circumstance to those rarer but more spectacular instances where firms or individuals extend the productive powers of nations and civilizations by grasping and turning to their immediate benefit some essential feature of an alleged logic of material progress. Accounts of this sort have a long and familiar pedigree extending back to such founders of classical political economy as Smith and Marx. Recast as business history, post-war versions of this story conflated the discovery by the large American corporation of special-purpose machines and the administrative structures required to manage high-throughput mass-distribution manufacturing with the perfection of human

<sup>8</sup> See for example Peter Temin (ed.), *Inside the Business Enterprise: Historical Perspectives on the Use of Information* (Chicago: University of Chicago Press, 1991).

<sup>9</sup> The most extreme statements of this position are associated with the attempt to rehabilitate the rationality of Victorian entrepreneurs whose attachment to gentlemanly values had been held to have inhibited their pursuit of business advantage: for an overview of this research, see Donald N. McCloskey and Lars G. Sandberg, "From Damnation to Redemption: Judgments on the Late Victorian Entrepreneur," in Donald N. McCloskey, *Enterprise and Trade in Victorian Britain* (London: Allen and Unwin, 1981), pp. 55–72.

productive powers.<sup>10</sup> More recent versions give pride of place to the large Japanese corporations, whose success in besting the American competition is attributed to the resolution of the classical conflict between gains in efficiency and losses in flexibility arising from specialization of resources by soliciting the participation of shop-floor workers in the continuous adjustment of the firm to changing circumstances.<sup>11</sup> But in all their variants, these accounts bear the marks of Greek tragedy, for they bind the heroic exercise of inventive freedom to a chastening, even humiliating recognition of the economic constraints imposed by the historical logic of material progress. The demiurge becomes in the end a humble problem-solver, a common enough problem as we will see later.<sup>12</sup>

Note furthermore that both managers and entrepreneurs can be the protagonists of economic histories about adjustment to local circumstance as well as those that recount the alleged *telos* of mechanization. In some accounts of the failure of Lancashire cotton firms to adopt new spinning and weaving technologies, it is individual entrepreneurs who are caught in the trap of short-term maximization within given constraints.<sup>13</sup> In some accounts of the failure of American corporations to avail themselves of the innovations exploited by the Japanese, on the other hand, it is the incrementalism of professional managers bound by accounting rules of their own making who are held responsible.<sup>14</sup> Alternatively, in many accounts of the nineteenth-century rise of these same corporations, such managers acting as a collective body are credited with the decisive administrative and technical breakthroughs.<sup>15</sup> But in several of the most recent writings on the creation of electric utilities, conversely, the shape of the industry as a whole is determined by the particular interventions and alliances of individual manager-

<sup>10</sup> See Alfred G. Chandler, Jr., *Strategy and Structure: Chapters in the History of American Enterprise* (Cambridge MA: MIT Press, 1962); *The Visible Hand: Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge MA: Harvard University Press, 1990).

<sup>11</sup> See James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine that Changed the World* (New York: Rawson Associates, 1990).

<sup>12</sup> The clearest example of a writer who appreciates these tragic possibilities is David Landes, who believes firmly that economic and technological progress culminates in something like the modern American corporation, and yet writes almost exclusively about the ultimately futile struggles of entrepreneurs and family firms to create a world in which domesticity and industry are united under their sovereign control. See particularly his "Religion and Enterprise: The Case of the French Textile Industry," in Edward G. Carter II, Robert Forster and John N. Moody (eds.), *Enterprise and Entrepreneurs in Nineteenth- and Twentieth-Century France* (Baltimore: Johns Hopkins University Press, 1976), pp. 41–86; *Revolution in Time: Clocks and the Making of the Modern World* (Cambridge MA: Harvard University Press, 1983); and "Small is Beautiful. Small is Beautiful?," in Fondazione ASSI di Storia e Studi sull'Impresa-Instituto per la Storia dell'Umbria Contemporanea, *Piccola e grande impresa: un problema storico* (Milan: Franco Angeli, 1987), pp. 15–34.

<sup>13</sup> See William Lazonick, "The Cotton Industry," in Bernard Elbaum and William Lazonick (eds.), *The Decline of the British Economy* (Oxford: Clarendon Press, 1986), pp. 18–50; and *Competitive Advantage on the Shop Floor* (Cambridge MA: Harvard University Press, 1990), chs. 3–5; and Lazonick and William Mass, "The British Cotton Industry and International Comparative Advantage: The State of the Debates," *Business History*, 32, 4 (1990), 9–65.

<sup>14</sup> See Johnson and Kaplan, *Relevance Lost*.

<sup>15</sup> The classic statement of this view is Chandler, *The Visible Hand*.

entrepreneurs able to mobilize through their social and business connections the resources needed to impose the one solution among the many possible outcomes which they personally favored.<sup>16</sup> Other recent writing on the same theme, however, adopts a point of view much less tied to classical presuppositions and closer to our own; and we will return to it later.

In important ways, and despite efforts to the contrary, our own earlier work on historical alternatives to mass production remains ensnared in the rigid distinction between context and actor that we are criticizing. A central theme of that work was the claim that mechanization could have proceeded down a track characterized by the use of flexible equipment operated by skilled workers to produce specialized goods instead of down the path of mass production of standardized goods which in the event proved victorious. The argument turned on the demonstration that in those regions where skilled labor was ample and tied by guild institutions or agricultural inheritance patterns to a particular locale, where demand remained differentiated because of the continuing influence of aristocratic tastes or the aggregation through extensive trading networks of the diverse wants of far-flung customers, mechanization accommodated itself to the need for flexibility. Where, on the other hand, as in the United States, immigrant masses provided both an abundant supply of unskilled labor and an extensive market for standardized consumption goods, mass production won out; and having thus established its dominance in a key economic zone, the argument continued, manufacturers elsewhere were moved by competition or the fear of it to emulate American success rather than press forward with their own promising but as yet unproven alternative. The whole process was compared to the neo-Darwinian idea of a branching point in which closely-related species arising in different environments come into competition and victory in the struggle depends not on the inherent superiority of one or the other but rather on the accidental advantages which they respectively draw from the historical conditions of the contest.<sup>17</sup> Alternatively the process was compared to the shift from

<sup>16</sup> These arguments come in two variants, both of which assume that technology is more malleable and hence less determinative of outcomes than in the view of classical political economy. In the first variant, associated with the work of McGuire, Granovetter and Schwartz, the outcome reflects the balance of power between rival networks that link business associates to sources of capital, whereas in the second variant, associated with that of Thomas Hughes, the outcomes reflect the particular relation between political authorities and system-building manager-entrepreneurs. Both variants aim to demonstrate that purely economic accounts cannot explain the outcome rather than to criticize the idea that the actors' decisions are completely determined by their context. For the first variant, see Patrick McGuire, Mark Granovetter, and Michael Schwartz, *The Social Construction of Industry: Human Agency in the Development, Diffusion, and Institutionalization of the Electric Utility Industry* (Cambridge: Cambridge University Press, forthcoming); for the second, see Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983).

<sup>17</sup> The neo-Darwinian analogy was taken from the work of Stephen J. Gould: see his "Bushes and Ladders in Human Evolution," in *Ever Since Darwin* (New York: Norton, 1977), pp. 56-63. Evolutionary analogies are frequently applied in modeling technological development: see Richard R. Nelson and Sidney G. Winter, *An Evolutionary Theory of Economic Change* (Cambridge MA: Harvard University Press, 1982).

one paradigm, or set of organizing ideas about technology, to another, where the outcome depended in part on the sequence of breakthroughs in the competing schools and in part on the alignment of interests in the community of those forced to make choices among competing technologies.<sup>18</sup>

Read this way, as many readers plainly did, our story can be understood as an extension of the standard accounts, and even as a step towards reconciling the localist and teleological variants. Instead of one logic of development, we envisioned two mirror-image outcomes and a whole class of mixed cases between them. Accordingly, we attempted to show that mass production was a special case of a more general set of possible outcomes; but the same argument implied that some local responses to particular environments represented viable alternatives to historically dominant forms even if they were later marginalized by the course of events. Thus the distinction between breakthroughs that advanced productive capacities along the trajectory traced by the logic of economic development and profit-maximizing adjustments which imperiled the actors' future by serving their immediate interests gave way to a world in which a distinction between "creative" and "adaptive" responses, if meaningful at all, could only be determined in long historical retrospect. No matter that we also argued that consumption patterns and producers' expectations about the technologically possible and the commercially feasible, all of which helped shape the choice of mechanization strategy, were themselves the outcome of complex political struggles. Our extensions and reconciliations nonetheless played so much on conventional ideas of the relation between actors and environments that they could not help but reinforce them.

Nothing that we have learned in this seminar leads us to believe that technology or the economy is less malleable than we originally thought. What we have learned is that the economic agents are more continuously and subtly aware of that malleability than ever we imagined. In order to do justice to this awareness and its consequences for industrial organization, it is necessary to attack directly the distinction between actor and context and the neo-Darwinian analogies as they appeared in our rough-hewn presentation. Three overlapping criticisms of the evolutionary analogy have been adumbrated in current social-scientific debate, and it is useful to underscore them here by way of introduction to a new characterization of economic agency consistent with the seminar's findings.

Firstly, in evolutionary models strictly speaking, adaptation occurs through the extinction of populations unfit for their environment and the expansion of populations that are. In human societies and in economies more specifically, adaptation occurs through the reconstruction of existing institutions to meet new demands rather than the wholesale replacement of one set of institutions by another.<sup>19</sup> It is plain that whole societies very rarely die out whereas it is equally

<sup>18</sup> The reference here was to Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd edn (Chicago: University of Chicago Press, 1970); for the application of this notion to technological development, see Giovanni Dosi, "Technological Paradigms and Technological Trajectories," *Research Policy*, 11 (1982), 147–162.

<sup>19</sup> See Phillippe van Parijs, *Evolutionary Explanation in the Social Sciences* (Totowa NJ: Rowman and Littlefield, 1981).

obvious that the institutions of which any society is composed are transformed to suit new purposes radically and repeatedly in historical time. It may appear that economic adjustment, by contrast, proceeds more often by extinction than by reconstruction, because the rates of natality and mortality of firms in modern economies are high enough to suggest the possibility of rapid regeneration by this means. But as the experience of diverse economies in the early phases of mechanization, during the rise of mass production in the late nineteenth century, and in the current period of restructuring shows, the most profound changes in the organization of production also require extensive redefinition of social hierarchies, patterns of education and socialization, and the boundaries of the household. Adjustment through natality and mortality, in other words, carries the burden of change when the changes are small. Adaptation of existing institutions does the real work when there is real work to be done.<sup>20</sup>

Secondly, adjustment proceeds in society and the economy by adaptation rather than natural selection because humans are sentient and more particularly strategic in the sense that using their wits they can find indirect means to their ends. It may seem superfluous to raise this point because it is hard to see how any account of human activity as maximizing behavior of the sort typical of economic history could not at least tacitly assume that the agents are aware enough of the logic of their situation to act purposefully in response to it. But this idea of sentience and strategy as the virtually automatic response to an unambiguous situation strips self-consciousness of one of its defining features: the ability to consider alternatives, meaning alternative responses to the same situation and speculations about the relative possibilities of creating alternative situations.<sup>21</sup> Unless this were so, it would be hard to understand how individuals acting in society could reconstruct the formative institutions upon which economic activity depends as they evidently do from time to desperate time. Another way to make this point is to say that economic agents make their environment even as they are formed by it, whereas in most accounts of natural selection organisms adapt or otherwise to environments which are given by nature. In a moment we will see that the ability to imagine these possibilities is constitutive of the economic agents' identity and indispensable to explaining the hedging strategies by which they both adapt to change and reduce the need for adaptation.

Thirdly, social and economic adaptation proceeds more by the recombination and re-elaboration of existing institutions than by the introduction of wholly novel features as suggested in the cruder formulations of natural selection for more competitive mutations.<sup>22</sup> In some ways, this point mirrors the preceding

<sup>20</sup> See for example the reconstruction of Japanese society under the Meiji as a response to the threat of Western economic and military superiority in Eleanor Westney, *Imitation and Innovation: The Transfer of Western Organization Patterns to Meiji Japan* (Cambridge MA: Harvard University Press, 1987).

<sup>21</sup> See Pierre Bourdieu, *Outline of a Theory of Practice*, trans. Richard Nice (Cambridge: Cambridge University Press, 1977).

<sup>22</sup> For the importance of recombination and re-elaboration of ancestral features in evolutionary biology, see Stephen J. Gould, *Ontogeny and Phylogeny* (Cambridge MA: Harvard University Press, 1977).