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1 Business History and Recent Economic Theory:

Imperfect Information, Incentives, and the Internal Organization of Firms

Daniel M. G. Raff and Peter Temin

1.1 Business History and Economists

Traditional economic theory—that is, economics as it has been taught to elementary students since World War II—is of only limited use to business historians. Business history is about firms, and there is not much to traditional economic theory's firms or to the problems they confront. The structure of the wants of the consuming public is a given. So is the particular selection of those wants that any particular firm should try to meet. So also are the methods by which inputs are to be combined to produce those goods. Nor are there any difficulties involved in getting the inputs to combine as they are meant to. Most firms are small with respect to the markets they trade in, and there are no intricate reactions or interactions between buyers, sellers, or buyers and sellers together to be puzzled out and manipulated. Altogether, strategic choice (in both the businessman's sense and that of the game theorist) is absent, and the details of organization are never a problem.[1]

This view of the economy represents the outcome of an intellectual struggle almost a hundred years old. Even before World War I, economics was hardly a unified discipline. The contending positions at that time can grouped roughly into two camps. The English school believed in abstract reasoning

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1. For a careful intermediate account of the traditional theory, see, e.g., Nicholson (1988). For strategic choice, see Learned et al. (1965) and Luce and Raiffa (1957), respectively.

and models along the lines pioneered by Ricardo, Mill, and Marshall. The German school believed in inductive reasoning exemplified by Sombart and Weber.[2]

Both schools of thought have endured, but the English methodology captured the seats of power within economics. German methodology survived in business schools. Economics and management studies both flowered, but along largely independent lines. The developments, however, were not completely parallel. For while economists could and did generally ignore scholarship from business schools, the business schools could not ignore conventional economics.

The relationship between these two strains of thought has become more interactive in our generation. Business historians, firmly rooted in the particulars of the companies under scrutiny, have begun to hazard tentative generalizations about the best way to organize complex economic activities. Led by Alfred D. Chandler, Jr., in a series of books, some business historians have tried to describe the operation of an abstract entity: the modern business enterprise (Chandler 1962, 1977, 1990).

Whether by design or the result of unseen forces, economists began to think at approximately the same time about issues members of the business community and business historians would recognize as managerial. George Stigler's famous article "The Economics of Information," emphasizing that information, like other goods, is costly and that it has consequences for decisions, was published virtually simultaneously with Chandler's *Strategy and Structure*.[3] Stigler's observation is not in itself startling; his contribution was to show how the cost of information might be inserted into economic analysis.

Treating information like another scarce good has many powerful implications. The deepest and most significant is that economic decision-makers will generally not choose to acquire all the information available, any more than they will want to have all of any other good or service in the economy.[4] They may not want, or even be able, to process all the information to which they do have access (Simon 1945, 1955). As a result, business people typically have to make decisions on the basis of only incomplete information.

Institutions have emerged to facilitate decision making in the presence of incomplete information, but they too have problems. Some forms of economic organization constrain reactions to new information and make transactions more costly than they would be in a simpler world.[5] Other forms of organization offer such substantial opportunities for abuse that the activities appear to be better undertaken without any explicit transaction or direct quid

2. For the development of early social sciences, see Haskell (1977); Ross (1991).

3. Stigler ([1961] 1968). Although Stigler's observation now seems like a commonplace even to economists, it struck the Nobel Committee as sufficiently momentous to be the centerpiece of Stigler's Nobel prize citation in 1982.

4. That is, information, like all other goods, is subject to diminishing returns at the margin.

5. See Johnson's essay (chap. 2) in this volume.

pro quo at all.[6] Management—in the whole breadth and variety the word conveys in a business school—emerges as an important activity.

In fact, the functions of management are visible at many different levels of business enterprises. There is an isomorphism between the process of making decisions at the level of hiring employees, managing subordinate business units, and deciding about the extent and financing of firms as a whole. The recognition of this commonality has sparked interest in the development of management tools and in the creation of a body of economic theory useful for thinking about this development.[7] There is a meeting ground in this intellectual endeavor for business historians who have long been interested in the questions of management and economists newly attentive to these questions.

There is also, however, a problem of communication—a problem of language. Business historians have adopted a literary style that is short on generalizations. Economists employ mathematics that assumes away details. These vernaculars obviously reflect the interests of the two groups. But they also create barriers to cross-fertilization. They promote insularity, even antagonism, between the two groups of scholars. Oliver Williamson has tried to bridge this gap in a series of discussions that have provided many of the terms that will be used here (1975, 1985). But traffic on this and other bridges has not been heavy as yet.

Economists writing about these issues, for example, are fond of referring to *principals* and *agents*. These are abstract terms designed to identify actors who stand in certain relations to one another, independent of the particular level or circumstances of their relationship. The principal is the manager, owner, or financier who has an asset he or she wants someone else to operate. The agent is the worker, manager, or owner who undertakes to act on the principal's behalf. The same individual may be principal in one transaction and agent in another. And in any given relationship both individuals, principal and agent alike, must be happy with the arrangement if it is to function well. These abstract claims represent the start of economic analysis, but also the outer bounds of traditional historians' interest. What do these abstractions have to do with any specific historical incident?

We contend that business historians and the new industrial organization theorists are looking—in the terms of the old story—at different parts of a common elephant. We believe that the analyses of each would benefit from a view of the animal as a whole. We cannot deliver such a view in any detail in an introductory essay. But we can offer some examples that strongly suggest there is indeed a single beast under scrutiny.

We do this by working through a series of historical examples that have

6. Coase (1937). In his analysis the choice is in effect either to buy a service on a market from a stranger whom you will never see again or to have it performed by your personal servant. The alternative to the open market rarely involves such an extreme of trustworthiness. The principle at issue is quite important, however. We develop it at some length in section 1.2.

7. On the new theory, see Levinthal (1988) and Holmstrom and Tirole (1989).

been carefully selected, ordered, and developed. Many of the episodes described below may well seem familiar. But the contexts in which we describe them and the emphases we place and questions we raise probably will not. One of our objectives in laying out the material in this way is to suggest, we hope seductively, a set of concepts business historians might use to organize their data. We feel confident that if they do this, they will reap better than they sow. (The proof of this, in the instance of this paper, will lie in the unexpectedness of our conclusions or the insights our arguments generate.)

Another objective is to encourage historians to turn up material that economists will find anomalous or otherwise beyond the scope of their familiar models. This should provide grist for the theorists' mills, or—to vary the metaphor—grit around which to make pearls. Such ongoing interactions, we feel, would be good for all parties concerned.[8]

Our examples illustrate three levels of managerial decisions: organizing the work of individuals, organizing whole production units, and organizing finance to pay for the enterprise as a whole. Our theme is that these are not in principle three disparate or even particularly distinct realms at all: the one single logic is working itself out, again and again, with only incidental variations. Our essay concludes with some ideas about fruitful ways of exploring the meaning and relevance of these parallels in particular cases.

1.2 Relationships with Individuals

We begin with the most familiar vertical relationships within the firm, that is, with workers and the structure of the employment relation. One respect in which labor—considered as a factor of production—is different from machines is that machines are designed to do nothing but perform some task or set of tasks. Once turned on, they steadily and consistently carry out the task. Their standard of performance may degrade over time as parts wear. If the energy supply is interrupted or some part suffers a catastrophic failure, the machine may stop entirely. But the motivation of the machine to do the work is never at issue. Roughly speaking, machines do as they are told. They never shirk. They never cheat. They never pursue their own interests.

It is not necessarily thus with people. One may think of human effort as an input to production and thus a good thing for the firm that employs it. But it is equally plausible that effort is, in the abstract, a bad thing for the employees. All other things being equal, most people would rather work less hard than more. They are not willing slaves. They look out for themselves. They certainly prefer their leisure to what they do to earn their living. This is why

8. For example, the economists' recent inside-the-firm and imperfect-competition literatures appear to have developed in isolation from one another. It is plausible that the solutions to the two problems might be connected in interesting ways. (For a hint, see Bernheim and Whinston 1985.) The theorists do not seem to know quite where to start in exploring this systematically (see Tirole 1988, 50–51). Historians could play a useful agenda-setting role by identifying and exploring a few really striking examples.

they are paid to do their work. They have their own preferences, and these are often not the same as those of their employers.

All this may seem obvious. But it develops interesting and sometimes subtle ramifications when it is costly for the employee's manager to know how well the employee's tasks have been executed and how diligently the employee's responsibilities have been executed. It may well be true that the workers on Henry Ford's assembly line—made vivid for us all in Chaplin's *Modern Times*—had very little scope for this sort of shirking.[9] But that was due to the experimental and self-consciously radical division of labor at Ford, which produced jobs of a degree of simplicity and monitorability unknown even in Ford's own industry today. Most production jobs in the economy then and now are not like that. Few managerial jobs have ever been. Generally speaking, where there is a job there is an agency problem.

The simplest example with which to begin analyzing agency problems and the significance of their solutions has been famous to economists from the days of Marshall's *Principles*. The subject is agricultural tenants who pay no set fee for the use of the land they farm, but instead give to the landlord a predetermined share of what they grow. Marshall writes that

> when the cultivator has to give to his landlord half of the returns to each dose of capital and labor that he applies to the land, it will not be in his interest to apply any doses the total return to which is less than twice enough to reward him. If . . . he is free to cultivate as he chooses, he will cultivate less intensively than [under a pure rental system]; he will apply only so much capital and labor as will give him returns more than twice enough to repay himself; so that his landlord will get a smaller share even of those returns than he would have on the plan of a fixed payment. (1961, 644)

The situation is that the landlord cannot work the land himself and needs to find someone else to do it for him. He is a principal in search of an agent. Yet he cannot continually stand over the agent, telling him how hard to work, how much fertilizer to apply, and so forth. The landlord—the principal—must employ a tenant—the agent—whose day-to-day actions he cannot observe and on whose day-to-day actions he depends for his income.

All is not lost for the landlord, however. The agent's inputs into the production process cannot be observed. But the process outputs can be observed, and, in Marshall's story, can be observed costlessly. The story is phrased in terms of a single period (one growing season, say). So the contract is set in terms of shares of the output—the harvest—at the end of the season. The problem is that the tenant, who gets to act independently once the period starts, will not want to invest as much of his energies and his wealth as the landlord would wish. The landlord will get something, but his asset will be underemployed.

9. See Raff (1991), especially chapters 3 and 5.

The tenant will make his decisions on the basis of his benefits and costs, and so ultimately on the prices and returns to effort that confront him. Only when the tenant's marginal incentives are the same as the owner's will the two want to make the same decisions. Only when both of these are undistorted will these decisions be the correct ones. The way for the landlord to bring about this desirable coordinated state of affairs (to get his asset exploited in an efficient way) is to charge the tenant a fixed rent for the use of the land, leaving the tenant free to capture all the marginal gains to investment and enterprise. The efficient contract sets the level of the rent so as to extract all the (expected) profits without undesirably distorting the tenant's decision making (Cheung 1969).

Marshall was interested in the divergent returns facing the two contracting parties. To focus on this, he set up his model abstracting away from almost all details of the common actual situation. In particular, he omitted some other important respects in which conflicts between the tenant and the landlord could appear. In the most obvious instance, he assumed—casually as it might seem—that both agent and principal knew exactly how much output there was to divide. However much output there was, it was with absolute certainty to be divided according to the initially agreed-upon rule. We now make the problem more complex by varying that assumption.

Consider instead what happens if the tenant can hide the results of a good year. (Consider, that is, what happens when the deterministic relationship between the farmer's effort and the size of the crop becomes uncertain and hard to verify.)[10] We focus on the verification problem.[11] The tenant might think that, since he works the land while the landlord sits by, he is entitled to the benefits of good rainfall. In the manner of taxpayers everywhere, he might not declare the whole of his output. The landlord, lacking accurate information, is at a disadvantage.

The extent of the landlord's vulnerability to self-serving underreporting depends upon the amount of uncertainty in the harvest. If harvests do not vary much from year to year, it will be difficult for the tenant to conceal very much: the landlord will have a fairly precise idea how big a harvest to expect. But if harvests vary a lot from year to year, then the opportunity for fraud is present.

In this context, partial payment creates a further wedge between the motivation of tenant and landlord. Just as in Marshall's original example, the sharing scheme creates inefficiencies. In this context, partial payment creates a new problem as well. How is the landlord to convince the tenant to be honest about his crop? He may need to break out of the simple share contract that Marshall described and design a new way of monitoring his tenant.

Marshall's assumption about the availability—more precisely, the relative

10. This situation has been explored systematically by Stiglitz (1974).

11. Most of the literature of the economic theory of agency focuses on the uncertainty and optimal risk-bearing arrangements.

costs—of different kinds of information was extreme. Once we get away from this, it becomes obvious that a landlord actually has many options open to him. He need not confine his attention to the output itself, but may look also at the acreage planted, the effort expended by his tenant, the materials used.[12] Each of these alternatives, of course, may be observable only with error as well. The landlord consequently has to compare the costs and the ultimate benefits of informing himself by different means.

Each of the landlord's alternatives creates a different incentive for the tenant. Faced with an output test, the tenant may hide his crop. Faced with a land or labor observation, he may sham working in order to fool the landlord. In this case, he is actually expending effort fooling the landlord that would be better spent farming. Monitoring schemes can do more than set up suboptimal incentives; they can set up perverse incentives.

This is peculiarly the case when long time periods are involved. Marshall considers only the yearly crop of the tenant farmer. But let us consider the incentives of the tenant to improve his land, by improving drainage or repairing buildings. The investment could be substantial, and the returns might only come over a long stretch of years.

If the tenant has only a yearly contract, he may not have any incentive to engage in a long-term investment. What is to keep the landlord from evicting him just as the improvements begin to improve the yield? How can he be assured of enjoying the fruits of his labor even in this indirect way?

There are again many options. The landlord might require improvements as part of the yearly contract. He could, under certain circumstances, offer the tenant a long-term lease.[13] He might pay the tenant at the time of investment for the time and materials used to upgrade the irrigation system or buildings. Each of these alternatives, as before, has its costs to the landlord and incentives for the tenant. Both aspects need to be considered in choosing or evaluating a contract.

These considerations apply as well to the development of human capital. Stepping outside Marshall's farming example, an employer may want her employees to engage in self-improvement. She may want her workers to engage in activities that will bring returns to the company only after several years. The timing problem is exactly the same as the landlord-tenant problem with fixed capital. But the intensity of effort and the effects of education are harder to observe than the repair of buildings. The problem, in other words, is doubly difficult. The activities in the present are hard to observe, and the results of these actions come only in the future.

12. Levinthal (1988) identifies and analyzes three distinct strategies for reducing these agency costs. They are improved accounting (i.e., measurement), long-term contracts between principal and agent, and competition among agents (i.e., rank-order compensation). There are business-history examples of each of these in our text and in the other papers in this volume.

13. This, to draw out the point of the preceding footnote, is an example of moving towards the first-best by developing a long-term relationship between principal and agent that allows future rewards for present good behavior. We explore this option further below.

Any owner therefore faces a problem of motivating his or her employees or agents. This problem is most intense when uncertainty is high, monitoring is expensive, and observable outcomes are delayed. It is the function of managers—the modern counterparts to Marshall's landowner—to design compensation schemes that are appropriate to the particular structure of costs and incentives faced by the various parties engaged in production.

One historic pattern in compensation schemes for blue-collar employees exposes the result of this kind of managerial design. It is a particularly interesting example because the sort of systematic, explicit reasoning about costs and alternatives we have been developing explains coherently a set of institutions that otherwise seem entirely capricious.

The story begins with a puzzling fact. There were many manufacturing firms circa 1900 that employed both men and women. The men were far more likely to be paid via time rates and the women by piece rates than vice versa. Why should this have been so?

It emerges upon investigation that the bulk of the jobs in question posed monitoring and incentive problems of the sorts outlined above.[14] When output is easily measurable, as it tended to be in these jobs, a formally simple solution to the shirking problem is to pay by piece rates and simply monitor output.[15] This links compensation to effort in a fairly direct way. It typically is a lot cheaper than intensive monitoring of the effort inputs. The problem is that piece-rate schemes are nonetheless costly to administer. Someone has to count the output.

We have a conflict here. The obvious way to respond to the difference between workers' and managers' objectives creates administrative costs. Managers naturally would prefer to solve the incentive problem without incurring large costs. One alternative was to pay time rates rising over time and to pose—through periodic spot-checks of various sorts—some threat of firing before the rates had risen as high as they eventually would. The employer, in other words, offered deferred compensation for hard work. Monitoring would be spread out over a long time, reducing its cost. It might even be done by evaluating relative performance, further reducing the expense.[16] The rising pay scale would provide a way of motivating each hour of work without monitoring each item produced.

This might seem to suggest that all employees would be paid on the same scheme. But that would follow only if all employees could offer a long-term

14. Goldin (1986) gives facts and a detailed analysis.

15. It is characteristic of the sort of jobs we are discussing, as it is of all jobs implicitly described in the economists' literature on compensation schemes, that the more output any particular worker produces, the better off the employer is. When outputs are complementary, this may not be not so. In that case, when workers produce output in an unsynchronized way, downstream employees, capital, and work in process will stand idle. This is wasteful and may be very expensive (see Raff 1988).

16. We assume that workers do not collude. Allowing worker solidarity introduces another level of complexity to the analysis.

relationship to the firm in which the incentive of deferred compensation would have some meaning. Women were systematically different from men in this regard. Their employment was affected by changes in their marital status and by childbearing: at the turn of the century, women were in and out of employment due to the biological and social impacts of reproduction. A deferred compensation scheme did not provide a way to motivate effort on the job for most women because most women would leave a job before the full bargain could be played out. Managers therefore used a rising time-rate pay scale when they could—with typical male employees—and more costly piece rates when they could not. The observed gender difference in pay modes was the result.[17]

A similar story, with interesting additional elements, can be told about the new executive bonus scheme introduced in the General Motors Corporation by Alfred Sloan in 1923. The basic problem and the basic solution idea will be familiar. The motivational mismatch Sloan confronted derives from the existence of firm-specific (or, more generally, transaction-specific) assets.[18] The assets in question are individuals' knowledge specific to a particular firm's operations and markets. Just as Marshall's landlord wanted tenants to use the land and Goldin's managers wanted workers to expend their effort, Sloan sought to induce managers to exploit these assets for GM's benefit. The question to bear in mind is how the mismatch between GM's and the managers' interests might best be accommodated, given that the mismatch problem cannot simply be wished away.

The salient facts are as follows.[19] GM had been operated as a holding company for some time. Roughly from its inception through the end of the war, executives had been paid salaries plus bonuses that were related to the performance of their particular division of the corporation. This naturally encouraged them to make their decisions with principal reference to the fortunes of their own division. There were circumstances, however, in which such decisions might undermine the prosperity of the corporation as a whole.

The first revision of this scheme was, then, to relate bonuses to corporate rather than divisional performance and to pay them out only when corporate performance was above a stated acceptable minimum. But the compensation still remained entirely a current transaction.

Excessive inventory commitments coincided with a downswing in the business cycle in 1920. The viability of the corporation as a whole was threatened, albeit briefly. Sloan's solution to this problem was to create a centralized corporate staff to plan and coordinate financial commitments and long-term investments. He created this staff and began to reorganize the way GM con-

17. Discrimination, of course, may provide another explanation. See Lazear (1979) for a different implication of the possibility of long-term contracts.

18. Becker developed these ideas in his "Investment in Human Capital" (1962). We develop the idea of assets being specific to a transaction or a firm at greater length in section 1.3.

19. This account follows Sloan (1964).

ducted its business to bring long-run planning into the forefront of managerial consideration. The creation of a corporate staff was crucial to the process, but the staff had to be motivated to place GM's interests first. Sloan implemented a significant change to the bonus scheme to solve this problem.

The change involved setting up the Managers Security Company. The Du Pont company, then and for many years thereafter the largest single shareholder in GM, made a large block of shares available for sale to this new entity. The Managers Security Company was, from time to time and as executive performances dictated, to makes its own shares available for sale to the corporate executives. Inducing the managers to hold their wealth in GM equity would in itself have given them the sort of longer-term interest in overall corporate performance the shareholders had. But Sloan produced two twists that made this much more pronounced. The executives bought the stock on margin: they paid only a fraction of the market value of the shares up front and paid off the rest over time. They agreed to pay off the balance through future bonuses they might earn. And the shares they purchased, though these had all the attributes of ordinary GM shares, were not in fact tradable assets. There were not even procedures in place for managers to voluntarily sell out their positions. In short, the investment was on generous terms. But it could only be liquidated with the approval and assistance of GM.[20]

The reorganization plan created a group of tasks whose successful execution would be crucial to the corporation's short-term viability and long-term success. The jobs involved some novelty, considerable difficulty, substantial monitoring problems, and very long-term consequences for the shareholders. Sloan's 1923 plan gave those who were in a position to carry the tasks out a pronounced long-term interest in seeing to it that the return on invested capital exceeded what the shareholders regarded as an acceptable minimum.

From the perspective of Marshall's landlord, experienced tenant farmers from a given region were probably more or less perfect substitutes. From the perspective of the owners of GM, there were no outside perfect substitutes for these men who came to know much more than anyone else did about the important novelties of running the GM business. As one might therefore expect, participation in the plan was not open to all employees of the corporation or even to all executives. It was restricted to "top" executives who were expected to see out their careers with the firm. When Sloan spoke later in the decade of the scheme, with pride, as having created more than a few millionaires, it seems clear that the main group of employees he had in mind were these senior members of the corporate staff.[21] By comparison, individual blue-collar

20. Even John Raskob, a top GM official who had been for many years previously a senior and trusted officer at Du Pont, discovered this when he wanted to leave GM in 1928. He owned nearly $20 million of the nontraded Managers Security Company shares and had to write, formally and as supplicant, to get these turned into securities he could trade on a market (see Kuhn 1986, 163).

21. It is an interesting but separate question whether it was efficient to offer the possibility of wealth on this scale.

employees had nothing unusual to offer the company. They had no long-lived and difficult-to-replace productive asset, and they could offer no services the corporation could not obtain competitively elsewhere.[22] Unless their cooperation became in itself an important asset, the corporation had no reason to pay them any more than the best they could earn elsewhere. Until that came about, though the company prospered, employees were not particularly well paid even within their industry. When it came about, both relationships changed.[23]

These two examples show the principal-agent problem in a simple form. The principals are the employers; the agents, employees at different levels. The problem in each case was what economists call "shirking." This may have been actual shirking in the case of factory pieceworkers. The term, however, is used to refer to any divergence of interest between the principal and agent. In the case of GM, Sloan was not trying to make his managers work harder. He was trying to align their incentives with the enterprise's objectives. "Shirking" in this context means playing for your own or your own division's gain, not the corporation's.

1.3 Relationships with Groups

Our discussion thus far has focused on relations between owner/managers and single employees, that is, on the simplest sorts of organizations. But the sorts of considerations we highlighted also bear on optimal designs for complex organizations. They can be observed at work in historical evolution of such designs, and they can be used to assess the wisdom of particular decisions effecting organizational change (see Chandler 1977).

Expanding our horizons adds additional dimensions to the decisions under study. For the issue is not simply how to align incentives between principal and agent, but also whether to use an agent at all. We assumed in the last section that the decision to hire farmers, workers, and managers had already been made. Here we ask also whether activities should be structured within the business enterprise or belong to the relations between firms.

The limits of the firm can be explored in two dimensions: horizontal and vertical. Horizontal integration refers to the inclusion of many similar elements in a single enterprise. Vertical integration refers to the inclusion of different stages of production within a firm: the "make or buy" decision. We provide two examples of each in turn.

In each case, one example is historical and illustrates the growth or restructuring of a large corporation. The other example is drawn from more recent

22. One sees the same sort of concerns at work in the structure of compensation contract in start-up companies backed by venture capitalists. (See Raff and Crocombe 1989.) Managers carrying heavy and difficult-to-monitor responsibilities are paid relatively heavily, and sometimes even predominantly, in shares and options. Managers in more routine jobs are not.

23. For evidence that this was in fact what the corporation did, see Raff (1989, section 4). Presumably the same obtained for lower-level managers. No data seem to have survived with which one could test the claim.

experience and explores the way in which some firms relinquish activities. Since business history is so often the history of successful enterprises, we have to draw on recent experience for examples of companies that are, in some sense, too big.

Around the turn of the century, it became common to find manufacturing firms that were horizontal conglomerates. The enterprises these corporations owned were diverse as well as complex. Furthermore, the performance of the several component parts was interrelated, not least because there was a common pool of capital and a common credit rating. Since generally speaking there are limits to information-processing capacity, this meant that the owners of the firm and even the managers were in roughly the same situation as Marshall's landowners: they couldn't know as much as they would like—and be able to monitor as well as they would wish—all the operational decision-makers.[24] So whatever the advantages, easily realized or merely potential, behind the new, broader grouping, it posed serious problems of control and motivation.

The common form of organization appropriate to simpler organizations was strictly functional. There was a division responsible for engineering (i.e., design of products and manufacturing processes), for manufacturing, for sales, and for finance (i.e., raising working and investment capital). So long as the shareholders—or at least the top managers—grasped all the major details of the business and the operating circumstances, it was possible for them to assess directly how well all the employees were doing their jobs and to reward them in a way that motivated them to continue or improve as appropriate.

Once the operations grew diverse and complicated, this ceased being possible. In particular, it became extremely difficult to tell whether corporate resources were being used efficiently. Not very much information was available to top managers and shareholders. The information they could easily obtain had too little structure to be very useful. For example, suppose one could actually assess on some absolute scales the average quality of the performances of the engineering group and that of the marketing group. How were they to be weighted against one another in a way that gave their employees helpful incentives?

All this became very obvious to the owners of GM during the inventory crisis of 1920 to which we have referred above. The organization they had invested in so heavily was a sort of holding company of divisions rather than a unitary functionally organized entity (see Williamson 1975, 143–44). But

24. This situation was exacerbated by the absence of helpful accounting conventions and, until the Securities and Exchange Commission Act of 1934, of any statutory obligation to publish even annual balance sheets. There was, of course, some incentive to publish some accounting information in hopes of attracting investors. The scale of fraud in such matters in the 1920s suggests the potential for moral hazard in this situation.

Roe (1990) discusses how various legal changes in the 1930s discouraged active shareholder monitoring even as more information became available.

its divisions were uncoordinated, undirected, and scarcely monitored. There was no systematic financial reporting. Many factory managers were in a position to commit the firm's resources to capital and materials expenditure—indeed, even to executive compensation—without any sort of real coordination or control. When the depression of 1920 struck, the firm was badly overextended. When the new owners wanted to rationalize resource use, they found they had very little appropriate and usable data.

The solution put forward was to restructure operations and information flows so that the firm became tautly divisionalized. That is, it became a collection of divisions, each with its own products, organized internally along functional lines, and substantially self-contained, all formally as before—save for finance. There would be a sort of internal capital market to carry out and monitor resource allocation, and a corporate staff was created with the main tasks of performing the monitoring (via regular and frequent calculations of return on corporate investment in the individual entities) and of planning long-term competitive strategy (i.e., making decisions that implicated future investment plans). Divisional managers were responsible for groups of operations that they could understand and assess. Now their own performance was given a common scale (Johnson and Kaplan 1987, 93–123), and the GM stockholders (or at least those acting in their stead) could compare the performance of Chevrolet and Oldsmobile managers, rewarding the managers and allocating capital appropriately.

All this raises an intriguing question. William C. Durant has often casually been said to have bequeathed this slack divisional form to GM because he liked buying companies but was uninterested in running them. After all, incumbent management was perfectly happy to continue doing that. Perhaps this was indeed Durant's psychological quirk. But he was an active investor. Du Pont bought into GM as a passive investment. The Du Pont executives do not appear to have valued the investment in terms of the personal satisfaction that interfering in GM's affairs might yield. Why then did it make sense for them to keep all these operations grouped together in a single giant enterprise? Why did they not seek to break up GM and select which units of the business they wished to own or control?

Horizontal disintegration would have offered an opportunity to shed risk specific to GM and its particular businesses. The du Ponts and their colleagues might have preferred a more diversified portfolio of investments. And they always could replicate the pattern of the risks and returns offered by their original GM interests by buying and selling shares of the disintegrated component companies on a competitive securities market. By keeping GM unitary, they constrained themselves to owning a controlling interest in all the subsidiary auto companies. They forswore the advantages of making individual investment decisions in order—we presume—to take advantage of other opportunities.

We can, of course, only speculate as to their reasons. But we can speculate

in a structured way. Suppose we start from the assumption that investors want in some general sense to maximize the return on their investment.[25] It is then natural to infer that the Du Pont group felt a strategy of horizontal disintegration would not realize the same value. Why might this have been? On the one hand, perhaps there were simply limits to abilities of the mass of Wall Street investors to understand the value of individual firms' long-term investment programs. This does not seem a strong argument, at least on a priori grounds: why should their analytical skills and those of their advisors have been dramatically less good than those of the du Ponts' private investment advisors? On the other hand, it is plausible to suspect that the Du Pont group saw or expected to realize economies of scope from joint operation (see Raff 1989). They thought that the sort of managerial skills and discipline required to run a large, complex manufacturing enterprise were scarce (that is, that the right sort of managers were a scarce resource), that they possessed on their staff in Wilmington some of the right sort of managers, and that they could use their influence in the GM boardroom to move these managers into GM.[26] Perhaps, that is, they had reasons for believing their employees would run the companies more efficiently than those who would otherwise do so.[27]

Issues of control at the plant level are more complex than at the individual level. In addition to the principal-agent problems discussed above, problems of synergy also arise. It is only worth designing appropriate incentive schemes, after all, if there are benefits to be reaped from joint activity.[28] The problems of principles and agents need to be placed in the context of control over specific assets.

The recent experiences of the Canadian entrepreneur Robert Campeau seem to expose, at least in the short run, the costs of joint operation. Campeau came to public attention as a man who had made a considerable fortune in real estate development. He also had established a beachhead in retailing.[29] He observed that a number of major American department store chains were up for sale through the sale of their holding company, Federated Department Stores. There were many common suppliers among these retail outlets. (In fact, there were even a considerable number of common products offered for sale.) The marketing strategies of the stores were in some cases competitive where head-on competition did not seek to maximize joint profits. Each chain also paid considerable sums for overhead expenses duplicated at every other division. Given the tax code, many of the individual stores were sitting on land that would be more valuable to other owners. Campeau also saw profit opportuni-

25. This seems historically apt. Consider the account of the Du Pont board's discussion of the initial GM investment in Chandler and Salsbury (1971).

26. Again, see ibid.

27. Appropriate compensation was needed, of course, to induce these managers to perform. This was discussed in section 1.2.

28. The benefits, of course, need to be net of any costs.

29. The most notable vehicle for the presence in retailing was Campeau's purchase of the Allied Stores group in 1986.

ties in malls. Once the Campeau Corporation added the Federated group to its Allied Stores, it would control a large fraction of the department store chains prominent enough to anchor suburban malls. Campeau hoped to use this position to extract equity from mall owners and to obtain more favorable rental terms.

It is characteristic of several of these items that the incentives facing managers of the isolated stores or groups of stores would lead to less profitable plans than would the incentives facing the managers of the whole. Joint profits would be higher if actions could be coordinated and centralized than if they were designed independently and competitively.

Most of these sorts of economies were increasing in the size of the venture. Campeau was a wealthy man, but his resources certainly would not stretch to simply buying Federated out of pocket. The American financial markets had recently become amenable to buying bonds issued to finance such transactions, providing another avenue toward unified operations. Campeau could buy the stores at a price greater than they were worth to their current owners (as they currently understood how to run the business) if he could borrow the money. This would, of course, commit him to regular payments to the lenders. The idea was to finance these payments out of the increased profits from the realized economies of common management.

Campeau attempted to buy the stores in 1988. He got involved in a bidding war. He did in the end succeed in purchasing the stores, but as a result of the bidding he paid a hefty price. His ability to meet the coupon on the bonds sold to cover this price turned on two factors. The first was that gross sales for the group would continue to increase at something like 5 percent per annum. The second was that the forecast economies of overhead reduction and economies of superior purchasing and planning procedures could be realized essentially immediately.

It appears that Campeau's calculations of the value and cash flows of the conglomerate firm—which were the ultimate basis of the price Campeau offered and the interest he was prepared to pay—estimated these joint economies without analyzing precisely how and when they would be generated. The most striking example is informational. The different department store chains each had idiosyncratic management information (i.e., computer control) systems. Configuring these to give top management integrated data on inventories and sales at the level of detail needed to bargain with suppliers was a project of massive proportions. The economies would be unavailable in the absence of such an investment in the infrastructure of information. Under pressure for short-term cash, Campeau instead squeezed the relevant budgets. His managers consequently were preoccupied with short-run survival, not long-run investments in information retrieval. Unsurprisingly, the economies that might have followed from common ordering were not rapidly forthcoming. Other projected overhead economies seem to have been equally unrealizable in the short run.

In the fall of 1989, the Campeau Corporation was in the news again. First cash flow problems were rumored. Then some of the company's suppliers expressed hesitation at extending trade credit. This was an extremely serious threat, given that the goods in question were for the Christmas trade. For department stores, the months preceding Christmas are the most sales-extensive period of the year. For a store to run out of money and therefore trade credit and therefore goods to sell in this period would spell complete commercial disaster.

Federated had initially been a profitable going concern. If it had remained independent, its managers would have taken care to have the cash and credit for Christmas, anticipating the familiar yearly cycle. As part of the Campeau firm, however, the Federated cash could be taken for other purposes. Campeau, optimistic about realizing the scale economies, took the cash to pay the interest on his bonds. He left the stores and their managers in the lurch. Alas, they lurched back at him.

Sales growth, always uncertain, emerged distinctly lower than expected, as the economy proved sluggish in 1989. There were no substantial cost reductions to cushion the blow. (Operations did not get more expensive, but they did not get cheaper as fast as Campeau and his bankers had been counting on.) The real estate deals contemplated were complex and required careful negotiation, and the whole project fell apart long before any opportunities arose to exploit the undervalued real estate. The point of the Campeau story, at least up to its moment of crisis, is that the existence of horizontal scope economies does not mean that their extent is unlimited or their timing wholly flexible. Abstract incentives are not everything: it only makes sense to talk about incentives in a particular informational context. Information, as we have stressed, is available only at a cost. In this case, it would take a considerable investment in order to make the cost manageable. Given the price Campeau had to pay, the optimal horizontal boundaries of a retailing firm were not obviously larger than those of Allied or Federated Department Stores, the economies of joint operations and assets notwithstanding.

Unlike the GM example, Campeau's experience appears to reveal the absence of incentives to integrate horizontally. We turn now to the problem of vertical integration, where we pose the same sorts of questions.

Firms constantly face the "make or buy" decision. Needing various products as inputs or various services as aids to merchandising, firms have to decide whether to purchase them in the market or produce them themselves. There are distinctive features in each case, of course. But the general problem is obvious. Any business person needs to have a source of supply of inputs to his or her productive process. (He or she also needs outlets, and the problem is symmetrical for "upstream" and "downstream" transactions.) It often makes sense to rely on the market for these inputs. But there are conditions under which the market does not work well. In such a case, it makes sense to make rather than buy the input.

As in the previous examples, these conditions feature uncertainty in a central role. Information is incomplete, and private incentives may be divergent in uncertain conditions. Vertical integration involves transactions whose effects will be realized only over time, and so involve some ex ante uncertainty, just as in the examples of employees at the turn of the century and department stores now. Vertical integration also involves assets specific to the transactions in question, as in the example of GM's management incentives.

The modern economist's theory of vertical integration has as its centerpiece a concept of idiosyncratic assets, that is, assets whose uses are specific to certain transactions. A careful definition may be helpful. An asset is said to be transaction-specific to the extent it has lower value in any other use (Klein, Crawford, and Alchian 1978). As we argued above, for example, long-time top managers have skills and knowledge specific to their companies and jobs, while relatively unskilled workers do not. This distinction turns out to make equally incisive sense applied to inanimate assets.[30]

If production costs would be increased by forgoing the use of a transaction-specific asset with one or the other of these attributes, then the owner of the specific asset acquires power. When there are many people involved, this is called market power. When there are only a few, it often is termed hold-up power. Given the durable nature of the asset, this power could be exploited opportunistically once the capital was in use. To avoid such a state of affairs, the buyer of the services of the specialized asset would have to have a complete contract, that is, one in which provisions had been made for all conceivable eventualities. It is very difficult and expensive to write such contracts. People cannot process all the information needed to formulate such a document in an uncertain world. And even if they could, the time needed to write it, negotiate it, and—if need be—contest it after the fact would be horrendous. When the use of a specific asset is indicated, therefore, some sort of integration is indicated.[31]

Chandler's celebrated account of Swift's successful introduction of centralized modern meat packing illustrates the main point vividly. Before the 1880s

30. Three distinct kinds of physical asset specificity have been identified by Williamson (see Williamson 1985, 95–96). The first is locational. The second is the ex ante specificity of the purpose-built capital good. The final type includes those assets that do not have any unique aspects ex ante, but that become dedicated to a particular use. (It will be noted that these categories are not necessarily mutually exclusive.)

31. Statistical tests have confirmed the relationship between transaction specificity of assets and various forms of vertical integration. Monteverde and Teece (1982) report that automobile companies were more likely to integrate backward into the production of components if engineering was important or if the item was made by a single supplier. Masten (1984) discovered that aerospace components were more likely to be made internally if they were highly specialized and complex. Joskow (1985) found that vertical integration between electric utilities and coal mines was much more likely for mine-mouth generating plants than for others. In each case, variables indexing transaction specificity significantly affected the decision whether to obtain the desired products through the market or internally. These three examples illustrate the importance of human capital, physical capital, and site specificity, respectively.

fresh meat went east "on the hoof." Animals were shipped live to local slaughterhouses and sold fresh to urban consumers. The animals' rail journey was stressful and resulted in massive losses of weight. There was a clear gain to be had if some way could be discovered to supply fresh meat without shipping live animals.

The modern refrigerated railroad car was invented in 1881.[32] This made it possible to slaughter animals in the West—that is, Chicago—and ship the meat east. But how was the transition to centralized packing to take place? Would there be market transactions? Would railroads sell refrigerated freight services to meat packers or shippers? Would Chicago meat packers sell dressed meat to wholesalers who would transport and sell it in the East?

The refrigerated freight car in the early 1880s was designed to carry perishable goods, and it was in addition the only way to transport such goods from Chicago to New York or Boston. It was an asset specific to this sort of transaction. It was of markedly less value in any other use, and the cost of shipping dressed meat was higher—much higher—by any other facility.

How would a market for refrigerated freight services have worked under these conditions? The answer clearly is badly. The railroads had only minor interest in Swift's business; they had many, many other customers to consider. Given the transaction-specificity of refrigerated cars, a market in their services would have been a bilateral monopoly. There would have been ample scope for bargaining, exploitation, and double-crossing on both sides. Potential entrants into either the refrigerated freight market or the meat-packing business would have been able to anticipate these problems. They would have been discouraged from entering. Even if the potential for bad bargains could have been eliminated by a contract or understanding, the cost of negotiating a suitable arrangement would have been daunting.

Swift's innovation was to create an integrated enterprise that both slaughtered and distributed meat. He expanded the boundaries of his firm to include the functions of shipping and storing dressed meat, that is, to include all the transaction-specific capital. Instead of trying to buy refrigerated freight services from the railroads, he built and operated his own freight cars. Instead of hiring a firm to use these cars to distribute his meat, he included a distribution function within his firm. Instead of relying on the market to buy ice for his refrigerated cars, he built ice stations along the way.[33]

This last, apparently minor, detail of Swift's operation exposes the point clearly. Ice, after all, does not seem to possess the qualities listed above to make an asset transaction-specific. But Swift could not rely on independent suppliers to provide ice at the time and place he needed. And the cost to him

32. It may strike the reader that the passive voice here suppresses the detail of what might be an interesting historical process. But our interest lies in the use of the innovation, not its genesis.

33. One might well ask why Swift did not buy the railroads. Efficiently operated railroads had other valuable uses, and we imagine the purchase cost and the costs of operating such a diversified enterprise would have been greater than the benefits in question here.

of being without ice at that time and place was very great. It was not just the cost of any spoiled meat, but also the damage to the nascent market for his meat from a shortage of supply or a shipment of spoiled meat. Swift could be held up by the owner of an icehouse who had the only ice in the neighborhood. Swift avoided this potential conflict by expanding his firm to the point at which he incorporated all the assets specific to his central activity.[34]

The refrigerated cars were specialized capital goods. The degree of their specialization gave them a great deal of transaction specificity. They illustrate the effect of asset specificity in a dedicated use. An icehouse could be located anywhere. But once it was cited, it became specific to the users in that location. Given a single large user like Swift, the potential for hold-ups was great. As Chandler has written, "the refrigerator car . . . was not the reason Swift became the innovator in high-volume, year-round production of perishable products" (1977, 299). Swift was a successful pioneer, Chandler writes, because he expanded strategically the operations of his meat-packing firm.

A recent episode may balance the historical account of Swift. The issue in this case was disintegration rather than expansion. As before, the choice was where to draw the boundaries of an enterprise, but now within the preexisting boundaries of the firm.

The example concerns the choices made by Charles Brown and the top administration of AT&T on the eve of the agreement to dismantle the Bell System. These men were thinking about the optimal configuration of their firm. They had to make an explicit choice because the historical boundaries of the company were no longer politically viable. AT&T was just too big. The firm's leadership therefore found itself in late 1981 under considerable pressure to decide which of several downsizing alternatives would be best for the firm.[35]

AT&T in 1981 was both an operating and a holding company. It provided long-distance telephone service directly through its Long Lines department. It owned the Bell operating companies (BOCs) that furnished local telephone service. It also owned Western Electric, which manufactured equipment used by AT&T and the BOCs, and Bell Labs, which supplied research and development (R&D) to Western Electric and the Bell System.

The managers' alternatives quickly came down to two. A "horizontal" divestiture would keep AT&T and the upstream Western Electric and Bell Labs together but sever the (horizontal) relationship between AT&T and the BOCs. A "vertical" divestiture would spin off Western Electric and Bell Labs from the providers of telephone service, AT&T and the BOCs. The government in an earlier antitrust suit against Western Electric had tried to effect a vertical divestiture. The suit had been resolved by the 1956 consent decree that left AT&T's structure intact but forced Western Electric to freely license its technology. AT&T's leadership feared in 1981 that Judge Harold H. Greene, who

34. See Kujovich (1970). Yates (1986) would term the ice time-specific as well as location-specific assets.

35. On all of this, see Temin (1987).

would decide the antitrust case then coming to a close, was sympathetic to the goals of the earlier suit. They resolved to make the choice themselves first.

AT&T's vertical integration dated from the early 1880s, the same time as Swift's. AT&T's market position was based on its patents on telephone sets. It needed a supply of telephones in order to extend its market and to earn revenue. Bell tried initially to license manufacturers, but this system broke down quickly as the interests of Bell and the manufacturers diverged. Once having tooled up to produce telephones, the manufacturers wanted to cut prices, expand, and sell to everyone.

These manufacturing plants had acquired transaction-specific assets as a result of their dedication to manufacturing for a sole purchaser. Initially general manufacturers, they came into a position of bilateral monopoly with Bell as a result of acquiring licenses and specialized technology. The result was conflict, bargaining, and nonadherence to the license agreements. AT&T decided that it would be cheaper to have direct control over the transaction-specific manufacturing assets. It acquired Western Electric and made it the sole source of supply for the Bell System (see Smith 1985).

AT&T's horizontal structure had evolved in the early years of the twentieth century in response to the transaction specificity of telephone equipment in use. Telephones and telephone switchboards, after all, are used for communicating with other telephones and switchboards. Midwestern companies kept installing party lines because they were initially cheaper, even though AT&T was trying to set uniform standards and phase out party lines. Improvements in telephone systems were not adopted uniformly. AT&T's management therefore decided to go to a system of wholly owned subsidiaries in order to avoid these problems of partial integration with asset specificity. Like the employers of men around 1900, they found that a long-term arrangement minimized the cost of control (Garnet 1985; Lipartitio 1989).

These transaction specificities were still present in 1981. Local telephone companies still interfaced with each other and Long Lines. Western Electric still made all the equipment they used, while Bell Labs had since the interwar period provided the Bell System's R&D. Which putative markets could work the best?

AT&T's management had little doubt that the market for telephone equipment could not work well. If Western Electric was to become a separate company, the old problems of patent control and uncertain supply would reemerge. The R&D done by Bell Labs was highly specific to the manufacturing done at Western Electric. The managers thought that a future AT&T dependent on the market for its equipment would be at a competitive disadvantage. They thought they needed to control their supply in order to continuously adapt to changing needs. In contrast, they reasoned that the problems of asset specificity in the telephone network had decreased as a result of both the establishment of a uniform technology and installed equipment base and by the growth of regulation.

A little reflection on transaction specificity suggests that this conclusion of

AT&T's management was probably not economically optimal. Many firms were already manufacturing telephone equipment in the 1970s. AT&T's patents had been licensed under the 1956 consent decree, and large parts of the market for equipment had been opened up by Federal Communications Commission (FCC) actions. In addition, the technology of telecommunications was undergoing a radical transformation. The electromechanical switches that had been the basis of Western Electric's success were being phased out in favor of electronic switches, and metallic cables were being replaced by fiber optics. Western Electric had been slow to enter the world of digital electronic switches in the 1970s. It is not clear that the Western Electric assets had much useful transaction specificity left by 1981.[36]

Turning to AT&T's horizontal integration, the process of divesting revealed clearly the transaction specificity of telephone switches. In fact, it became a make-or-break issue in the negotiations for divestiture. The Department of Justice was worried that the switches interfacing local and long-distance calls were too specific to AT&T's operations and would impose additional costs on Long Lines' competitors. It took a flurry of last-minute bargaining to work out a solution that would not allow the divested AT&T to benefit from the transaction specificity of the earlier investments. AT&T took a multibillion dollar write-off shortly after divestiture to pay for the cost of disentangling the human and physical capital of the Bell System (Tunstall 1985).

This surely is a paradox. The theory of transaction-specific assets indicates a clear choice for a vertical divestiture. Yet Brown and the other managers of AT&T never spent time even considering it. They were so convinced of the opposite that they never even studied the choice. Their strong conviction therefore cries out for an explanation.

AT&T's leaders thought the costs of horizontal divestiture were worth incurring for three reasons. As we have said already, they overestimated the asset specificity in Western Electric. They looked back at the historical source of their electromechanical equipment, rather than to future supplies of electronic fixtures. They also relied on continuing regulation of the BOCs to prevent the exercise of monopoly power by the local exchange carriers. And they had by 1981 to consider the political as well as the economic implications of any agreement. Relinquishing Western Electric would have reduced AT&T's size only by one-fifth; spinning off the BOCs reduced it by two-thirds. Having politicized the discussion of the firm by introducing a well-publicized but ill-fated bill into Congress, AT&T's leadership was forced to take dramatic action to head off drastic legislative action.

The concept of transaction specificity is a useful tool for the analysis of

36. Bell Labs' assets were more specific to AT&T's needs, and AT&T's managements were concerned to maintain their R&D edge. They argued that Bell Labs without Western Electric could not function. This is a harder argument to evaluate because the process of R&D is largely hidden from view. But the steady flow of significant telecommunications innovations from small companies supports the inference that here too AT&T management overestimated the amount of transaction specificity.

business decisions about the extent of firms, but it has its limitations. It provides a framework within which to ask questions about the effects of costly information. It directs attention to conditions where divergent interests can impose costs on operations. It provides a way to generalize the questions of control and motivation from individuals to organizational business units.

But how should we react when the theory predicts one kind of institutional arrangement, and historical managers choose another? Like the other concepts described here, the transaction specificity of key assets cannot predict business history, even though it has some predictive power at the industry level. In any individual case, it is not the only factor. It often is an important one, however, in the history of large and complex firms. And when, as in the case of AT&T, managers go against the tide of transaction specificity, the theory suggests either that noneconomic or nonrational considerations are involved. In the case of divestiture, other factors can easily be identified. They were the congressional bill to tighten regulation of AT&T that was in a horse race with the antitrust case to break the company up and nostalgia for the electromechanical past in which Western Electric was the centerpiece of AT&T's patent monopoly and then system integration.

The problems of control seen in the principal-agent relationship at the individual level have reemerged at the business unit level. The problems of reporting and investment that were at issue with individuals are equally difficult at the activity or plant level. We have in this section turned our attention from the design of arrangements for control discussed in section 1.2 to the question of whether to seek or maintain control at all. These questions are intimately related. For only if the incentives are appropriate at the individual level will economies of integration appear, as Campeau discovered when his divisions resisted his attempts to integrate their operations. And only if there are transaction-specific assets will it be worthwhile to design complex solutions to the principal-agent problem, as Sloan understood.

1.4 Relationships with Entire Enterprises

Having progressed from individuals to business units, it is time to go to the firm as a whole. Up to now, managers have been the principals who were analogous to Marshall's landowner. They had to deal with their agents, employees, or subordinate managers. Now, when the whole firm is in view, managers become the agents of the suppliers of capital. These suppliers may be owners who possess equity in companies, or they may be renters who lend money to firms, that is, bondholders.

The questions here are the same as before. Will principals choose to employ agents? If so, how will the principals motivate their agents? What kind of financial arrangements can reduce the costs of the interaction between the principals and agents? And, for business historians, how can managers get caught by injudicious bargains or inefficient financial arrangements?

The analysis of industrial finance in the last generation has been dominated by the Modigliani-Miller theorem asserting that the value of a firm should be independent of the structure of its financial commitments.[37] The basic Modigliani-Miller argument, which is related to one we invoked in a heuristic way above, was that different financial structures would indeed influence the riskiness of the firm's shares, but that investors cared about the riskiness of their overall portfolio rather than that of the individual underlying assets. They could achieve whatever level of overall risk they wanted by undertaking the appropriate borrowing and portfolio diversification. In doing this, they could in effect undo any unwanted risk taken on by individual firms' managers. Thus the mix of securities issued by a firm would not matter for its value: increased idiosyncratic riskiness would not make investors pay less for the shares.[38]

The assumptions behind this argument paralleled the common assumptions about competition more generally in the old-style microeconomic theory. Just as ignorance was ruled out in ordinary trades, bankruptcy—the inability to make transactions that resolve conflicts without bringing in third parties—was ruled out here. There was no risk of discontinuous losses. And assets were all traded on markets big enough for the price to be independent of the actions of any individual. There were no new and untried financial instruments. There was no private placement. There were no transactions large enough to convey information about the transactors' financial positions and needs.

In many times and places, however, such radical assumptions seem very far from relevance. The availability of many publicly traded financial instruments is a twentieth-century phenomenon. And even now, financial transactions can involve new securities or risk bankruptcy. Under these conditions, financial structure affects behavior.

The giant merger wave at the turn of the twentieth century offers a case in point. Many factors determined the timing and incidence of the mergers. The growth of vertically integrated firms discussed above in the context of Swift was one influence. The effect of the depression of the 1890s on firms with large fixed capital stocks was another. And a dramatic change in financial markets was a third.[39]

Prior to the late 1890s, the market for industrial securities was very thin indeed.[40] Railroads had been able to borrow by means of publicly traded bonds and, to a lesser extent, equity. The markets for these securities were well established. Governments traditionally had borrowed by means of negotiable bonds, and utilities possessed a quasi-governmental character. English utilities had raised money through organized capital markets. But the situation

37. Modigliani and Miller (1958). There are, of course, assumptions.

38. This works only for uncorrelated risks. The investor cannot diversify away "systematic risk" that affects all assets at once. See Brealy and Myers (1988).

39. See Chandler (1977), Lamoreaux (1985), and Navin and Sears (1955).

40. For more detail in this vein, see Baskin (1988).

for private enterprise was much more strained. The placements were entirely private. The securities were not really traded on a market. There was real negotiation over the supply and use of resources.

The late 1890s saw the rise of a public market in industrial securities. This amounted to the invention of financial instruments and informational environments to deal with the incentive problems. Private placements were still required to place the bonds initially. But after that, relatively free trading obtained.

This expanded capital market drew on more participants and more money than the nineteenth-century arrangements it replaced. But it did not make all financial transactions like the purchase of a commodity like wheat. Whenever transactions were large in scale relative to the operating cash needs of the firm raising capital, more traditional problems arose. In a world in which bankruptcy was possible—if not to say likely—investors wanted to have more information before committing their funds.

The parallel is with Swift's icehouse. Initially a general-purpose asset, it became transaction-specific by virtue of where it was located and when its services were needed. So too with capital. Initially fully fungible, if a loan or stock purchase is to provide a major part of the capital for a firm, the capital becomes more specific to this transaction.

Once the capital is committed, the lender and borrower or investor and manager are in the position of bilateral monopoly characteristic of transaction-specific assets. The agent has acquired capital; she now has every incentive to run off with it, that is, to use it for her benefit, not the investor's. The principal therefore has a need to monitor the agent's actions, to make sure that the funds are used to best advantage. The agent is in the position Sloan's managers in charge of GM's divisions.

In the midst of the 1920 stock market crisis, it emerged that William C. Durant had been secretly buying GM stock on the market to prop the price up. Durant had been buying on margin from a large number of stockbrokers. Given a recent steady decline in GM's share price and in share prices generally, he had become impossibly overextended. If Durant defaulted on his loans, as seemed quite likely, the brokers would dump the shares they held as collateral on the market. The blocks of stock in question were large, and the market was already skittish. Such a sale would surely make raising funds for GM capital investment programs more difficult.

In his capacity as head of GM, Durant was supposed to be acting as an agent for the owners of GM stock, his principals. He maintained that he was buying stock to protect the financial interests of friends who had invested in the shares on his recommendation and thus in the interests of all GM shareholders generally. The Du Pont group, on the other hand, suspected that he was merely trying to prop up the value of collateral for other investments—speculative investments—that he had made. They therefore felt that he had pursued his own objectives opportunistically in exactly the selfish way that the possession of transaction- (in this case, enterprise-) specific assets al-

lowed. Durant was acting on his own account, not that of GM's shareholders. He was in effect using GM's assets to bolster his personal position, not the firm's.

The Du Pont group was a principal that had found the existing arrangement to be inadequate to protect it from the opportunities created by transaction-specific assets. The positions in GM and its stock were transaction-specific by virtue of their size, that is, by virtue of Du Pont's large holdings of stock and Durant's pivotal place at the top of the GM's management. Durant's and the Du Pont interest's transactions were too large relative to the size of GM for the market to absorb either of them without effect.

Durant appealed to the Du Pont group for help in his distress. They were willing to bail him out to protect themselves, but unwilling to allow the re-creation of the opportunity Durant had just exploited. They felt his secrecy and evasions regarding personal financial matters were of a piece with his reluctance to share or even regularly generate financial and operating statistics about the firm. They therefore performed in this market the equivalent of vertical integration. They bought Durant out and took control of GM.

By the 1980s, the market for institutional securities was performing somewhat better. Robert Campeau could raise the money for his 1986 acquisition on relatively competitive terms. But in 1989 when the Christmas crisis struck, he was not an anonymous transactor but conspicuously in distress. The market failed again. Almost a hundred years after the birth of the market for corporate securities, with the Dow wire, vast statistical databases, and powerful personal computers sitting on every financial analyst's desk, the market still would not buy Campeau's bonds. Campeau did not need much money. But he needed it very soon, and all the world knew it (see Raff and Salmon manuscript, fig. 2). He could not raise cash from real estate sale-leasebacks because potential buyers knew who would have to find the money to pay the lease. Campeau's very fund-raising transaction told everyone about the corporation's financial position and its riskiness.

In a transaction startlingly similar to Durant's seventy years earlier, Campeau turned to some of his friends. He sold a controlling interest in his firm to Olympia and York, another Canadian real estate firm. Like Durant, Campeau found that a private placement offered advantage (a higher price based on the more detailed knowledge) not present in a market transaction. Like the Du Pont executives, Olympia and York did not want to allow Campeau the liberty of going off and making further mistakes.

But even the infusion of capital from Olympia and York proved insufficient to maintain the Campeau firm. Soon after Christmas, rumors began to fly that various department stores were up for sale (*New York Times,* passim). Unlike GM, where a change of leadership revived an economically sound organization, Campeau's firm had outgrown its economic limits. It had expanded beyond the point where the gains from internal operations outweighed the costs of acquisition and integration. The constraints imposed by the capital market—the extent to which the Campeau company had to borrow to raise the

cash it needed for ordinary operations—did not allow time for the anticipated cost savings from integrated operations to be realized. However beneficial these economies would be in a steady state, the investment seemed to be too risky in the current financial conditions. Campeau had gone well over the line. The creditors did not trust him and did not wish to throw good money after bad. Chapter 11 bankruptcy proceedings were initiated in February 1990.

Decisions at this third level are symmetrical to those at the preceding two. Principals have trouble directing agents to do their bidding equally at the farm level observed by Marshall and at the firm level in GM. And the question of hiring and firing, of integrating or not, is mirrored by the question of financing or not. Only when there is mutual advantage will a bargain be struck. But, as these examples show all too clearly, advantage appears only dimly in a complex and changing world. Information is costly and hard to find at all levels. Who knows what and when is a crucial element in the structure of relationships and deals.

1.5 Conclusion

The traditional economics of industry assumed that most industries, and more broadly most economic exchanges, were competitive. Two assumptions were therefore central in analyses. First, knowledge was possessed by all. Second, no one actor was important enough to affect the price of any transaction. Under these circumstances, decision-makers would be indifferent whether they participated in any particular activity. Activities would be chosen even if they were only marginally more rewarding than the alternatives. The pay for working would be almost the same in any job as in the next best alternative. The price paid for any asset would be the same price that many other people would be willing to pay. The interest rate for loans to different borrowers would be essentially uniform. There would be no agency problem of any form.

The recent economic theory of industry and firms has turned its attention to conditions of imperfect information and limited competition. Attention has thus turned to those conditions where the two assumptions of the traditional theory are not satisfied. Knowledge is assumed to be partial and costly. Situations arise in which a few individuals struggle for control. It therefore matters for the outcome and structure of these transactions who knows what. Particular structures of information may induce inefficiencies and gross distortions.

Agency theories have suggested certain ways out of the dilemmas and burdens threatened by these empirically ubiquitous conditions, and new empirical work has successfully tested the relevance of these theories in a variety of contexts. The examples presented here show how the basic, underlying reasoning can be used to give explanations in business history. The theories, based as the are on profit maximization, are prescriptive as well as descriptive. They always provide a cogent, systematic set of questions. They often provide a standard against which to evaluate actions. They sometimes suggest out-

comes that do not at first seem likely or may not even have happened. Either situation provides food for further, focused thought.

The theories ought, therefore, to be useful to business historians. It is our hope as well that the stories business historians tell will stimulate economists to rethink and extend their theories. When the existing theories do not predict well, this may indicate that the theory needs amendment. When the choices of business people cannot be subsumed under a well-formulated case, there is an opportunity to extend theories.

Historians are good at empathy. Economics can supply a little fruitful alienation. The best relationships have a little tension in them.[41] Business history and economic theory can learn from and enhance one another.

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41. "Is there no change of death in Paradise? / Does ripe fruit never fall?" (Stevens 1954, 69).

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Comment

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In their paper, Daniel Raff and Peter Temin offer us a lively and elegantly argued statement on the relevance of newer economic theory to the study of business history. Both the economist and the business historian will find much in their paper to contemplate.

In spite of providing us with a brief but cogent sketch of the two dominant approaches to economic thought—English deductionism and German inductionism—Raff and Temin have short-shrifted their readers in not developing a fuller account of how both economists' and business historians' understanding of the firm has changed in the last three to five decades. For example, they argue at the outset that traditional economic theory's treatment of the firm has been of limited use to business people and business historians. But one should not assume that business historians paid no heed to economic thought, because many business historians worked quite diligently to write firm-based business history that was consistent with or shaped by the evolving theory of the firm—theory to which economists contributed all along. Nor do Raff and Temin lay out how economists contemplating both firm and larger economic behavior responded to the work of business historians in their derivation of the new economic theory that Raff and Temin argue is so valuable to business historians.

Perhaps Raff and Temin believe such a developmental history of these two

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fields is unnecessary given that such an economist as Oliver Williamson, whose work figures heavily in their analysis, has written on the historical development of the new economic theory in both his *Economic Institutions of Capitalism* and the autobiographical sketch he included in his collection of essays, *Economic Organization*, and given Thomas McCraw's portrait of business historian Alfred D. Chandler Jr.'s evolving scholarship first published in *Reviews in American History* and later introducing *The Essential Alfred Chandler*.[1] But I, for one, would have liked to have seen the authors include a much fuller section on how these two fields have developed to the point where they can pronounce the new economic theory of great utility to business historians and, presumably, vice versa.

If I read Raff and Temin correctly, the basis of the new theory they advocate stems from George Stigler's classic paper of 1961, "The Economics of Information," and the body of works that followed from it. These works rejected older economic theory with its assumptions that knowledge was essentially a free good, that most industries were competitive, and that no single actor was big enough to affect the price of any transaction. Information, like other goods, is costly, and how much one has of it has definite consequences for decision making. Raff and Temin seek in their paper to draw out more explicitly the useful and critical connections among the Williamsonian theory of the firm, Stiglerian economics of imperfect information, and Marshallian-inspired agency theory and, in their words, "to suggest . . . a set of concepts business historians might use to organize their data."

They do so by illustrating three levels of managerial decisions: "organizing the work of individuals," "organizing whole production units," and "organizing finance to pay for the enterprise." Within each of these three areas of managerial activity, Raff and Temin use specific historical episodes to demonstrate the utility to business historians of the concepts from the new economic theory. Raff and Temin's articulation of agency theory is extremely helpful, but it also poses some problems. The authors argue that a "single logic" governs principal-agent relations at all three levels of managerial decision making within the firm. Agency theory suggests that the major problem is for the principal to devise incentives and controls to ensure that agents serve completely or "maximize" the interests of the principal rather than serving their own interests to the detriment of their principal's interests. The ideal scheme is, of course, to structure principal-agent relations, systems of controls, and incentives such that the interests of both principal and agent are maximized.

1. Oliver E. Williamson, *The Economic Institutions of Capitalism* (New York: Free Press, 1985); Oliver E. Williamson, *Economic Organization: Firms, Markets, and Policy Control* (New York: New York University Press, 1986), xi–xviii; Thomas McCraw, "The Challenge of Alfred D. Chandler," *Reviews in American History* 14(1986): 160–78; Thomas McCraw, ed., *The Essential Alfred Chandler: Essays toward a Historical Theory of Big Business* (Boston: Harvard Business School Press, 1988).

But indeed such a set of conditions rarely exists, and the past is replete with cases in which principals maximized their own interests while not protecting those of their agents (some would call such instances "exploitation") and where agents put their own interests above that of their principals (Raff and Temin call this "shirking"). The critical question for me is, speaking as a historian, what is the ultimate utility of determining whether someone in the past exploited or shirked in a relationship?

What is most problematic about the employment of agency theory, either by the economist or the historian, is establishing an appropriate time frame for analysis. In one of the most frequently cited articles ever published in the *Harvard Business Review* (58 [1980]: 67–77), "Managing Our Way to Economic Decline," Robert H. Hayes and William J. Abernathy charged that corporate managers were making decisions to maximize profits in the short run—that is, for the next quarterly report—rather than taking a longer-run view and pursuing long-term objectives for growth and return on investment. The phenomenon Hayes and Abernathy observed could be explained easily using agency theory. But so what? Beyond allowing the scholar to say whether shirking, exploitation, or optimization has occurred, does the analysis help us answer the questions of why and how? If Thomas Johnson (chap. 2 in this volume) is correct that inappropriate accounting rules have led to short-run maximization in the United States, can agency theory tell us why this happened here and how? For this historian, at least, the new economic theory does not go far enough in explaining what aesthetic, cultural, psychological, and other factors come into play when managers, in the face of imperfect information, pursue particular strategies in managing their workers and their nonhuman assets. In other words, I am frankly skeptical of a "single logic" adequately accounting for or guiding decisions at all levels of the firm.

In particular, the analysis in Raff and Temin's paper ignores one very important area of enterprise altogether—in shorthand, Schumpeterian economics. One of the critical aspects of managerial activity surely must be *deciding what to produce.* Such decision making is part of the larger area of entrepreneurship, which is not addressed in this paper. Marshall's (and, indeed, Raff's and Temin's) assumption that all farmers are equal is essentially a statement that rules out the possibility of innovation and entrepreneurship, phenomena that have played a major role in the history of business.

Raff and Temin discuss relationships with groups and devote considerable discussion to horizontal boundaries. Here is where most of my responses to the paper lie. The authors provide an explication of GM's divisionalization. Such a reorganization produced what might be thought of as an internal capital market, made possible by the establishment of a common scale for the evaluation of economic performance across divisions. Despite their earlier recognition that information is costly and not perfect, their account here assumes perfect information. But the reality is very different. Du Pont's post-1921 his-

tory is literally full of instances in which the multidivisional firm did not operate in the way Chandler and Williamson would have it. I cite but two examples.

Raff and Temin might consider Du Pont's New Venture Program of the 1960s, which is discussed at length in the study I published with John K. Smith.[2] Here is an instance in which, despite the company's possession of return-on-investment tools, Du Pont's executives had absolutely no rational way for allocating capital because they did not possess the kind of information necessary to make sound judgments across the firm's divisions. The very idea of an effective internal capital market within a decentralized firm such as Du Pont or GM presupposes better information than perhaps really exists in such firms. Decision making, therefore, must be made on some other grounds. What might those grounds be?

The authors might also ponder transfer pricing deficiencies. In Du Pont in the 1940s and 1950s, some departments selling chemical intermediates to other departments kept two sets of books, the "official books" by which transfer prices were negotiated and the "real books" by which division heads made decisions affecting their division's overall allocation of resources. Within the multidivisional, diversified firm, there has been continual difficulty in assessing Du Pont intermediates' performance because some intermediates are not available on the open market, because those that are available are sometimes not perfect substitutes, and because when market-obtained intermediates are available (and, therefore, a market price is valid), executives have been unwilling to discount potential improvements to intermediate products and processes that might come from R&D pursued by those divisions selling the intermediates.[3] This last point is related to the authors' discussion—and Williamson's analysis—of asset specificity.

Raff and Temin explore the question of why the du Ponts did not break up GM. Here the record is pretty clear—at least to me. First, Pierre du Pont and John Jacob Raskob viewed the automobile industry as the major growth industry of their period. They believed the industry was a promising outlet for their hoard of cash earned from World War I explosives sales. The Du Pont Company itself was investing some of this money to diversify the firm away from explosives, and the architects of the strategy had identified the automobile industry as a major market for the company's new products (paints, lacquers, plastics, artificial fibers, artificial leather, fuel additives, etc.). By buying into GM, Du Pont could obtain a captive market (or so the Du Pont people initially believed and so charged the Justice Department in the antitrust case that eventually forced Du Pont to divest its GM holdings). In reality, the automotive markets were indeed huge and proved to be critical for the growth and performance of Du Pont in the 1920s and 1930s.

2. David A. Hounshell and John Kenly Smith, Jr., *Science and Corporate Strategy: Du Pont R&D, 1902–1980* (New York and Cambridge: Cambridge University Press, 1988), 509–40.

3. Ibid., 580–82.

Finally, GM is not an example of perfect horizontal combination. That is, not all GM units or divisions are identical. GM's divisions, one could argue, were producing different products; a Chevy is not a Cadillac. In fact, this point becomes all the more clear after the du Ponts came into the picture and forced Durant out. Sloan's policy of a car for every purpose and purse, the rethinking of the Chevrolet Division in the 1920s (which lead in 1927 to Chevy blowing the Model T out of the market), and the creation of the Pontiac Division to fill a void in the segmented market, all provide testimony to GM's and Du Pont's long-term investment strategy, their recognition of multiple markets within the automobile industry, and their belief in economies of both scale and scope. Finally, one must remember that GM was also characterized by its verticality, which the authors do not address in any detail in this section of the paper.

The authors also discuss the vertical boundaries of the firm and emphasize the concept of transaction or asset specificity, although they play down one of the four kinds of asset specificity articulated by Williamson,[4] namely human asset specificity. One of Du Pont's major weaknesses in developing a pharmaceuticals business has been its lack of know-how in getting compounds cleared through the regulatory/clearance maze.[5] The recently announced Du Pont–Merck pharmaceuticals joint venture was made in large part because Du Pont needed Merck's experience with Food and Drug Administration and other regulatory-body clearance procedures in order to get some very promising compounds into the market.

I want to suggest an alternative explanation for the manner in which AT&T divested, emphasizing similar human asset specificity. I believe AT&T executives saw transaction specificity not in the way interpreted by Raff and Temin but by their assessment of Western Electric's expertise and capabilities—capabilities they did not believe could be easily secured in the marketplace or grown anew. Here I refer to development capabilities, which are in many ways more critical to successful technological innovation than Nobel-prize–caliber research. The success of Bell Labs as an institution rested as much on its and Western Electric's development capabilities as it did on its research per se. The authors discount far too heavily the perceived value of Western Electric in the minds of AT&T executives.

Unlike Hayes and Abernathy's typical managers, AT&T's executives were seeking long-term goals when they charted how they would carve up the pie. They sought entry into new information-processing markets (integrated information processing in particular), which made Western Electric and Bell Labs appear to be transaction-specific and therefore governed their strategy to divest horizontally rather than vertically. On a short-term basis, this type of divestment might have been nonoptimal, but Brown et al. were not thinking short-term. They were looking long-term and working in an entrepreneurial

4. Williamson, *Economic Institutions of Capitalism.*
5. Hounshell and Smith, *Science and Corporate Strategy,* 464–73.

mode that, as I noted earlier, is not accommodated in the new economic theory, as presented by Raff and Temin. Divestment vertically would have left them, I believe, with fewer long-term development capabilities in areas they perceived as having high potential for growth.

Raff and Temin's assessment of AT&T's divestiture raises the fundamental question about the ultimate goals of the economist and the historian. If economic theory suggests that a company or an executive did not maximize profit, what should be our response as historians and economists? Here, I believe, the goals of economists and historians diverge. Raff and Temin suggest that the historian is merely a teller of stories, a suggestion that grossly underrates what historians do. In interpreting the past, the historian seeks to understand and to explain, not just to tell a story and certainly not to castigate or to correct. The historian is prone to pay special attention to the particularities of past events and to the context in which they occurred. But the best historians are also interested in drawing generalizations from the events of the past. Gauging by Raff and Temin's paper, the economist seeks to test current theories on the past and sometimes to test the past as interpreted by historians with current theories. In some instances the economist seeks to expose and to rectify the past.

Business historians and economists have made substantial progress in the last few decades by looking at each other's work. If this conference serves the purpose of opening a more formal dialogue between the two disciplines, so much the better. Yet we must recognize that our ultimate goals might, in fact, be different.