

# THE INTERNET AND FINANCIAL MARKET STRUCTURE

WILLIAM J. WILHELM, JR  
*Saïd Business School, Oxford*<sup>1</sup>

*Financial markets are markets for information. As such, they are directly influenced by advances in information dissemination, storage, and processing associated with the commercial development of the Internet. On the other hand, given the long-standing centrality of information in financial markets, the consequences of the Internet for financial markets can be understood as evolutionary rather than revolutionary. This article provides a framework for understanding how the historical interplay between information technology and human capital has influenced financial market structure. In doing so, it sheds light on the recent reorganization of financial markets. The daring reader might infer implications for reorganization of product markets where the impact of the Internet is more abrupt.*

## I. INTRODUCTION

Financial markets provide for trade in financial capital. But money is just a scheme for tracking the relative purchasing power of individuals and organizations and so, fundamentally, financial markets are information markets—perhaps the longest standing and most highly developed. Likewise, the products and services that financial intermediaries offer to promote trade in information are themselves information intensive. Since the Internet presents un-

precedented capacity for information dissemination, storage, and processing, one might then reasonably expect it to have a profound effect on financial intermediaries. In fact, early proponents of the Internet touted the demise of such intermediaries as a primary social benefit of the new technology. In this article, I examine this argument rather more carefully through the lens of the financial markets. However, I hope to suggest some implications of the Internet for organizational and industry structure generally.

<sup>1</sup> Further elaboration of the ideas expressed in this article can be found in my forthcoming book with Joseph Downing entitled *Information Markets* (Wilhelm and Downing, 2001). I have benefited from discussion with or comments from Geoff Boisi, Michael Millette, Vic Simone, Tim Opler, Alec Petro, and Pegaret Pichler, but I take full responsibility for any unintended interpretation of our conversations.

Where financial intermediaries do little more than pass along or disseminate information, there is some merit to the argument that intermediaries are on the decline. In the USA, at least, stockbrokers are finding it increasingly difficult to compete with online trading platforms. On the other hand, displacement of human judgement from mundane functions is old news in financial markets. Automated teller machines have chipped away at the functions of bank tellers for over 20 years. More recently, the lending function in many banks is being standardized and mechanized to the point where far fewer loan officers are required to manage a portfolio of the same size. The same is true in the securities markets, where the scope of human judgement is being leveraged and sometimes displaced by electronic order-processing systems, electronic limit order books, and electronic auctions.

In contrast, the historically most lucrative human-judgement-intensive functions, such as corporate finance or 'dealmaking' functions in investment banks, will not soon be displaced. Rather, the Internet will reshape the organization of these functions as information storage and dissemination are unbundled from higher-level functions, at least implicitly. For example, Credit Suisse First Boston (CSFB), a large, full-service banking organization, nominally 'employs' the star technology banker Frank Quattrone. But, as I argue shortly, it is probably more accurate to think of Quattrone as an independent content provider who, for the moment, has chosen CSFB as his distribution network. Simply put, I envision a world comprised of perhaps fewer but even more powerful individual human capitalists whose talent is leveraged by advanced information technology and who essentially outsource distribution services to large-scale 'financial factories' that specialize in lower-margin data processing and mass-marketing functions.

In the remainder of the article, I flesh out this argument by first outlining the fundamental functions of financial intermediaries. I then explain why the Internet's increased *capacity* for information exchange does not imply an increase in the *realized level* of exchange. The basic idea is that information, and financial information in particular, often has strategic value. As a consequence, a bigger or less exclusive pipeline for information could plausibly lead to reduced flow of information. I then use the

investment banking syndicate as an example to illustrate this idea and to examine how banks are responding to the technological advances associated with the Internet. I then offer a broader, evolutionary perspective on the financial markets that emphasizes the historical interplay between information technology and human capital. I conclude the article by offering a perspective on the ongoing reorganization of the financial services industry and by considering whether the Internet will be seen from a historical perspective to have been revolutionary or evolutionary in its influence on financial market structure.

## II. THE ECONOMIC FUNCTIONS OF FINANCIAL INTERMEDIARIES

Bankers, brokers, market-makers, and other financial intermediaries grease the wheels of exchange in financial markets. *How* they do this depends on the state of technology and regulatory constraints. But in the midst of great upheaval in both the technology and regulation of financial markets, it is easy to lose sight of the fact that *what* financial intermediaries do is relatively stable. Robert Merton and Zvi Bodie suggest a taxonomy that distinguishes between these stable functions of a financial system and their sometimes arbitrary execution that is particularly useful for understanding how financial intermediaries adapt to changes in technology and regulation (Merton and Bodie, 1995; see also Merton, 1990).

At the core of any financial system must lie a means of clearing and settling payments. In modern economies, this function is already highly mechanized. A second function of any financial system is to provide means for pooling savings. Large-scale industrial production requires investment well beyond the means of most individuals. Banks, mutual funds, pension funds, and the like pool the resources of many individuals for investment in large-scale projects. Pooling resources also promotes more efficient risk-sharing by providing investors with relatively small savings with a level of diversification that would be costly, if not impossible, to achieve otherwise. Once pooled, savings are generally transferred across time and space. A geographical correspondence between savings and investment opportunities would be purely happenstance. Likewise, individuals, organizations, and economies at

large are net borrowers at some stages of their life cycle and net savers at others. Finally, a financial system must provide liquidity for financial claims to allow both borrowers and lenders to respond to changes in the economic environment.

Given a well-functioning legal system that protects contracts and individual property rights, a condition often taken for granted, these five functions are largely a matter of record-keeping and therefore modern information technology provides for a high degree of mechanization. In other words, functions involving information storage and dissemination, historically carried out by people, are being disembodied. In the process, these functions become commodities that remain profitable only in large-scale production by highly specialized intermediaries.

The securities custody and transaction processing businesses provide a window to the extreme scale economies in information storage and dissemination. As of June 1999, the top 15 global custodians held about \$32 trillion in assets under custody (see Credit Suisse First Boston, 2000). The top five accounted for about 76 per cent and the top ten about 94 per cent. The Bank of New York, the top bank with almost \$6 trillion under custody, held about 20 times the amount of assets held by number 15, Lloyds Bank Securities Services. The balance changed only slightly in June 1999 when Lloyds withdrew from the custody business and recommended that its customers turn to State Street Corporation, second to the Bank of New York in assets under custody. In short, a few large banks dominate asset custody, and concentration and scale are on the rise.

The last function of financial intermediaries is to promote exchange of information among self-interested parties. The most insidious, and subtle, frictions in financial markets arise from differences in information among trading partners. For example, corporate borrowers often have a clearer understanding of their ability to repay loans than do potential lenders. Borrowers therefore have an advantage

because they only accept loan terms that are commensurate with or better than their credit quality warrants. From the lender's perspective, borrowers *adversely select* into transactions that favour them. Although individual borrowers have an interest in protecting this strategic advantage, absent some form of redress, lenders shy away from such transactions because they expect to do no better than break even. In the worst cases, otherwise mutually beneficial trades simply do not occur. The same problem arises in securities markets, where institutional traders compete for an informational edge over one another and almost certainly maintain a collective edge over retail investors.

Returning to the lending example, after a loan is made borrowers have an incentive to invest in projects that are riskier than the lender envisioned when the loan terms were set. In essence, the borrower's actions alter the terms of the transaction after the fact. This *moral hazard* arises when parties to a transaction influence events that bear on their ability to carry out their obligations. Moral hazard is particularly common in the provision of guarantees or insurance. The purchaser of a fixed-price car insurance policy, for example, essentially receives more insurance for his money by driving recklessly. Likewise, the insurer can reduce the insured's level of protection by recklessly investing the proceeds from the sale of the policy and thereby weakening its ability to make payments if the insured is involved in an accident. Perhaps less obviously, such threats arise in any setting where counter-parties make contingent commitments to one another. For example, the institutional fabric of the over-the-counter (OTC) derivatives markets developed over the last two decades, including features such as AAA trading subsidiaries and standardized master agreements, can be understood to reflect the threat of moral hazard.<sup>2</sup>

Finally, information production often is subject to externalities because information is costly to produce but cheap to reproduce. In fact, information is perhaps too easy to reproduce—once revealed, it is

<sup>2</sup> Master agreements essentially establish default provisions, including netting arrangements, for multiple derivative contracts between two counter-parties. The first AAA subsidiary, Merrill Lynch Derivatives Products (MLDP), was established in 1991 to shield Merrill's counter-parties from the credit risk of the parent firm at a time when the enforceability of OTC derivative contracts remained in question. Salomon Brothers followed in 1993 with Salomon Swapco in the aftermath of the parent's credit rating decline associated with the firm's 1991 violations of US Treasury auction bidding guidelines.

difficult to exclude others from further use of information. When information is costly to produce and its value is mainly strategic, as is often the case in financial markets, information producers have the incentive to protect their investment by holding their cards close to the vest. But doing so obstructs trade and undermines the social interest in making the most of information's non-rival nature. By 'non-rival', economists mean that information, unlike most physical assets, is not limited to exclusive use. In financial markets, wide dissemination of information increases social welfare by ensuring more efficient allocation of scarce resources. Financial intermediaries promote trade in financial markets, and thereby promote social welfare, by balancing the tension between self-interest and collective interests in information.

Primitive information technology led early financial intermediaries to form information networks by scattering human repositories for information as widely as possible (*The Economist*, 26 October 1996). Fair dealing over time within the network led to strong relationships bound by trust, through which information moved about more freely than it would have otherwise. The Internet upsets this delicate balance by creating greater potential for unbundling the transmission network from the intermediary. This point highlights an important difference between networks that simply disseminate information and those that promote sharing of strategic information. As an example of the former, in a telephone network the service provider and the customer are clearly distinguished. As such, we might expect customers to pay fees according to their demands on the scarce bandwidth they consume.

But in networks like securities markets, the distinction between service provider and customer is less clear. The hardware or bandwidth for communication alone may be worth little if the incentives to share information are weak. In securities markets, the pipeline effectively becomes wider as more people use it because greater participation en-

hances liquidity. In other words, although physical congestion increases as participation widens, the net effect might be to improve the transmission of information through the network. Another way of thinking about this is that wider participation provides for wider sharing of the costs of information production. But any potential individual contributor to market liquidity has the incentive to withdraw when things get difficult and allow others to bear the burden of price discovery. For example, think of the liquidity crisis that revolved around the seemingly benign practice of dynamic portfolio insurance during the 1987 stock-market crash. This perspective not only suggests access fees that increase in a trader's demand for liquidity but might also argue for payment for order flow or liquidity provision at times when liquidity is particularly dear.

The goods and services that financial intermediaries provide in this capacity are subject to the same problem. Financial products are easy to reverse-engineer and are generally built on ideas that receive little protection from copyright, trade secret, and patent law.<sup>3</sup> The registration of public securities offerings, for example, virtually guarantees the reverse-engineering of the transaction's innovative features before the typically high costs of innovation to the pioneering bank are covered. In fact, Peter Tufano found that pioneers most frequently complete only one transaction before a new product is replicated by competitors (Tufano, 1989). Equally problematic is that the productive assets of financial firms are often concentrated in human capital embodied in a notoriously mobile work-force. For example, Deutsche Bank's entire technology banking group (more than 70 bankers) left to join CSFB in the summer of 1998. Ironically, the departure of the team built by Frank Quattrone, Bill Brady, and George Boutros came only 2 years after Deutsche bid the three away from Morgan Stanley.

Financial innovation has long flourished in the context of close relationships and powerful intermediaries that tempered competition and thereby protected easily copied ideas and products, assuring at least a

<sup>3</sup> However, a 1998 appellate court decision in *State Street Bank v. Signature Financial Group* substantially altered expectations regarding the legitimacy of US business-method patents generally, and provoked a flurry of financial patent applications (see Lerner, 2000). The decision also led to considerable soul-searching among US law-makers, leading some to suggest revisions to patent law that would parallel the greater capacity in Europe for contesting an application prior to its approval. In Wilhelm and Downing (2001), I suggest that the rush to patent among financial firms can be understood as a response to a decline in non-legal, organizational protections associated with the industry's increasing substitution of financial capital for human capital.

fair return on investment.<sup>4</sup> Seemingly, reputations and relationships, the foundations for networks of trust, were not easily disembodied from their originators—you cannot buy a reputation.<sup>5</sup> But the Internet appears to be upsetting a delicate balance as human capital is transformed and in some instances displaced by information technology that codifies what previously was embodied in human intermediaries.<sup>6</sup>

The tension between human capital and information technology has profound consequences for the organization and management of intermediary firms. The small family partnerships that dominated early financial markets provided an environment in which human capital was nurtured and passed from one generation to the next. By contrast, the modern financial firm depends far more on financial capital to support the large-scale but low-margin operations that remain when intermediary functions are codified. The evolution of the underwriting syndicate, particularly recent efforts to shift various of its functions to more permanent electronic platforms, illustrates this point.

### III. INVESTMENT BANKING SYNDICATES

At the turn of the twentieth century, the investment banking industry was characterized by relatively small organizations headed by dominant individuals such as J. P. Morgan—content originators, if you will. Organizations were small for two reasons. First, the knowledge underlying the information goods produced by investment bankers was mostly tacit. The scale and scope of its application was then limited in large part by the physical capacity of the individual in which it was embodied. Obviously, some knowledge and responsibility could be shared, but technological and theoretical limits to codification were substantial. Even where codification was possible, monitoring one's peers in the application of shared intellectual assets was difficult.

A primary consequence of the fragmentation of the industry was that individual banks often could not meet the needs of governments and the large-scale industrial concerns spawned by the second industrial revolution. In many functions, content production and distribution were coordinated informally, often through family connections or within well-defined social networks such as the German-Jewish banking community in New York (see Supple, 1957). In the case of securities offerings, a formal syndication platform evolved. Jay Cooke, dubbed the 'modern Midas' for his role in marketing Civil War bonds, is generally credited with introducing the underwriting syndicate to the US markets after having observed its application in France. Prior to 1890, syndicates were most commonly formed in the USA to handle massive bond issues for railroading concerns. The syndicate temporarily brought together resources from many banks to purchase securities from the issuing firm or government and then provide for their distribution through the combined networks of the syndicate members.

Until very recently, the underwriting syndicate had changed little since its inception. Modern syndicates have a lead manager, or perhaps several co-managers, who advise the issuer in structuring the transaction and are responsible for coordinating the sales and distribution effort of other syndicate members—often upwards of 20 banks. Chief among the sales efforts is responsibility for managing the book of indications of interest from institutional investors, essentially price/quantity bids for the securities on offer. The lead bank is also responsible for allocating securities among the selling members of the syndicate and so effectively determines the commissions earned by other syndicate members. Whether the offering is successful or not, the codified elements of the underwriting syndicate are formally dissolved upon completion. The price of admission to underwriting syndicates is a proven ability to admit others to one's own deals. As a consequence, banks tend to work repeatedly with one another so that syndicate composition across

<sup>4</sup> A recent paper by Bharat Anand and Alexander Galetovic formalizes the competitive effects of the industry's dependence on human capital (see Anand and Galetovic, 2000).

<sup>5</sup> Or can you? For thoughts on the matter, see Tadelis (1999).

<sup>6</sup> In the words of Michael Polanyi, what previously was tacit knowledge is being converted to explicit knowledge (Polanyi, 1966). In his 1973 book, *The Coming of Post-industrial Society*, Daniel Bell identified the growing capacity for codifying theoretical knowledge as an 'axial principle' reshaping modern society.

deals is quite stable, with only the lead manager(s) varying.

Although syndication takes its most explicit form in securities underwriting, coordinated effort and repeated dealing through complex networks of relationships are pervasive in the investment banking industry. Foreign-exchange markets might be thought of as syndicates comprised of the many dealers in the market loosely bound by a tacit but clear understanding of each other's capacity for analysis of market conditions (content) and putting capital at risk (distribution capacity). Even in their corporate advisory role, perhaps the most tacit of functions, investment bankers repeatedly work with one another for a single client or negotiate with one another on behalf of adversarial clients. In doing so, banks make unique contributions to the bundle of content defining a particular 'deal'. Content might involve only advice, but more typically includes the execution of securities transactions necessary for financial restructuring. Distribution capacity might come bundled with advice from one or more banks or just as likely be provided, at least in part, by other banks. But again, *the coordination among intermediaries is more nearly transaction specific*.

On the surface of things, underwriting syndicates appear rather inefficient. Why, for example, are syndicates, virtual firms, if you will, formed around a transaction only to be dissolved and then reformed for the next? Why did the highly fragmented banking industry not simply collapse into a smaller core of behemoths each capable of independent execution of the largest transactions? Alternatively, why were more permanent, formal syndicate arrangements not established? Sanford Grossman, Oliver Hart, and John Moore observe that in circumstances where a contract is ambiguous, silent, or otherwise incomplete, careful assignment of property rights over unique, alienable physical assets can help to resolve conflicts that arise in joint production.<sup>7</sup>

To see why, it is useful to recognize that a firm is nothing more than a collection of human and physical assets. Contracting over physical assets is relatively straightforward, but a mind cannot be enslaved. However, if human assets are most productively used in conjunction with a unique physical asset, the control that resides with owner of the physical asset can be used to shape behaviour in circumstances where contracts are ambiguous—*control over non-human assets leads to control over human assets* (Hart, 1995). Physical assets, then, are the glue that binds the collection of human assets defining a firm, and the assignment of property rights over physical assets determines how effectively the firm's assets are used.

But what if physical assets contribute little to the value of products or services that nevertheless require a team production effort? This is more nearly the setting in which investment banks as well as most other professional services firms operate. Advances in information technology have led to a substantial physical infrastructure in financial markets, but at the turn of the twentieth century, the physical infrastructure of financial markets was virtually non-existent. In such instances, Oliver Hart observes, 'it is not clear what keeps the firm together, or what defines authority within the firm' (Hart, 1995). So the Grossman, Hart, and Moore view of the firm suggests one reason why the investment banking industry remained so fragmented for so long—physical assets, the glue that binds human assets to one another, were inconsequential.<sup>8</sup>

#### IV. FORM FOLLOWS FUNCTION<sup>9</sup>

The success of an underwriting syndicate is determined in large part before it is formed. Obviously, the marketing and distribution of securities offerings must be conducted in a professional manner, but the

<sup>7</sup> See Hart (1995) for a comprehensive review of this 'property rights approach' to the theory of the firm.

<sup>8</sup> For extensions and applications of the theory to financial services, see Rajan and Zingales (2001) and Rajan (1998).

<sup>9</sup> The following perspective on the syndicate is developed formally by Pichler and Wilhelm (forthcoming). Alternative theories of the syndicate's function interpret it as a risk-sharing device—risks that one bank cannot absorb are comfortably spread across a group of banks. But these theories shed little light on the seemingly inefficient practice of dissolving syndicates upon completion of a transaction, only to reform similar if not identical teams for future transactions. Moreover, the process of building a book for securities offerings coupled with deals being priced just hours before trading begins substantially diminishes the syndicate's risk of paying more for securities than market conditions will support. Add the fact that risks borne by bulge-bracket banks are now spread widely through public ownership and the risk-sharing rationale for underwriting syndicates appears quite fragile.

capacity for doing so lies in the tacit knowledge and relationships developed independently of the transaction at hand. Likewise, the quality of a banker's advice to a client who is considering acquiring a competitor or otherwise restructuring derives more from experience in other transactions than from the sheer effort exerted in the moment. In other words, bankers bring human capital to transactions.

In light of the gruelling pace of their work, it is perhaps a statement of the obvious to say that the development and preservation of the banker's human capital requires considerable effort. Unfortunately, measuring the quality of this effort on a day-to-day basis is difficult. A combination of measuring the frequency of client contact (call reporting) and cross-evaluations among bankers who work closely with one another can shed light on the quantity and quality of a banker's effort (see Eccles and Crane, 1988, ch. 7). Linking these evaluations to compensation and promotions diminishes incentives for bankers to free-ride on one another, but only if the evaluations are meaningful.

The problem is that anything more than a superficial review process consumes an enormous amount of energy in non-hierarchical organizations. For example, when Goldman Sachs went public in 1998, it reported in its S-1 filing with the Securities and Exchange Commission that its '360-degree' evaluation system involved over 140,000 performance evaluations (in a firm with fewer than 15,000 employees) in 1998 alone. At some point, the balance between evaluation and performance begins to favour a more decentralized form of organization and this tension, I think, essentially determined the limits of formal organization in the investment-banking industry.

But collaborative efforts, such as the underwriting syndicate, that cut across formal organizations present their own problems. Syndicate members do not work with one another on a day-to-day basis and therefore have less opportunity for monitoring the current state of a collaborator's human capital. Observable outcomes, such as the number of deals carried out and the banker's role, provide some insight. On the other hand, in a business where reputation is everything, even modest effort can disguise slow but steady decay in human capital. In other words, potential collaborators must consider

the threat that their peers are resting on the laurels of past success. If there were a physical asset central to the collaborative effort, one party's control over that asset might serve to diminish the problem by threatening those who shirk with exclusion from future use of the asset. But again, the role of physical assets in the traditional banking platform was minimal. Likewise, if reputation attached to the syndicate rather than its members, control over this intangible asset might be assigned to a key member. But the syndicate is short-lived.

Against this background, let us re-examine the structure of underwriting syndicates. First, banks compete aggressively for the lead manager's role because it carries larger fees and enhances the bank's reputation (and therefore future earning power). But the lead manager designation also puts one (or a few) syndicate member's feet to the fire. Responsible or not, the lead manager is usually held accountable for the highly visible outcome of a securities offering by the issuing firm and the market generally. Thus banks have an incentive to protect their reputations by putting forth the ongoing effort necessary to make the most of such opportunities.

The incentive for bankers to free-ride on one another is further blunted by the relatively exclusive but informal working relationships they maintain. Exclusive working relationships essentially create a barrier to entry for potential upstarts and therefore support fees in excess of competitive levels. If transactions are beyond the capacity of any single bank, there is no way for a single competitor to break into the market by undercutting the existing fee structure. Many would argue that this is the reason that underwriting spreads in the USA for medium-sized initial public offerings (IPOs) have clustered so persistently around 7 per cent of the money raised. But if spreads exceed competitive levels, dominant banks will have a powerful incentive to preserve access to such opportunities. So while there is no physical asset of the kind imagined by Grossman, Hart, and Moore, similar incentives are created if those who shirk their responsibilities can be excluded from sharing in particularly attractive profit opportunities.

Placing one or a few banks in the spotlight provides a crude means of judging a bank's ongoing efforts that bear so heavily on its contribution to the team.

The informality of banking relationships, embodied in the limited formal life of the syndicate, eases the exclusion of apparent slackers from future deals. If, on the other hand, underwriting syndicates were longer-lived legal entities, the threat of exclusion would have less bite. Seen in this light, the form of the underwriting syndicate reflects its function as an organizational structure that reduces the threat of shirking among bankers who do not work closely with one another on a day-to-day basis, but depend on one another for success in large-scale transactions.

## V. HOW THE INTERNET IS ALTERING THE TRADITIONAL SYNDICATE

The traditional syndicate weaves together the fragmented networks of relationships maintained by many different banks. The fragmentation of these networks had much to do with the fact that word-of-mouth communication dominated information dissemination. As a consequence, content development and distribution were effectively bundled and embodied in one or a few key individuals. Advances in information technology have long provided opportunities for codifying (although not fully) what I am referring to as the distribution function. But intermediaries have a strong interest in content origination and distribution remaining bundled. In essence, key individuals are monopolists in their human capital and by tying the more commodity-like distribution function to content origination, they extend their monopoly power.<sup>10</sup> The Internet provides new capacity for unbundling pure information dissemination and distribution functions from functions that necessarily remain human-capital intensive. But this does not imply that industry structure will change dramatically in the short run.

Recent e-commerce initiatives being pursued by Goldman Sachs provide a useful case in point. If we focus strictly on their fixed-income business and further still on primary sales and distribution (the marketing, pricing, and initial sale of newly issued bonds), as of May 2000, Goldman was developing both proprietary and joint-venture electronic platforms. For example, the proprietary platform, E-Syndicate, provided for electronic dissemination of proprietary information and online order entry and

allocation of claims for Goldman clients. By contrast, Syndicate.Hub, a joint venture with Morgan Stanley, Citigroup, J. P. Morgan Chase, Lehman Brothers, and Merrill Lynch, commingled general research from member firms and provided links to each firm's proprietary platform. Syndicate.Hub was open to each member's clients and permitted, for example, a Goldman client to enter Morgan Stanley's proprietary space. In other words, members of the joint venture could attract other members' clients, but they also ran the risk of losing the attention of their existing clientele.

At the proprietary level, information technology was aimed at enabling Goldman bankers to spend less time in pure information dissemination and more time managing relationships and originating new ideas and analysis. In other words, to focus their energy on the development and marketing of content rather than pure distribution. The non-proprietary joint venture provided for large-scale distribution of information goods and services that were more nearly commodities.

The joint venture also served another purpose. As the costs of information dissemination decline, the primary barrier to being heard is the difficulty of standing out from the gathering crowd. By sweeping together research from six of the most prominent fixed-income broker-dealers, Syndicate.Hub encompassed a critical mass of research that would more likely attract the attention of institutional investors than that offered by any single broker-dealer. In other words, Syndicate.Hub was being modelled after portals to the broader Internet.

But if scale is the order of the day, why are these joint ventures so exclusive and will they remain so? This is where the tension between content and distribution comes into play. On the one hand, there is little marginal cost to posting the prices or research of an additional participant, and a bit more competition to stand out from a crowd of content providers is a good thing. On the other hand, the distribution platform or portal need not be just a pipeline. If it also vets the quality of content or other experience goods, it takes on the role of an intermediary balancing the competing interests of the parties it serves.

<sup>10</sup> For a review of the theory, see Tirole (1988, p. 333).

Against a noisy background, a reputable portal serves content providers by setting them above the din and thereby increasing the returns to investment in high-quality content. Consumers benefit from delegating responsibility for monitoring quality to the portal. But content providers will always have the incentive either to misrepresent the quality of their content to make their way into a reputable portal or, once in, to curb the investment that made their content quality high enough to gain entry in the first place. Limited membership reduces the dimension of the portal's vetting and monitoring responsibilities and leaves open the door to exclusion of those who do not measure up. Joint ownership of the portal by key content providers serves the function envisioned by Grossman, Hart, and Moore of placing control over non-human assets in the hands of those contributing key human assets.

But joint ownership of the portal presents its own problems in the sense that it is more difficult to break ties with a partner in the venture who fails to tow his share of the load than in the traditional syndicate structure where formal ties were weak. But direct links from the portal into an interface for each partner's proprietary content expose each member to the risk of losing business to other partners. The best way to retain or attract new clients is to contribute high-quality, non-proprietary content to Syndicate.Hub that might persuade a client to consider the contributor's proprietary offerings. With each partner facing the same incentives, Syndicate.Hub's structure promotes high-quality, non-proprietary content that will serve as a magnet for a larger share of market attention that might then be attracted to proprietary goods and services. The threat of losing one's clients to competitors can substitute for the frequent re-contracting in traditional syndicates that was a costly but perhaps necessary means of assuring commitment from syndicates' members.

So this Internet-enabled syndicate structure can serve the same function as the traditional syndicate, but technological advances have made possible the creation of a physical asset—the portal—that extends the formal boundaries of the firm. Whereas the traditional syndicate might be thought of as a virtual firm that temporarily linked human distribution networks, modern electronic networks lend themselves to large-scale, long-lived business platforms. The scope of these platforms, or their degree of exclusivity, will be tied directly to the difficulty of monitoring the quality of the content for which they provide distribution. Where quality is observable or can be sampled, as in the case of books and other physical goods, expect the likes of Amazon.com or Tesco to extend their brand or reputation broadly. In financial markets, where content is a true experience good that depends on unobservable investments in relationships or other forms of human capital, scalable distribution platforms will tend toward preserving exclusivity.

The emerging structure thus preserves the received relationships embodied in the traditional syndicate. On the other hand, it appears that the modern equivalent to the syndicate will involve more permanent shared distribution and price discovery platforms through which content providers will compete with one another for the market's attention.<sup>11</sup> The latter will be more like a commodity except to the extent that it provides content quality certification. Where the latter is true, exclusivity will reign and the implicit tying of content development and distribution will persist.<sup>12</sup>

## VI. AN EVOLUTIONARY PERSPECTIVE ON FINANCIAL INNOVATION<sup>13</sup>

If we step back from short-term efforts to preserve the *status quo*, the tension between human capital

<sup>11</sup> For a discussion of innovations in the price-discovery function see Wilhelm (1999).

<sup>12</sup> The US Department of Justice has recently launched an investigation 'looking at the competitive effects of certain joint ventures in the online bond-trading industry and in online foreign exchange'. See the *Wall Street Journal*, 1 December 2000 (p. C22). It is noteworthy that neither Goldman nor its peers among the bulge-bracket banks were pioneers in developing electronic platforms that would heighten fixed-income market transparency. In fact, most of the dominant banks did not roll out significant e-commerce initiatives in this area until InterVest filed a lawsuit against many of the major broker/dealers claiming that they conspired to prevent InterVest's introduction of an electronic trading platform on the Bloomberg network.

<sup>13</sup> The development of theories explaining the path of financial innovation is a growth industry in the recent academic literature. Key contributions that inform the following discussion include Allen and Gale (1994), Merton (1989), and Ross (1989).

and information technology suggests an evolutionary path for the structure of financial intermediaries. In this section I suggest that this perspective can help shed light on the massive reorganization under way within the financial markets at large.

In financial markets there is a natural attracting barrier for the evolutionary path of intermediaries. Economists define a complete market as one in which it is possible to trade on any potential future state of the world. We might imagine a very simple world in which the future is either good or bad and economic welfare is determined by the efforts of 10 industries whose performance differs with the state of the economy. In other words, there are 20 elements of uncertainty or ‘states’ in the future (10 each for the good and bad economic states). A complete financial market provides for buying or selling a claim on any one of these states. A risk-averse investor might hedge his bets by spreading wealth across each of the states, perhaps investing a bit more in industries expected to perform well in the bad economic state. So long as markets are incomplete, opportunities for financial innovation exist because there remain elements of risk that cannot be traded. The primary barriers to market completeness are frictions that outweigh the benefits of new products that provide for trade in previously illiquid risks. Intermediaries diminish these frictions.

Intermediaries also follow an evolutionary path over the life cycle of most financial products and services. Initially, intermediaries serve as catalysts for a previously non-existent market. At this stage of market development, key intermediaries promote trust and balance interests in privacy and openness. In this capacity, intermediaries can be thought of as deploying human capital in the creation of new content. As an example, we might think of Michael Milken’s central role in jump-starting the junk-bond markets. As community standards evolve, members develop their own reputations and relationships and best practices become apparent. Consequently, human-capital-intensive intermediary functions diminish in importance. Milken’s forced departure temporarily slowed the junk-bond markets, but ultimately they were self-sustaining.

The remaining intermediary functions are predominantly aimed at sustaining trade. These include maintaining distribution and communications networks and the like. Since these functions are more nearly commodities, profits diminish—junk-bond dealers no longer earn the princely sums commanded by Milken. In effect, content originated by the intermediary enters the public domain. On the one hand, this diminishes the intermediary’s control over the content it originated. But on the other hand, the transformation enables unbundling of human capital from the now mundane functions, freeing human capital to serve as a catalyst for higher-margin products that lend to further market completion.<sup>14</sup> And the process goes on.

We might therefore think of the intermediary’s role in the life cycle of a particular product or service as evolving from human-capital-intensive, catalytic functions to commodity-like, low-margin, maintenance functions. In this context, technological advances compress the product life cycle by promoting codification and widespread application of what once was tacit knowledge. This, in turn, heightens competition. As scale and scope economies take over, they pose a threat to intermediaries that lag in re-deploying human capital. Technological advances and product-life-cycle compression occur both continuously and more abruptly in the face of ‘shocks’ such as the introduction of the Internet. Where application of human capital is persistent, we might think of lags in technology or theory as delaying the redeployment of human capital. In some instances, as in pure advisory services, the lag might for all practical purposes be indefinite.

As information technology further enables unbundling of codifiable or mundane functions, we will see a shift to larger-scale and longer-lived platforms for carrying out these functions. Organizational emphasis will then shift from human capital to the financial capital necessary for building permanent physical infrastructure. This does not portend the decline of the human side of intermediation. Rather, freeing human capital from mundane functions and coupling it with large-scale physical infrastructure vastly amplifies its power. And as long as markets are incomplete and so there is room for financial

<sup>14</sup> Or to serve time in federal prison, as the case may be.

innovation, there will be demand for the catalytic role of human capital.

## VII. IMPLICATIONS FOR ORGANIZATION AND INDUSTRY STRUCTURE

The preceding discussion attempts to provide a compact outline of the historical interplay between human capital and information technology in financial markets. At the core of the theory lies the notion that, at any point in time, institutions develop to protect property rights over information goods. This occurs at both the level of information-intensive financial products and services and at the level of the intermediaries that use these products and services to promote exchange of strategic information. As technology evolves, so too does institutional structure. Early investment banks depended heavily on human capital in virtually every intermediary function. Organizational structures, such as small, private partnerships and membership exchanges, appear to have been particularly effective in developing and preserving inalienable human assets.

With advances in information technology and economic theory, what previously were human-capital-intensive functions have been codified and, increasingly, mechanized. On the theoretical front, advances in portfolio theory, financial engineering, and auction theory have made possible the likes of programme trading, systematic approaches to security design, valuation, and hedging, and the implementation of electronic trading platforms. But as these functions depend less on human judgement, even to the point of mechanization, the control that existed with their being embodied in key individuals is lost. As a consequence, organizational structures that promoted development of the human capital lodged in these key individuals are giving way to organizational structures like the public corporation that more efficiently sweep together the financial capital necessary for large-scale mechanization. The 1999 public offering of equity by Goldman Sachs marked the culmination of several decades of transition among large investment banks from the private partnership to public incorporation. Similarly, most major stock exchanges world-wide have either demutualized (the Australian Stock Exchange), moved fitfully toward demutualization (the London

Stock Exchange), or have begun laying the groundwork for public ownership (the New York Stock Exchange and NASDAQ).

Simultaneously, where intermediaries historically depended on limited access to key elements of human capital to sustain investment in financial innovation, these same theoretical advances are driving them to seek legal protection for their innovations. So, in addition to the explosion in financial patenting, we are seeing financial firms increasingly turn to non-compete contracts and other forms of restraints on those who leave the organization to join a competitor.

Where legal protection remains absent or impractical to seek out, financial firms can be seen developing organizational adaptations. Historically, banks freely shared research and product innovations with clients in the context of long-standing relationships that limited competition and thereby assured at least a fair return on R&D. But as these relationships have weakened, spreads for corporate advisory services, for example, have narrowed. On the other hand, the pace at which deals are conceived and executed is so rapid that enforcing legal protection for the deal-maker's contribution is likely to be infeasible even if such protection falls within the scope of the relevant legal framework. So it is perhaps not surprising that parallel with the decline of relationships, investment banks, in particular, have grown their balance sheets as they take equity stakes in transactions where previously they offered advice with the expectation of a super-competitive fee. Examples of this forming pattern include venture-capital and private-equity investments, as well as increasing capital commitments to proprietary trading functions.

The nature of dealings between functions that remain human-capital intensive and those that depend more on physical and financial capital also is changing. In many instances, we have seen leveraged buy-out (LBO) groups, for example, being spun out of large, full-service banks. Even when these human-capital-intensive functions are not formally spun out, the increasing mobility of entire teams of bankers suggests widening informal divisions.

A noteworthy case in point involves Geoffrey Boisi, who recently took over as head of investment

banking for J. P. Morgan Chase. Prior to leaving Goldman Sachs in 1991 at the age of 44, Boisi had been the youngest-ever partner, headed the firm's investment banking operations, was a member of the firm's management committee, and headed strategic planning for the firm. Boisi was well known in Wall Street circles, but his commitment to Goldman Sachs's culture of teamwork kept him from the public eye. In 1993, Boisi, along with three former Goldman Sachs partners, formed the Beacon Group, a small, private partnership specializing in corporate advisory services and private-equity management. In May 2000 he sold the 14-partner firm to Chase Manhattan for an estimated \$500m and was appointed head of Chase's investment banking business in a deal *The Economist* (27 May 2000) characterized as perhaps 'the largest signing bonus in Wall Street history'.

Is Boisi in the employ of J. P. Morgan Chase, or is it perhaps more useful to think of him as an independent content provider who now essentially owns and controls a substantial element of one of the world's largest financial-content-distribution platforms? The

preceding discussion suggests that the latter is the more useful perspective. Moreover, with continued technological advance there may be fewer bankers than we saw through the course of the twentieth century. But as the remainder use technology to extend the reach of their human capital, we might expect to see more key individuals or small teams whose stature more nearly approaches that of J. P. Morgan at the turn of the twentieth century.

If the Internet stands apart in furthering this process, it will be because it provides unprecedented capacity for unbundling of mundane functions involving information storage and dissemination from those requiring human judgement. The tying arrangements that traditionally supported glamorous lifestyles, even for bankers of middling ability, will thereby be weakened and the spoils more narrowly concentrated. This is not to suggest that the financial-services industry will contract. Rather, as it becomes more efficient and international market integration continues, demand for the services of financial intermediaries should continue to rise.

## REFERENCES

- Allen, F., and Gale, D. (1994), *Financial Innovation and Risk Sharing*, Cambridge, MA, MIT Press.
- Anand, B., and Galetovic, A. (2000), 'Information, Nonexcludability, and Financial Market Structure', *Journal of Business*, **73**, 357–402.
- Bell, D. (1973), *The Coming of Post-industrial Society*, New York, Basic Books.
- Credit Suisse First Boston (2000), 'State Street Corporation', Equity Research, 18 February.
- Eccles, R., and Crane, D. (1988), *Doing Deals: Investment Banks at Work*, Cambridge, MA, Harvard Business School Press.
- Hart, O. (1995), *Firms, Contracts and Financial Structure*, Oxford, Oxford University Press.
- Lerner, J. (2000), 'Where does State Street Lead? A First Look at Financial Patents, 1971–2000', Harvard Business School Working Paper.
- Merton, R. C. (1989), 'On the Applications of the Continuous-time Theory of Finance to Financial Intermediation and Insurance', *Geneva Papers on Risk and Insurance*, **14**, 225–61.
- (1990), 'The Financial System and Economic Performance', *Journal of Financial Services Research*, **4**, 263–300.
- Bodie, Z. (1995), 'A Conceptual Framework for Analyzing the Financial Environment', in D. B. Crane *et al.* (eds), *Global Financial System: A Functional Perspective*, Cambridge, MA, Harvard Business School Press.
- Pichler, P., and Wilhelm, W. (forthcoming), 'A Theory of the Syndicate: Form Follows Function', *Journal of Finance*.
- Polanyi, M. (1966), *The Tacit Dimension*, Garden City, NY, Doubleday.
- Rajan, R. (1998), 'The Past and Future of Commercial Banking Viewed Through an Incomplete Contract Lens', *Journal of Money, Credit, and Banking*, **30**, 524–50.
- Zingales, L. (2001), 'The Influence of the Financial Revolution on the Nature of Firms', *American Economic Review*, **91**(2), 206–11.
- Ross, S. (1989), 'Institutional Markets, Financial Marketing, and Financial Innovation', *Journal of Finance*, **44**, 541–56.

- Supple, B. E. (1957), 'A Business Elite: German–Jewish Financiers in Nineteenth-Century New York', *The Business History Review*, **31**, 143–78.
- Tadelis, S. (1999), 'What's in a Name? Reputation as a Tradeable Asset', *American Economic Review*, **89**, 548–63.
- Tirole, J. (1988), 'The Theory of Industrial Organization', Cambridge, MA, MIT Press.
- Tufano, P. (1989), 'Financial Innovation and First-mover Advantage', *Journal of Financial Economics*, **25**, 213–40.
- Wilhelm, W. (1999), 'Internet Investment Banking: The Impact of Information Technology on Relationship Banking', *Journal of Applied Corporate Finance*, Spring.
- Downing, J. (2001), *Information Markets*, Cambridge, MA, Harvard Business School Press.