ELEMENTS OF STRATEGIC NEGOTIATION UNDER UNCERTAINTY: THE CASE OF VENTURE CAPITALISTS

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Abstract

This paper uses the theory of transactions economics to model the process whereby venture capitalists and financiers negotiate the terms of financing. We show that the process has both static and dynamic elements, and involves incomplete information in a world of uncertainty. Central to the arrangement is the alignment of borrower attributes and lender capabilities.

Keywords: governance, venture capitalists, transaction economics

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1. Introduction

This paper analyzes how venture financiers and their clients seek to arrange financings. We provide both static and dynamic views of a negotiation process aimed at determining mutually satisfactory outcomes for both parties. We first consider how the perceived acceptability of a project is affected by current financial market and business conditions. We model how environmental features - reflected primarily in the project's perceived liquidity risk at time of financier exit - affect initially perceived project profitability and hence the manner in which any initial financings are structured. Second, given the current environmental context, the parties enter negotiations with an attempt to refine initially established terms. Crucially, these arrangements are struck under conditions of uncertainty, which means the initial contract is incomplete and will likely require renegotiation over the life of the arrangement.

We view the negotiation process as defining an incomplete contract, a process that can be viewed analytically as attempting to align project attributes with the governance capabilities of financiers. So far as is possible, these initial arrangements contemplate the manner in which the project and its financing will evolve over the lifetime of the arrangement. However, because we are considering decisions under uncertainty the arrangement's evolution cannot fully be specified quantitatively, and hence the initial contract is structured to facilitate subsequent adjustments of both project operations and the financing arrangement. Third, even while recognizing that the parties initially attempt to map out the project's evolution, both project performance and the terms of its financing will usually change over the course of the arrangement, essentially because planning under uncertainty means that new or more refined project information is likely to become available. The dynamics of renegotiation include refinements of initially anticipated possible changes in project scale (phased financing), addition of outside partnerships, and revisions to plans for the project's eventual liquidation. We use the economics of real options to analyze the nature of the renegotiation process. In distinction to analyses of real options under conditions of risk (when all alternatives can be specified probabilistically at the outset), features of the real options modeled here cannot actually be fully specified at the time the contract is first arranged. In the language of decision theory, the parties attempt to draw the game tree when the financing arrangements are first struck. However, uncertainty means that it will often be necessary to redraw the game tree (re-specify the available real options) at various times during the course of the arrangement.

2. Overview of the Paper

Venture capital financing differs from traditional corporate financing in that it is arranged under uncertainty[1], and also in that venture capitalists typically provide both financing and managerial expertise. The arrangements between financier and entrepreneur are typically non-arms' length and, from the outset, recognized as being evolutionary. The entrepreneur attempts to safeguard his investment from expropriation, while the financier attempts to control the moral hazard and adverse selection aspects of an evolving arrangement. As new operating and

[1] We use the Knightian distinction between risk and uncertainty. Essentially, risk means it is possible to draw the game tree and specify outcome probabilities in such a way that the tree does not need to be redrawn during the course of the arrangement. Uncertainty recognizes the possibility of genuine surprises (and not just the realization of probabilistic outcomes) that require at least parts of the game tree to be redrawn.

financial information is obtained, the parties jointly consider adaptive forms of renegotiating the original terms. The renegotiations involve phased financing, possible further partnerships, and exit strategies.

The initial negotiations take place within a financial and business environment that affects the perceived profitability of the project. At this stage, the project's principal attribute of interest is the perceived liquidity risk of the exit markets. More early-stage projects are financed when liquidity risk is perceived to be low, and vice versa. When liquidity risk is low, the incentive to syndicate the financing is less pronounced, phased financing is relatively less important, as is the value-added component of venture capitalists' advice (Cumming et. al., 2005). Willingness to extend venture financing can also be affected by the availability of capital to the venture financiers, which in turn depends on ultimate investors' attitudes towards risks. The availability of capital is also affected by networking: better-networked firms have easier access to financing and turn in better performance (Hochberg et. al, 2007).

Given the initial environmental specification, the paper examines how financiers and their clients jointly strive to arrange cost-effective forms of financing. The entrepreneur's problem extends far beyond identifying an adequate supply of risk capital. Entrepreneurs are concerned about retaining a degree of ownership, and about the appropriateness of different financing structures at different stages of venture development. Projects differ in their attributes, and financiers differ in both their priorities and their capabilities. Financiers are concerned with incentive-compatible arrangements that align the interests of the two parties, and also with maintaining a degree of control over the evolution of the project's fortunes. Especially, financiers seek to employ arrangements that will allow them to intervene constructively if and when a project encounters pitfalls. They are concerned with striking profitable arrangements that, so far as is possible, manage their earnings uncertainties. Entrepreneurs and their financiers thus face a joint negotiation problem that involves evaluating and negotiating deals, choosing the appropriate forms of financial instruments, choosing the terms of the (necessarily) incomplete contract, specifying the use of phased financings, and exit strategies.

Not all financiers can muster the spectrum of capabilities necessary for profitable governance of venture projects. Entrepreneurial skills are difficult to quantify, and depend heavily on entrepreneurial motivation. Both these features make it difficult to predict the firm's likely future earnings, and consequently to value its intangible assets. Financiers who successfully provide venture financing have unique capabilities to assess, monitor and control their clients' operations. Different types of financiers can offer different types of arrangements to entrepreneurs seeking venture financing. Hence, at the outset, negotiations are aimed at devising a mutually satisfactory arrangement, which can analytically be described as aligning the attributes of the proposed transactions with the governance capabilities of financiers.

Since an agreed financing takes place under conditions of uncertainty, the initial financing terms take the form of an incomplete contract. Moreover, both project performance and financing arrangements will normally evolve during the course of the arrangement, usually as a result of new information becoming available. Adjusting to evolution involves renegotiating the original incomplete contract, an arrangement whose dynamics we analyze using real options theory. In distinction to the usual applications of real options theory, however, the uncertainty surrounding venture financing means that the real option analyses will be re-specified as the project evolves. Moreover, the nature of the re-specification cannot always be laid out quantitatively at the time the financing is originally arranged. Thus, to guide its evolution, the original arrangement will focus on specifying the principles to be followed as and when readjustment becomes necessary.[2]

For any project, a financing agreement attempts, subject to the bounded rationality of both parties, to reconcile attributes of the proposed project with the capabilities of the financier. In these negotiations the parties strive to find both an incentive-compatible and a cost-effective arrangement. The relevant attributes of a project are the degree of risk or uncertainty it presents, and the specificity (and consequently liquidity) of the assets involved. The relevant capabilities of successful financiers are the governance and control capabilities they can muster. These capabilities include the potential to extract relevant project information at different states of the project's evolution, to renegotiate the financing contract accordingly, and to affect the incentives facing the entrepreneur. Financiers possess aspects of these capabilities at the outset, and also specify contractual terms to enhance the capabilities' effectiveness.

The presence of asymmetric information, with its attendant moral hazard and agency problems, also impacts on the negotiation process. Cassar (2004) shows that information asymmetries and agency costs affect choice of financing structure. Cumming (2005) shows that optimal financial contracts are a function of, among other factors, expected agency problems. Lu, Hwang, and Wang (2006) show that venture capital firms which are weak in reprisal ability expend more resources on due diligence screening. All of these views are consistent with our theoretical approach.

Section 3 presents our theoretical framework. Section 4 shows how the process evolves over time

[2] The distinction is analogous to the difference between a constitution and a body of legislation that attempts to codify the constitution's principles.

with the arrival of new information. Section 5 provides our summary and conclusions.

3. A Theoretical Framework

This section outlines a theory of financial system organization within which we embed our analysis of venture financing arrangements. Financing of any type involves an alignment of project attributes with financier capabilities, and cost-effectiveness considerations influence these alignments. The particular attributes of venture projects and the particular capabilities of venture financiers constitute one such example of the economics affecting financial system governance. [3]

Thus we first present a full continuum of financial system entities, their activities, and the financial deals they accept. We specify how projects can be classified according to a few attributes, and we show how and why different financiers possess different capabilities for governing projects' possible attribute combinations. We examine the alignment of project attributes with financial governance capabilities, and how governance and transactions costs affect cost-effective choices of the alignments. We then show how venture capital arrangements constitute one type of selection within a spectrum of possible alignment choices.

3.1 Governance Complementarities and Asset Specificity

Our exposition of the theory will be aided by first studying the theory of financing an asset with one varying attribute. Williamson (2002) models governance complementarities as a function of asset specificity.[4] Table 1 demonstrates the relationships among asset specificity, the presence of financing safeguards, the type of financing contract, and the type of financier. Figure 1 shows the transactions cost consequences of organizing financings through markets, through banks, and through financial conglomerates when the transactions vary by asset specificity.

Increasing asset specificity is plotted toward the right of the horizontal axis, and costs are plotted on the vertical axis. When assets have a low degree of specificity, the bureaucratic costs of financial conglomerates place them at a serious disadvantage relative to markets, while the bureaucratic costs of banks place them at a lesser disadvantage. Banks are therefore viewed as a hybrid form of governance structure that possesses capabilities somewhere between those of markets and those of conglomerates. The cost differences narrow and are eventually reversed as asset specificity increases. With an increase in asset specificity banks come to offer a cost advantage relative to markets, and as asset specificity increases further still, conglomerates come to offer a cost advantage relative to banks. Because added costs accrue on taking a transaction out of the market and governing it with a hybrid (bank) or conglomerate organization, the three structures are usefully viewed as complements. Cost-effective governance choices for all degrees of asset specificity imply that the effective form of cost curve is the envelope describing the minimum of the three cost curves displayed.

[Table 1 here.]

[Figure 1 here.]

3.2 Governance complementarities: further analysis

This section expands the theory of complementary structures to include different project attributes and a more detailed analysis of financier capabilities. We continue to develop the view that financiers and their clients jointly seek cost-effective forms of transacting, and their negotiations align transaction attributes with financiers' capabilities for governing deals (Williamson 1996; Neave 2005; Johnson and Neave 1992, 1994; Allen and Gale 2000; Carlin and Mayer 2003). Financiers accept only deals they believe they can govern cost-effectively, and will not entertain financing proposals unless they feel competent to govern them profitably.

Financial governance, including information production, is often characterized by fixed operating and learning costs, and hence by increasing returns to scale. Moreover, combining transactions of sufficiently similar types can yield scope economies when the deals use common inputs. Financiers organize firms whose operations exhibit scale and scope economies, and the firms govern groups of similar financial transactions. Choices of organizational structure are shaped by managements' and financiers' conceptual and computational limitations.

Following Williamson, we identify three main classes of governance structure: markets, intermediaries (hybrids), and hierarchies. Each offers different capabilities for governing deal attributes. Table 2 illustrates the key elements of our theory, which will be explained below.

[Table 2 here.]

3.2.1 Types of governance structures

·*Markets* are well suited to complete contracting, i.e. deals in which there is little perceived need for adjustment of the initial arrangement. These kinds of

[3] Relations between apparently different types of financing are also stressed by Cochrane (2005) who compares the risk and return in venture financing with the risk and return for small NASDAQ stocks.

[4] Although the concepts are not identical, for purposes of this paper, we can identify asset specificity with asset liquidity – the greater the specificity the lesser the liquidity.

deals are typically extended under risk rather than under uncertainty.

Intermediaries offer a governance advantage relative to markets, since they have both greater initial screening capabilities and greater capabilities for monitoring and control. They have some ability to adjust contract terms during the course of the deal, and can rectify past errors at lower costs than market agents, since the latter's principal means of effecting adjustment is to sell out an investment position.

Hierarchical (internal) governance offers the greatest potential for intensive screening, continued monitoring, continued control over operations and adjustment of deal terms. Internal governance will normally be used to govern deals whose uncertainties are greater than those acceptable to intermediaries, e.g. in cases of incomplete contracting.

3.2.2 Attributes, capabilities, and alignment

Moving from left to right in the attributes section of Table 2 represents increasingly greater informational differences between the two parties (the financiers typically having less information). Increasing differences are seen as involving higher degrees of risk, or as presenting uncertainty instead of risk. The higher-risk and more uncertain deals pose greater need for continuing governance, not least because they can present increasing costs of default. Uncertainty and asset illiquidity render market valuations difficult.

The second section of Table 2 specifies the principal capabilities of financiers and suggests that different governance structures utilize them in different degrees. For example, hierarchical financings offer greater monitoring and control capabilities than market financings. The third section is a reminder that greater capabilities are normally mustered at increasing cost.

The three principal types of governance structure are listed in the last section of Table 2, along with illustrations of each type. The listing from left to right indicates increasing governance capability. For example, public markets are shown to the left of private markets, since private market agents usually have greater investigative capability, and in some cases greater freedom to negotiate terms. Similarly, commercial and industrial banks usually have less highly developed governance capabilities than do venture capital firms that make greater use of discretionary arrangements.[5] Financial conglomerates and the Japanese keiretsu are examples of hierarchical governance. Capabilities closer to those of the hierarchical form are also offered by universal banks (such as those found in Germany) that enter into long-term lending and share purchase arrangements with their clients.

As shown by the relations between the different sections of Table 2, deals' attributes are matched against different governance capabilities in attempts to achieve cost-effective governance. Market deals tend to be more standardized, and to have smaller informational differences among the parties. The governance costs of market deals are relatively low, mainly because market governance uses relatively few monitoring and control capabilities. The costs of hierarchical governance tend to be higher, because of its greater monitoring, control, and adjustment capabilities. Thus financings under uncertainty are likely to have higher governance costs, which must be compensated for by higher returns on the investment.

3.3 Theory of Venture Financing

We now apply the theory to financing new ventures.

3.3.1 Why venture financing is difficult

The principal attributes of venture projects are asset specificity, earnings uncertainty (as distinct from risk), and heavy dependence on the abilities and motivation of the entrepreneur. Thus a typical start-up firm needs to obtain outside financing in the presence of informational asymmetries and without being able to provide liquid assets. The firm has both a market value with which shareholders are concerned and a private value to management. The entrepreneur's human capital complements the operating assets of the firm, and the combined value of human and non-human capital is worth more than the sum of their separate values.

As is well known, informational asymmetries create problems of both moral hazard and adverse selection for both parties. In the presence of informational asymmetries managers may be able to increase the private value at the expense of the firm's market value. If the entrepreneur holds equity and outside investors hold debt, the insider has an incentive to choose excessively risky projects, since the debt holder shares downside risk but not upside potential. While management ownership of equity aligns management and shareholder interests, it can also contribute to management entrenchment. The venture financier must understand how to trade off these conflicting possibilities effectively. Insofar as adverse selection is concerned, financiers must incur additional governance costs in attempts to offset the effects.

3.3.2 The roles of venture capital

Different types of venture financing are used at different stages of project development because they convey different degrees of capabilities to the financier. Seed and startup finance are the riskiest types of financing, and are provided when the outlook for the project or firm is relatively uncertain. Venture capital funds backed by individual investors are more

[5] Szegö (1993, p. 779) also recognizes an hierarchy of governance capabilities.

likely to invest in early stages of high technology sectors, such as biotechnology, information technology, and electronics, both in domestic and foreign markets. With such projects the economies of acquiring available project information are relatively small, and many of the benefits derive from aggregating diverse views of many investors about the uncertain prospects of new technologies.

Expansion and later stage finance display a more limited kind of uncertainty[6], and are provided as both financier and entrepreneur have learned more about the details of the project and the pitfalls it presents. In essence, different types of venture financing occur as different degrees of learning about project performance take place. The attributes of a project change as a company proceeds from one development stage to the next, and the governance concerns of the financiers evolve equally. Some of the details of the process have been investigated in the literature, as indicated next.

The non-arms' length arrangements in venture capital present opportunities for both mutual benefit and mutual exploitation. Rajan and Zingales (2003) argue that financiers' power over client firms can depress the incentives to form new start-up ventures and consequently high-tech entrepreneurship may be rare in relationship-based systems. On the other hand entrepreneurial risks resulting from specific shocks (i.e. developments negatively affecting a single project) are reduced in relationship-based systems, since the prospect of future rents may induce the financier to bail out the project. The bailout incentive is eliminated in an arm's-length system, since future rents are competed away. Conversely, a relationship-based system is less well equipped to deal with systematic shocks (developments negatively affecting an entire portfolio of projects) but an arm's-length system can absorb them relatively easily (2003, pp. 17-18). Since the financings take the form of incomplete contracts, a legal environment in which the traditional rights of both parties are well protected is of considerable importance because it conveys a degree of confidence that unforeseen developments can be worked out without impairing the interests of one party at the expense of the other.

Venture financings focus both on how the client firm will be controlled and on the cost of financing. Kirilenko (2001) models a relationship between a venture capitalist and an entrepreneur setting up a new firm. Kirilenko assumes that the entrepreneur derives private nonpecuniary benefits from having some control over the firm. To separate the entrepreneur's value of control from the firm's expected payoff, the venture capitalist demands disproportionately higher control rights than the size of his equity investment. The entrepreneur is compensated for a greater loss of control through better terms of financing, ability to extract higher rents from asymmetric information, and improved risk sharing.

Cassamatta (2003) analyses the joint provision of effort by an entrepreneur and by an advisor, effort aimed at improving investment project productivity. Essentially Cassamatta argues that the nature of the arrangements reached will depend on the relative expertise of the entrepreneur and the financier. Typically, outside financiers will enhance project value by supplementing the entrepreneur's expertise. In situations characterized by moral hazard, if the entrepreneur's effort is more efficient (less costly) than the advisor's effort, the advisor will only be hired if she provides funds. Common stocks provide high-powered incentives to venture capitalists, but in cases where the entrepreneur must be most strongly motivated, the financier may accept convertible bonds. Common stocks are likely to be sold to financiers when the amount of external financing is small; convertible bonds are more likely to be used when the amount of financing is large. Although Cassamatta does not investigate the possibility, it may be that convertible bonds are attractive because they provide for payment of interest that will allow the venture capitalist to post an interim return attractive to the institutional investors funding the venture capital activity.

4. The Dynamics of Venture Financing

As a project matures with the passage of time, two evolving processes require to be governed to mutual advantage. At the project level, new information about project success, competitive entry, and other relevant features can be revealed and change the nature of the deal. At the financier level, there are increasingly urgent requirements for ongoing decisions about exit, phased financing, acquiring new partners, etc. Both of these processes introduce dynamic elements into the initial static governance relationship. The real options framework offers a useful way to model the economics of these governance adjustments. In the atmosphere of uncertainty that we examine here, the specification (or refined specification) of available real options takes place episodically during the life of the project rather than when the project is initially financed.

Real options theory recognizes that the stream of future cash flows can be altered by management decisions, and provides a means of valuing the cash flow changes contingent on development decisions. In the simplest analyses of real options, the decision-maker plays a game against a neutral nature. With more complex real options, the decision-maker plays a game against nature and also with (and/or against) potential partners and competitors. Johnson and Suo (2005) find that strategic alliances are entered into

[6] We cannot usefully employ probability distributions to convey uncertainty, because if they can be specified at all the distributions are too diffuse to give usable quantitative results. Nevertheless, we can specify greater and lesser uncertainty using nested intervals, where the less degree of uncertainty refers to an interval nested within the larger interval associated with greater uncertainty.

because of resource dependency; as such, the alliance has to be value-adding for both parties. The approach permits valuing an alliance as a whole, recognizing the roles of both parties. The value generated is allocated to the parties based on some sharing rule.

The theory can also incorporate potential actions by competitors (see, e.g., Johnson and Suo, 2005). In this paper, we extend the model to incorporate the evolving nature of the financier-entrepreneur relationship. We recognize that the competitive environment, project attributes, and the financier's governance requirements are all evolving simultaneously. At each stage of the venture, the financier re-values the project in the context of the state of the venture and of the competitive environment, and re-examines the nature of the deal's governance incorporating his own evolving needs.

[Figure 2 here.]

Figure 2 schematically displays the principal elements of our analysis. For simplicity, we have broken the relationship into three stages: seed money, phased financing, and exit. At the start-up stage, the financier determines whether to invest seed money or not. At an intermediate stage, the financier decides whether to inject additional money or not; in the latter case, there may or may not be abandonment value (through, for example, an IPO, as shown in the figure). At the exit stage, the financier decides whether to get out through an IPO or bring in additional partners to share the risk and reduce the financial commitment.

As far as is possible, dollar values are assigned to each possible outcome, but as already indicated under uncertainty the attempt to specify probability distributions may not prove useful. The financier's decision at each stage is two-fold: do I stay or go, and if I stay, what will be the terms that will best attain the parties' mutual advantage?[7] Usually the decision will be made on relatively crude dominance conditions. One such condition, for example, is that an approach of establishing a market position may be regarded as offering potentially better outcomes than would a wait-and-see approach that would only be implemented after the market had been proven.

5. Summary and Conclusions

An entrepreneur and a venture financier seek to arrang mutually satisfactory but incomplete contract, under conditi of uncertainty. This type of financing is determined by pro attributes and entrepreneurial motivation, along with finan capability to govern a temporally evolving relationship. alignment of entrepreneur and financier is thus a speciali form of the alignments that characterize the complementary aspects of financial system function.

[7] It is important to recognize that financiers' actions can also affect outcomes, unlike conventional analysis, where outcomes are "given".

At the outset of negotiations, the terms of the financing are coloured by the business and economic environment. The project attribute of perceived liquidity risk figures prominently in financiers' initial assessment and depending on the degree of perceived liquidity risk, terms will be proposed accordingly.

Also at the outset of negotiations, the terms of the financing seek to perceive the evolution of the deal, including the ability of the venture financier to exit profitably.

As the project evolves, the dynamics of its evolution determine the kinds of adjustments the parties contemplate. Real options analysis helps to analyze the kinds of mutually beneficial adjustments that will be effected.

Although venture financing is a specialized form of alignment under uncertainty, the same elements can be used to analyze other types of financings.

Table 1. Degrees of asset specificity and financier capabilities

Asset specificity	Capability to Safeguard	Type of financing contract	Type of Financier
Nonspecific assets	Absent	Arm's length	Market agent
Specific assets	Absent	Arm's length	Financing not likely obtainable
Specific assets	Present	Arm's length	Bank financing if collateral or verifiable cash flows from redeployable assets
Specific assets	Present	Non-Arm's length	Venture or internal financing if repayment depends on cash flows from non-redeployable assets

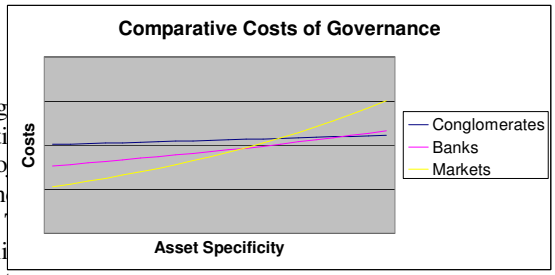


Figure 1. Comparative Costs of Governance. Adapted from Williamson (2002)

Table 2. Deals' Attributes, Governance Capabilities, and Alignment

Deals' Attributes

----------→ Increasing information differences----------→
Perceived greater risk; uncertainty greater than risk
Increased asset specificity/decreased asset liquidity
Greater potential earning from continued monitoring
Greater potential earning from ex post adjustment
Increasing cost of default

Governance Capabilities

----------→ Greater monitoring capabilities --------→
(particularly on a continuing basis)

Greater control capabilities
(auditing, replacement of key personnel)

Greater adjustment capabilities
(ability to alter contracts as circumstances change)

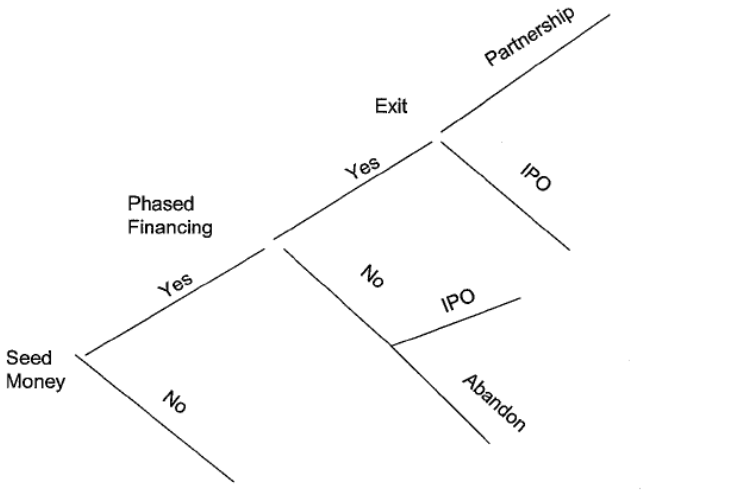
Governance Costs

-→ Increasing -→

Governance Structures

Markets	Hybrids (Intermediaries)	Hierarchies (Internal Financing)
Public Markets		
Private Markets		
Securities Firms		
Commercial Banks		
Universal Banks		
Venture Capital Companies		
Financial Conglomerates		
Holding Companies		
Keiretsu		

Figure 2
The Evolution of a Deal



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