



Chandler in a Larger Frame: Markets, Transaction Costs, and Organizational Form in History

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In 1977, when Alfred Chandler's path-breaking book *The Visible Hand* appeared, the large vertically integrated "Chandlerian" corporation dominated the organizational landscape. A quarter-century later, however, the Chandlerian firm is under siege from a panoply of decentralized and market-like forms that often resemble some of the "inferior" nineteenth-century structures the managerial enterprise replaced. Recently, authors of two long essays attempted to reinterpret Chandler in a way that preserves the essence of his contribution while placing that contribution in a frame ample enough to accommodate both the rise and the (relative) fall of the large managerial enterprise. One is the work of the formidable trio of Naomi R. Lamoreaux, Daniel M. G. Raff, and Peter Temin; the other is my own paper called "The Vanishing Hand." There is much common purpose and a good deal of overlapping explanation in the two papers; and I see the essential differences that remain as complementary rather than contradictory. In the end, the papers offer quite similar solutions to what is perhaps the fundamental post-Chandlerian puzzle: why has a monotonic decline in transportation and communication costs since antebellum times resulted in a "reswitching" of organizational form back to what appears to be an "earlier" structure of decentralization, market orientation, and relational contracts?

In 1977, when Alfred Chandler's path-breaking book *The Visible Hand* appeared, the large vertically integrated "Chandlerian" corporation had dominated the organizational landscape for nearly a century. In some interpretations, possibly including Chandler's own, *The Visible Hand* and subsequent works constitute a triumphalist account of the rise of that organizational form. The large vertically integrated firm arose and prospered because of its inherent superiority, in all times and places, to more-decentralized market-oriented production arrangements. A quarter

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century later, however, the Chandlerian firm no longer dominates the landscape. It is under siege from a panoply of decentralized and market-like forms that often resemble some of the “inferior” nineteenth-century structures the managerial enterprise replaced.¹

What to do with a triumphalist history of something no longer triumphant? The menu of intellectual alternatives is short. One could reject Chandler’s account as having been wrong from the start.² One could deny that the large corporation is less successful and superior today than it was in the past.³ Or, most interestingly, one could attempt to reinterpret Chandler in a way that preserves the essence of his contribution while placing that contribution in a frame large enough to accommodate both the rise and the (relative) fall of the large managerial enterprise. This last

¹ I take this assertion as a starting point. For evidence see Naomi R. Lamoreaux, Daniel M. G. Raff, and Peter Temin, “Beyond Markets and Hierarchies: Toward a New Synthesis of American Business History,” *American Historical Review* 108 (April 2003): 404-433; Richard N. Langlois, “**The Vanishing Hand: The Changing Dynamics of Industrial Capitalism**,” *Industrial and Corporate Change* 12 (April 2003): 351-385; Timothy J. Sturgeon, “**Modular Production Networks. A New American Model of Industrial Organization**,” *Industrial and Corporate Change* 11 (June 2002): 451-496; and Todd R. Zenger and William S. Hesterly, “The Disaggregation of Corporations: Selective Intervention, High-Powered Incentives, and Molecular Units,” *Organization Science* 8 (May-June 1997): 209-222.

² An alternative that some writers have suggested for a long time. See for example 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): 133-76.

³ Chandler himself may have taken this approach. For example, in his account of the rise of the electronics industry after World War II, he is at pains to stress the contribution of large firms such as International Business Machines (IBM), and invites us to see the rise of this industry as akin to, if not identical to, the original Chandlerian revolution of the late nineteenth century. What this fails to stress is that the “large” firms today, such as 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 Chandler’s account, see Alfred D. Chandler, Jr., *Inventing the Electronic Century* (New York, 2001). For my own account see Richard N. Langlois, “External Economies and Economic Progress: The Case of the Microcomputer Industry,” *Business History Review* 66 (Spring 1992): 1-50; Richard N. Langlois, “Digital Technology and Economic Growth: the History of Semiconductors and Computers,” in *Technological Innovation and Economic Performance*, ed. Benn Steil, David Victor, and Richard R. Nelson (Princeton, N. J., 2002), 265-284; and Richard N. Langlois and W. Edward Steinmueller, “The Evolution of Competitive Advantage in the Worldwide Semiconductor Industry, 1947-1996,” in *The Sources of Industrial Leadership*, ed. David C. Mowery and Richard R. Nelson (New York, 1999), 19-78.

alternative, done right, has the advantage of preserving the essence of Chandler's remarkable and profound insights while at the same time extending our understanding of the economic theory of organization.

In April 2003, two long essays appeared in print attempting this third approach. One is the work of the formidable trio of Naomi R. Lamoreaux, Daniel M. G. Raff, and Peter Temin (henceforth LRT); the other is my own paper called "**The Vanishing Hand.**" Rather than rehash my own attempt to reframe Chandler, I compare my account with that of LRT. There is much common purpose and a good deal of overlapping explanation in the two papers; and I see the essential differences that remain as complementary rather than contradictory. Armed with this general comparison, I will examine how both papers address what is perhaps the fundamental post-Chandlerian puzzle. Although transportation and communication costs appear to have been declining in secular fashion since antebellum times, organizational structure has not change monotonically. Instead, it has followed a pronounced hump-shape pattern over time, moving from highly decentralized to integrated back to decentralized again.⁴ Why? A "new synthesis."

Both LRT and "The Vanishing Hand" are fundamentally Chandlerian in orientation. They are homages to Chandler far more than critiques. Nevertheless, as LRT observe, Chandler's achievement was largely descriptive, and lacked an underlying theory of organizational change.⁵ The fundamental aim of both papers is to supply this missing theory.

LRT first look for theory in the work of Oliver Williamson. A dominant figure in the present-day economics of organization, Williamson self-consciously attempted to explain the rise of the Chandlerian firm as the "product of a series of organizational innovations that have had the purpose and effect of economizing on transaction costs."⁶ In Williamson's account, vertical integration in the Chandlerian firm arose in response to incentive problems (especially in the face of asset specificity and asymmetric information) that disinclined potential market partners from investing in appropriate assets. LRT are anxious to adapt some of Williamson's basic apparatus to their own goal of explaining the Chandlerian firm as one element in a diverse array of possible organizational forms. This is one of their major themes: that there are not just markets and vertically integrated firms to be explained, but also many kinds of hybrid forms that mix aspects of market and hierarchy.

⁴ Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 429-430; Langlois, "Vanishing Hand," 377-79.

⁵ Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 406.

⁶ Oliver E. Williamson, "The Modern Corporation: Origins, Evolution, Attributes," *Journal of Economic Literature* 19 (Dec. 1981): 1537-68, quotation at 1537. See also generally Oliver E. Williamson, *The Economic Institutions of Capitalism* (New York, 1985).

The fundamental idea that LRT take from Williamson is that one can explain organizational form largely if not entirely as a response to incentive problems created by asymmetric information. In this respect, the theory LRT supply to Chandler fits snugly within the mainstream of the modern neoclassical economics of organization.⁷ There are many useful and important ideas here; and LRT use this theory to good advantage, especially in their discussion of America before the Chandlerian revolution, a discussion rich with both historical texture and economic explanation. It is also here that the overlap with my story is greatest. In discussing the antebellum period and the beginnings of the Chandlerian revolution, I also cite issues of asymmetric information as part of what I call the evolutionary design problem organizations had to solve.

My quarrel with this mainstream approach lies not so much with its substantive results as with its implicit explanatory claims. There are more things in heaven and earth than are dreamt of in the philosophy of asymmetric information. Nicolai Foss and I have pointed out the strange explanatory dichotomy under which the mainstream economics of organization operates. In this literature, the world of transacting is a jungle of contractual hazards, asymmetric information, agency problems, and opportunism; by contrast, the world of producing—the business of figuring out what to make and of learning how to make it—is a carefree land of perfect information and known blueprints. However, knowledge surely must be as imperfect and costly in production as in transacting.⁸ Following the lead of George Richardson, Richard Nelson and Sidney Winter, and others, a growing group of writers has seen as central the problem of how economic agents and their organizations acquire

⁷ A paradigmatic representative of the mainstream economics of organization is Paul J. Milgrom and John D. Roberts' *Economics, Organization, and Management* (New York, 1992). In their footnotes, LRT do invoke the idea of path dependency, citing Paul David, and claim affiliation with the evolutionary theories of Douglass North, Richard Nelson, and Sidney Winter. However, they never seem to make use of these affiliations, at least not in any explicit way. See Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 409, n14 and 410, n16. See also Douglass C. North, *Structure and Change in Economic History* (New York, 1981), and Richard R. Nelson and Sidney G. Winter, *An Evolutionary Theory of Economic Change* (Cambridge, Mass., 1982.) Moreover, in an earlier footnote, Lamoreaux, Raff, and Temin distinguish their effort from that of "The Vanishing Hand" precisely because the latter "takes recent experience as the culmination of a process of economic evolution" (Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 405, n3).

⁸ Richard N. Langlois and Nicolai J. Foss, "**Capabilities and Governance: The Rebirth of Production in the Theory of Economic Organization**," *Kyklos* 52 (1999): 201-18.

economic *capabilities* – the limited and costly knowledge of how to produce.⁹

Drawing on the literature of economic capabilities, Paul Robertson and I have proposed an evolutionary theory of what we call business institutions, that is, of markets, hierarchies, and the many hybrid forms that exist between and around markets and hierarchies.¹⁰ What drives the theory are the costs faced by various business institutions of acquiring economic capabilities suitable to the profit opportunities they face. Three factors are important:

a) The pattern of existing capabilities in firm and market. Are existing capabilities distributed widely to many distinct organizations or are they contained importantly within the boundaries of large firms?

b) The nature the economic change called for. When technological change or changes in relative prices generate a profit opportunity, does seizing that opportunity require a systemic reorganization of capabilities (including the learning of new capabilities) or can change proceed in autonomous fashion along the lines of an existing division of labor?

c) The extent of the market and the level of development of market-supporting institutions. To what extent can the needed capabilities be tapped through existing arrangements and to what extent must they be created from scratch? To what extent are there relevant standards and other market-supporting institutions?

One pattern typical in the history of business institutions emerges when existing capabilities are largely under separate ownership, or, roughly speaking, the existing production system is coordinated through market mechanisms and a profit opportunity arises that requires systemic reconfiguration of those capabilities. Simultaneous change in several stages of production would likely render obsolete some existing assets and call for the use of capabilities not previously applied in product production. Under this scenario, the vertically integrated 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 existing organizational structure, such a firm could overcome not only the recalcitrance of asset-holders whose capital would have to be creatively destroyed but also the “dynamic” transaction

⁹ G. B. Richardson, “The Organization of Industry,” *Economic Journal* 82 (Sept. 1972): 883-96; Nelson and Winter, “An Evolutionary Theory.” When Chandler himself addressed directly the issue of the appropriate theoretical underpinnings of his work, he came down firmly in the evolutionary capabilities camp. See Alfred D. Chandler, Jr., “Organizational Capabilities and the Economic History of the Industrial Enterprise,” *Journal of Economic Perspectives* 6 (Summer 1992): 79-100.

¹⁰ Richard N. Langlois and Paul L. Robertson, *Firms, Markets, and Economic Change: A Dynamic Theory of Business Institutions* (London, 1995).

costs of informing and persuading those who possess the necessary capabilities.¹¹

This scenario is of course the Chandlerian revolution. With the lowering of transportation and communications costs in nineteenth-century America, 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.¹²

Consider vertical integration in the early years of the Ford Motor Company. LRT tell some interesting stories about how Ford used techniques such as the \$5 day and gender coding of work to mitigate some of the agency problems of the moving assembly line. However, this does not explain Ford's high level of vertical integration. LRT go on to describe Ford's strategy of classic mass production: making a more-or-less undifferentiated product with a fine division of labor and specialized tools. In furtherance of this strategy, and unlike his early competitors, "Ford pursued a strategy of vertical integration in order to reduce costs and insure a ready supply of parts that precisely fit his specifications."¹³ Why did vertical integration reduce costs? Why was it that independent vendors could not produce a ready supply of parts to Ford's specifications?

Robertson and I tell the story differently. The moving assembly line was not about assembling cars; it was about making parts. To accommodate his mass-production strategy, Ford needed to invent fast and cheap ways to make parts. Existing suppliers were typically generalists who used batch techniques; a radiator supplier might well be a firm whose principal business was making tin buckets. Mass-producing parts called for a systemic change in the production process. In effecting this change, it was far less costly for Ford to make the parts himself than to try to manipulate a grossly ill-adapted supplier network.¹⁴ Ford did not teach his suppliers the techniques of mass production and then buy from them because he could not teach them what he did not yet know.

¹¹ 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. See Richard N. Langlois, "Transaction-cost Economics in Real Time," *Industrial and Corporate Change* 1 (April 1992): 99-127.

¹² In many of these cases, the non-price attributes of the products may initially have deteriorated in consumer eyes as mass-produced items substituted for particularized or hand-made ones, but any such disadvantage was rapidly outweighed by reductions in product price.

¹³ Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 420.

¹⁴ Richard N. Langlois and Paul L. Robertson, "Explaining Vertical Integration: Lessons from the American Automobile Industry," *Journal of Economic History* 49 (June 1989): 361-375.

Inventing the moving assembly line—or, rather, many different assembly lines for many different parts—was a process of capability-building requiring lengthy trial-and-error learning. To say that the suppliers lacked the incentives to make the necessary investments may be true, but it scarcely captures the reality of the situation.

However, incentives and asymmetric information may still be part of the story. Consider the case of Singer Sewing Machine, which in the late nineteenth century slowly replaced a network of commissioned sales agents with its own regional sales offices staffed by salaried employees who could demonstrate the machines, repair them, and offer credit to buyers. LRT explain this (and similar integration in other industries) in terms of Williamson's "externality principle"; independent distributors failed to invest in necessary assets and exert adequate sales effort because they understood that other distributors could free ride on those investments. The evidence for this interpretation is persuasive. On the other hand, adopting a different contracting structure such as territorial exclusive dealing or resale price maintenance can solve such free-rider problems.¹⁵ Why did Singer choose vertical integration? Chandler's account actually stresses Singer's invention of management techniques for selling sewing machines.¹⁶ In part, the company needed to figure out how to manage the geographically dispersed distribution of a complex and expensive consumer product, and it was easier to learn and teach these management techniques through wholly owned branches than through contract.¹⁷

¹⁵ See Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization* (Reading, Mass., 1999), 405-408. Evidently, Singer's territorial contracts with independent dealers were not exclusive, inducing the dealers to free ride on Singer's reputation while pushing other brands of sewing machine. See Andrew B. Jack, "The Channels of Distribution for an Innovation: the Sewing Machine Industry in America, 1860-1865," *Explorations in Entrepreneurial History* 9 (1957): 133-41. Exclusive dealing would have eliminated that particular problem.

¹⁶ Alfred D. Chandler, Jr., *The Visible Hand: the Managerial Revolution in American Business* (Cambridge, Mass., 1977), 302-6. Chandler also notes that Singer was rolling in free cash flow and much of its vertical integration into things such as timberland and an iron mill may have been the result of a weak selection environment.

¹⁷ "Transactions cost considerations played a significant part in the determination of the extent of both forward and backward integration. Even when suppliers and distributors were competent and reliable, they were often unable to deliver on schedule and in the quantity and quality required by the new capital-intensive industries. Distributors were often slow in returning sales revenues to the manufacturer or in providing necessary marketing services and information. But the initial move forward into distribution and marketing by entrepreneurs in the new industries of the Second Industrial Revolution was that often suppliers and distributors had neither sufficient knowledge of the novel and complex products

We can never have a complete explanation of organizational form without attending to the transaction-cost (asymmetric-information) problems those forms help solve. However, our explanation is in danger of being even less complete if we only pay attention to such problems. For one, transaction-cost issues are seldom the drivers of organizational change, even though they may influence the shape of the final product of organizational change. As the railroad and the telegraph lowered transportation and communication costs in the late nineteenth century, it became economical to package goods centrally (such as cigarettes) or to coordinate the distribution of goods centrally (such as mail-order retailing). This created problems of asymmetric information that organizations solved by branding and other means.¹⁸ However, these transaction-cost problems did not drive organizational change. What drove the change were factors affecting production costs and production technology.

Moreover, sometimes transaction-cost explanations do not seem very helpful at all. Consider the problem of explaining the continued, perhaps accelerated, dominance of the Chandlerian corporation in the middle years of the twentieth century. LRT devote little space to this period, and their treatment is essentially descriptive, a paraphrase of Chandler. For good reason, there is no mention of asymmetric information or transaction costs. However, that does not mean theory is entirely unhelpful. The story is in part one of path dependency and a relatively attenuated competitive environment. Because large enterprises set out on the path of vertical integration, capabilities tended to develop within that integrated structure rather than outside of it. This was especially true to the extent that the internally grown capabilities were relevant to the major technological developments of the era. At the same time, many large American firms benefited from a certain amount of *de facto* protection after the Japanese and European economies were devastated during World War II. This environment was ripe for the pattern of firm growth that Edith Penrose theorized about: the spreading of internal capabilities over a wider set of activities.¹⁹

Chandlerian firms are not the only possible response to problems of asymmetric information; neither are they the only possible response to the need to rearrange economic capabilities. Consider a second scenario that flows from the Langlois and Robertson explanatory framework. Suppose that when exogenous forces call for a realignment of capabilities, institutions exist—or can be cheaply created—to channel change into a

nor the facilities required to handle them efficiently.” (Chandler, “Organizational Capabilities,” 87.)

¹⁸ Sukkoo Kim, “**Markets and Multiunit Firms from an American Historical Perspective**,” *Advances in Strategic Management* 18 (June 2001), pp. 305-26. But compare Langlois, “Vanishing Hand,” 368, n25.

¹⁹ Edith T. Penrose, *The Theory of the Growth of the Firm* (Oxford, 1959).

decentralized pattern. In such a case, change can proceed in autonomous fashion along the lines of an existing or a developing division of labor.

This scenario can play itself out in a number of ways. Indeed, it was at work even in the era of the Chandlerian firm. Branding by large multi-unit firms was one solution to the problems of quality guaranteeing that arose with high-volume trade. Another was standards. By the middle of the nineteenth century, lowered transportation and communications costs made possible bulk shipment of wheat from the Midwest. This necessitated the mixing of wheat from many different farmers, which destroyed traditional small-scale mechanisms of reputation based on the identity of the farmer. As a result, farmers no longer had strong incentives to maintain quality. The Chicago Board of Trade addressed the problem by creating standard categories of wheat and eventually by hiring inspectors to enforce the standards. The resulting system was one of high-throughput market exchange, with a bit of hierarchy added in by the Board of Trade.²⁰ As Alfred Marshall insisted, markets as well as firms require conscious organization.²¹

This is by no means an isolated case. In “The Vanishing Hand,” I mention a more recent example, the creation of standards in home mortgage lending by the Federal National Mortgage Association and other banking institutions, which led to the creation of alienable securities in home mortgages and an ongoing de-verticalization of the home mortgage industry.²² An even more dramatic example is that of personal computers. Here standards generated a modular system that allowed entry points for market players at virtually all vertical and lateral stages of production.²³ Note that in these late twentieth-century cases, the development of market-supporting institutions creatively destroyed the existing system of capabilities contained within Chandlerian firms. This scenario is the unmaking of the Chandlerian revolution.

Explaining the Hump

In setting forth our framework, Robertson and I explicitly described the process of explaining organizational form as “necessarily complex and

²⁰ Lamoreaux, Raff, and Temin, “Beyond Markets and Hierarchies,” 414-415.

²¹ Brian J. Loasby, “Firms, Markets, and the Principle of Continuity,” in *Centenary Essays on Alfred Marshall*, ed. J. K. Whitaker (Cambridge, U.K., 1990), 120.

²² Michael G. Jacobides, “Why Do Markets Emerge? Organizational Unbundling and Vertical Dis-Integration in Mortgage Banking,” Working Paper, Centre for the Network Economy, London Business School, 2003.

²³ Langlois, “External Economies”; Richard N. Langlois and Paul L. Robertson, “**Networks and Innovation in a Modular System: Lessons from the Micro-computer and Stereo Component Industries**,” *Research Policy* 21 (Aug. 1992): 297-313.

historically contingent.”²⁴ Both these scenarios, as well as others, have occurred throughout the last 150 years, and will continue to occur. But to tackle the question that LRT and I both address: “Why was the large Chandlerian firm relatively more dominant in the past and relatively less dominant now?” one has to pay attention to systematic changes in boundary conditions. Transportation and communications costs have fallen monotonically since antebellum times; population and per capita income have risen in secular fashion.²⁵ LRT and I both apply our contingent theories in order to confront the post-Chandlerian puzzle of these boundary conditions.²⁶

What we (and others) observe is that, 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

²⁴ Langlois and Robertson, “Firms, Markets, and Economic Change,” 3.

²⁵ Lamoreaux, Raff, and Temin, “Beyond Markets and Hierarchies,” 429-430.

²⁶ In the penultimate version of their paper, published as a prestigious National Bureau of Economic Research working paper, LRT twice single me out as exponent of the view that “the organizations that appear to be characteristic of the present era [are] a new endpoint toward which history has been evolving.” (Naomi R. Lamoreaux, Daniel M. G. Raff, and Peter Temin, “Beyond Markets and Hierarchies: Toward a New Synthesis of American Business History,” **Working Paper 9029**, National Bureau of Economic Research, July, 2002, p. 58). What distinguishes their work from mine, they say, is that I see “see the economy of the 1990s to be the last stage in a historical evolution” (ibid., 2, n3). After I protested to the authors and supplied them with the final version of my paper, they eliminated the former reference and changed the latter to the slightly more ambiguous claim, cited earlier, that my paper “takes recent experience as the culmination of a process of economic evolution” (Lamoreaux, Raff, and Temin, “Beyond Markets and Hierarchies,” 405, n3). If they intend this claim to mean that (unlike them?) I am a follower of Nelson and Winter, then I embrace it; if it is intended to suggest that I see evolution in teleological or historicist terms, then it is extraordinarily wide of the mark. For my views on the non-teleological character of evolutionary explanation, see Richard N. Langlois, “Rationality, Institutions, and Explanation,” in *Economics as a Process: Essays in the New Institutional Economics*, ed. Richard N. Langlois (New York, 1986), 225-55; Richard N. Langlois and Michael J. Everett, “What Is Evolutionary Economics?” in *Evolutionary and Neo-Schumpeterian Approaches to Economics*, ed. Lars Magnusson (Dordrecht, 1994), 11-47; and Müfit Sabooglu and Richard N. Langlois, “Knowledge and Meliorism in the Evolutionary Theory of F. A. Hayek,” in *Evolutionary Economics: Program and Scope*, ed. Kurt Dopfer (Dordrecht, 2001), 231-51.

begin to look a lot more like the antebellum one. Keeping in mind the population logic of this claim, we might say that vertical integration started low, increased, and then decreased again even as the boundary conditions changed monotonically.

In what is an important substantive contribution to the discussion, LRT draw our attention to the income variable. Classic mass production generated economies of scale by optimizing a standardized product. That product may have represented 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 became 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.²⁷

Of course, transportation and transaction costs matter, too. For one thing, antebellum consumers had even lower incomes, but markets and relational contracts served them. 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 becomes less pronounced.²⁸ 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*."²⁹

Notice that, taken literally, this does not provide 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 Coase's sense (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

²⁷ Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 430.

²⁸ Paul Krugman, *Geography and Trade* (Cambridge, Mass., 1991), 111. 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.

²⁹ Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies," 429-30, emphasis added.

Krugman's other work) suggests that the core ought to look like a Marshallian industrial district. However, 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.

Early on, high transportation and transaction costs (TC) dominate the story (see Figure 1). 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

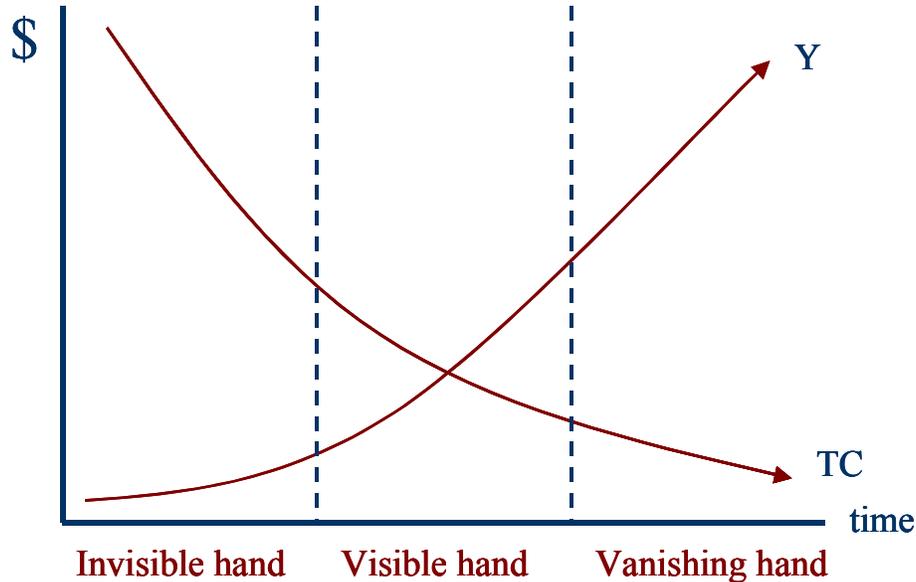


FIGURE 1 The Lamoreaux, Raff, and Temin Explanation?

individualized products, which agile market-oriented and relational forms supply best. Either a low level of transaction and transportation costs reinforces this tendency or, if it fails to reinforce it, the demand effect swamps the TC.³⁰ In the middle, when incomes are still relatively low but

³⁰ It is the focus on the demand side that distinguishes the LRT explanation from otherwise similar explanations that rely solely on arguments about changes in transaction costs arising from present-day computer and communications technology. Of course, a naïve account that appeals only to modern computer and communications technology is inadequate, since, as Ronald Coase pointed out, whether new technology favors markets depends on whether that technology lowers the cost of market exchange more than it does the costs of hierarchical control. See Ronald H. Coase, "The Nature of the Firm," *Economica* (N.S.) 4 (Nov. 1937): 397n3. Sophisticated arguments must contain an account of why modern technology favors markets over firms. 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

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. Perhaps Williamson will do. Middling transportation costs permit classical mass production of undifferentiated products, and middling incomes induce consumers to accept those products. Classical mass production calls for dedicated machinery, suppliers, etc., and this implies highly specific assets. As incomes rise, however, consumers become less willing to accept standardized products, the need for highly specific assets lessens, and internal coordination becomes less desirable.³¹

This explanation is strikingly congruent with my own. Where LRT rely on Williamsonian asset specificity, I appeal to a broader notion of buffering that I borrow from the “cybernetic” theory of organization developed in the 1960s and 1970s.³² In addition, whereas LRT discuss rising incomes and lowered transportation and communications costs, I 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

the attributes of a product in enough detail to allow potential buyers ... to make a selection.” See Thomas W. Malone, JoAnne Yates, and Robert I. Benjamin, “Electronic Markets and Electronic Hierarchies,” *Communications of the ACM* 30 (June 1987): 484-97, quotation at 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. For empirical evidence that information technology tends to favor vertical disintegration, see Lorin M. Hitt, “Information Technology and Firm Boundaries: Evidence from Panel Data,” *Information Systems Research* 10 (June 1999): 134-49.

³¹ 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.

³² Buffering mechanisms 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. See Jay Galbraith, *Designing Complex Organizations* (Reading, Mass., 1973); Herbert A. Simon, “The Corporation: Will It Be Managed by Machines?” in *Management and the Corporations, 1985*, ed. Melvin Anshen and George Leland Bach (New York, 1960), 17-55; and James D. Thompson, *Organizations in Action* (New York, 1967).

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.³³

However, the supply side also matters. “In the beginning there were markets” is Williamson’s famous heuristic dictum.³⁴ 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 understood) to become more “capable.”³⁵

As time passes, all other things being equal (including extent of the market), the outlines of new capabilities will become sharper; activities will become more routine and better understood; and capabilities will thus begin to diffuse to others.³⁶ Moreover, we can expect economic agents to discover techniques other than integration for mitigating problems of asymmetric information. As the extent of the market grows, all other things being equal (including knowledge), it will pay to incur the set-up costs that markets and market-supporting institutions (such as 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 generally likely to decline.

In the end, there are markets. This is not a historicist claim, merely a claim that history matters. Williamson’s catch phrase is self-consciously ahistorical. To apply any contingent theory, including Williamson’s, we need to look at history. We need to look at boundary conditions and at how those boundary conditions change systematically.

³³ Chandler, in “Organizational Capabilities,” 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.”

³⁴ Oliver E. Williamson, *Markets and Hierarchies: Analysis and Antitrust Implications* (New York, 1975), 20.

³⁵ Langlois, “Transaction-cost Economics.”

³⁶ In the terminology of Malone, Yates, and Benjamin, “Electronic Markets,” product descriptions will become more standardized and interpersonally shared, thus reducing the complexity of the information that has to be exchanged in transaction.

In principle, 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. However, 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, larger markets can support more “general specialties” or “general-purpose technologies.”³⁷ A Chandlerian firm starting up today can plug into modern financial markets, modern banking, containerized shipping, Federal Express, personal computers, and the Internet without having to reinvent those stages of production itself. This suggests that, not only should we expect Chandlerian forms 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.

³⁷ “General specialties” is the terminology of George Stigler, “The Division of Labor Is Limited by the Extent of the Market,” *Journal of Political Economy* 59 (June 1951): 185-93, more recently revived under the term “general-purpose technologies.” See, for example, Elhanan Helpman, ed. *General Purpose Technologies and Economic Growth* (Cambridge, Mass., 1998).