Commitment, Liquidity and Control in Business Organizations

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Abstract

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In this dissertation I reflect on business organizations, as ways to legally organize economic activities. In Chapter 1, I build on extant literature to define a theory of business organizations that is orthogonal and complementary to the theory of the firm. The central question this theory addresses is: What legal form should a firm take? I argue that the "property turn" that has characterized recent advancements in the theory of the firm has yet to fully take place in the theory of business organizations and attempt to make several steps in that direction. In particular, I show that a central issue for organizations is whether the capital provided by investors is committed for the long period or not. Different organizational forms are characterized by different levels of commitment. Historically, the enforceability of commitments to invest for the long was slow to be granted and involved politically-charged process. Once established, long-term commitment of capital unleashed a series of developments that are now well understood to characterize modern markets.

In Chapter 2, I build on these ideas to propose a formal model of the commitment of capital for the long term. In the model, two organizational forms are contrasted: one with short-term capital (a "partnership") and one with capital committed for the long term (a "corporation"). By starting from this basic difference, I show that a series of implications follow. In particular, investors in the corporation

have to compensate the loss of liquidity entailed by the long-term commitment with a more liquid market for shares ex post. In turn, liquidity in the market depends endogenously on the degree of asymmetric information that characterizes trade. Thus, for the commitment of capital to be sustainable, shares have to be liquid, which in turn implies that shareholders need to be (in expectation) relatively uninformed so that outside (fully uninformed) investors do not demand too large a discount when purchasing their shares.

This mechanism yields implications for the typical size of different organizational forms, with corporations faring better than partnerships in terms of share value when the number of equity holders is large, and vice versa when it is small. In addition, the separation between ownership and control in large corporations, which is typically seen with preoccupation, emerges endogenously from the model as a necessary feature that guarantees liquidity in the secondary market and, in turn, increases share value in the primary market.

In Chapter 3, I apply the model to shed light on the regulation of exit. The commitment of financial resources to a project is essential for long-term investment but brings about both a loss of control and a loss of liquidity for investors. Therefore, investors are ordinarily given an exit option. In this chapter, I contrast three common ways to exit: tradability of one's equity position, liquidation rights and redemption rights. I show that they balance liquidity and control very differently. Large safe projects are better associated with tradability, because the risk of inefficient continuation is low and the market provides enough liquidity. Small risky projects are better associated with redemption rights, because they can sort inef-

ficient liquidations from inefficient continuations. Liquidation rights are desirable when redemption rights fail because of high costs of capital or the risk of runs on the company's cash.

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1 The Theory of Business Organizations

Abstract

This chapter introduces a property-rights theory of business organizations and contrasts it with the contractual theory that has dominated scholarship in law, economics and finance since the 70s. Since firms can take different organizational forms, this chapter also discusses how the theory of business organizations relates to the property-rights theory of the firm. It will be shown that these two theories, although complementary, are based on different notions of property rights. The chapter further unpacks the fundamental features of business organizations examining their origins, historical evolution and functions in western economies. Two stereotypical organizational forms—the partnership and the corporation—will take center stage in the analysis as two different degrees of separation between the business and its owners. Finally, the chapter examines how the organizational form a firm takes affects its relationship with creditors in case of default and contractual counterparts in case of transfer of essential assets, thus shaping the way in which firms borrow on and trade their assets.

Keywords: theory of the firm, legal entity, legal personality, nexus of contracts, capital lock-in.

JEL codes: G30, K22.

1.1 Introduction

The last half a century of research has produced a greatly influential scholarship on business organizations. Yet, while the theory of the firm has clarified the allocation of the rights to control strategic firm assets within economic enterprises, there has been no comparable effort to understand how businesses are legally organized. Basic questions such has those addressing the difference between firms organized as partnerships and firms organized as corporations have largely gone unanswered. Similarly, while corporate finance has yielded a comprehensive theory of debt, to date we still know preciously little about equity.[1] At a very fundamental level: Why does equity have such long—mostly indefinite—maturity while being often characterized by little power to control management? In this chapter, I show that these features of the current theorizing about business organizations have a common root in the purely-contractual approach that, with only few notable exceptions, has dominated scholarship since the seventies. I will leverage on these exceptions to build a property-rights theory of business organizations and show its potential for addressing fundamental, unanswered questions.

In the dominant view, corporations—and, by reflection, also other organizational forms—are little more than a nexus of several contracts among the individuals—owners, managers, creditors, employees, suppliers, customers and others—who form and interact with the organization. This view originates from Jensen and Meckling (1976), who argued that organizations could be understood as com-

[1] See Bolton (2014) for a review of the literature and an assessment.

plex contractual webs aimed at solving agency problems among the individuals involved and, in particular, between those taking strategic decisions (management) and those with claims on the organization's profits (owners and creditors). This perspective goes hand in hand with a second, equally powerful notion proposed earlier by Berle and Means (1932): the fact that ownership and control are starkly separated in large corporations. The combination of these two ideas has been the canon for economists and legal scholars for decades and has given rise to a large and important literature on corporate governance, studying ways to design organizations so as to limit principal-agent problems (for a review, see Shleifer and Vishny, 1997). The impact of this approach and its importance for modern scholarship cannot be overstated.

For all its merits, however, reducing organizations to contracts obfuscates two important aspects of the problem, both of which will play a central role in the present analysis. First, it neglects the problems arising with third parties who were extraneous to the original contract, privity being a fundamental principle in contract law. Second, it frames the problem largely in terms of default rules that the parties can adjust at their convenience and hence reduces organizational law to a menu of default—hence customizable—contractual arrangements. Although largely correct, this approach underplays the role of mandatory (unmodifiable) rules. In this view, there is little or nothing that the law does to shape organizations.

A contractual view of organizational and, in particular, corporate law is not incorrect but a *merely* contractual approach would be, both doctrinally and historically. Almost two millennia ago, the jurist Gaius (in Digest 3.4.1pr.) stressed that

it was a prerogative of the state to give "corporate status" to selected bodies, which were to be understood as pools of assets, not as collections of individuals. Most telling is one of the examples of *corpora* in the Roman law: estates opened but not yet distributed to the heirs, which were pools of assets with temporarily no relation to any living individual (see Robbe, 1975). Organizational law is best understood as a set of property-like arrangements—creating rights *in rem*, that is, rights attached to assets—in addition to through the contract lens—focusing on rights *in personam*, that is, creating obligations among individuals.

The theory of the firm has long recognized the importance of property rights for understanding economic enterprises. The property turn in the theory of the firm, however, did not translate automatically into a similar revolution in understanding how such enterprises are legally organized. The reason is twofold. First of all, a firm and its legal organization are typically not overlapping notions. A firm could be and often is organized in different legal entities and, conversely, an entity could be a legal umbrella for several firms. Laws dealing with fundamental issues, such as bankruptcy and the assignment of contracts, do not apply directly to firms, they apply to legal entities. Second, property may seem a clear-cut concept; it is not. A theory of business organizations built on property rights requires a preliminary clarification of what property is. Most importantly, the present analysis will leverage on a notion of property that is markedly different from and complementary to the one advanced in the theory of the firm.

As a first step, we need to clarify in what sense "property" is different from "contract". This is not a trivial exercise and it will help us appreciate the difference

between economic activities run in a business organization (as in Coase, 1937) versus those supported by a (relational) contract (as in Goetz and Scott, 1981). There are (at least) three commonly used definitions of property (and contract) that have contributed profoundly to economic theory in the last several decades. Disentangling them is important insofar as different notions of property play a role at different junctures of the theory laid out in this chapter. Section 1.1.1 discusses these notions of property and lays the foundations of the theory. Section 1.2 reviews the theory of the firm, emphasizing both its property-like foundations and its limited expandability to the study of business organizations.[2] Section 1.3 illustrates how the fundamental features of legal entities in general—and of the corporate form in particular—can be understood through a property lens. Section 1.4 zeroes in on the most fundamental feature of the corporate form: the lock-in of capital for the long term. This section connects the theory of business organizations to an embryonic theory of equity. Section 1.5 investigates the implications of the theory in two cases concerning the way in which organizations raise capital through debt (and may fail to repay it) and transfer their essential assets, respectively. After having stressed the importance of organizational law as a set of rules that applies essentially to assets, in Section 1.6 I bring individuals back into the picture, connecting the theory with the contractual view. In advocating for a "property turn" in the theory of business organizations I hope both to push the theory of business organizations forward and to bring it closer to its historical roots.

[2]For an analysis of how the theory of the firm can be used to illuminate the study of organizational law see Armour and Whincop (2007).

1.1.1 The economics of property rights

In the literature, the term "property" is used to refer to several different notions. This section focuses on three approaches: property as protection against expropriation from powerful groups, property as unified ownership of complementary assets, and property as a right that runs with the assets. We will focus in particular on what distinguishes property from contract.[3]

Property as stable ownership A commonly-used and powerful definition views property rights as rights that are protected against expropriation powerful individuals, in the tradition of North and Weingast (1989). This perspective goes beyond the distinction between default and mandatory rules. Private individuals cannot negotiate around mandatory rules—while they can do so with default rules—but legislators have the power to amend even mandatory rules. In contrast, the idea behind property rights protection comprises constraints on expropriation that are embedded in a series of institutions (like the "constitution") that cannot be easily dismissed by the elite. Property, in this view, is a set of constitutionally protected mandatory rules.

A notable application of this idea can be found in Acemoglu and Johnson (2005), where the authors "unbundle" property and contract by defining the first as a set of institutions that protect individuals' private property against expropriation by powerful elites and the second as a set of default rules around which indi-

[3]This section is arguably as much about contract as it is about property, since the focus is the distinction between them. Yet, the narrative focuses on property because it is instrumental to the next sections, which build on it.

viduals can negotiate. From this perspective, property solves problems associated with the fact that contract rights can be negotiated around, reneged and violated. In line with Coase (1960), the authors show that rights that cannot be altered through negotiation have a deeper impact on the economy than negotiable rights. In legal scholarship, these notions find a parallel in the view that property law is a set of rules designed to maximize the value of ownership while minimizing the costs of defending against challengers Bell and Parchomovsky (2005, with a review of the literature).

These ideas play an important role in political economics and development and stress the fundamental observation that property rights are, in a broad sense, as a set of institutions that constrain rulers and other potential takers.[4] While important and influential, this view of property differs drastically from the two definitions that follow, which are based on an "horizontal" view of property, that is, on a notion of property grounded on how an individual relates to other private individuals.

Property as a residual control right A second way to define property is to view it as the owner's residual right to control assets, after rights assigned to others by contract have been satisfied. This is the definition on which Grossman and Hart (1986) and Hart and Moore (1990) built the now standard theory of the firm. The crucial observation is that, since contracts are inherently incomplete, it is virtually impossible to specify rights under all contingencies by contract and, hence, there will always be some residual contingencies that have escaped specification. If one

[4] A fascinating application of this idea to the ancient world can be found in Fleck and Hanssen (2006). For a review of the literature on property rights see Besley and Ghatak (2012).

of these contingencies materializes, then the individual who holds the property right on the asset is in control of it. In short, property is designed to solve the problems arising from incomplete contracts (Barzel, 1997).

In legal scholarship, this approach finds a parallel in the literature on commons versus anticommons (starting with Hardin, 1968; Heller, 1998; Heller and Eisenberg, 1998), which shows that residual rights to use and exclude others from using complementary assets should be under unified ownership. In particular, Parisi (2002) has argued that property is subject to an inevitable transition towards higher entropy, because it is easy for a unified owner to fragment property by selling partial rights to different buyers, while holdup makes it very costly for a next potential owner to re-unify property by buying back the pieces. The need to counter this process and keep complementary assets under unified control is said to justify fundamental differences between property and contract and, in particular, the fact that only a limited number of rights (a *numerus clausus* of them) can be qualified as property rights and is protected by a property rule, that is, violations are prevented by injunctive remedies and, if they occur, they are undone Calabresi and Melamed (1972).

Contract law scholarship, however, has emphasized that, while contracts may be incomplete ex ante, they will necessarily be completed ex post by the court, if disagreement results in litigation. Contract law (not property law) defines the courts' interpretive and gap-filling functions (Goetz and Scott, 1985; Scott, 2006). In addition, the assumption that parties cannot write a complete contract does not account for the fact that contracts are, often, deliberately incomplete (Scott, 2003;

Choi and Triantis, 2010). In the next section, it will be illustrated how the notion of property that is standard in legal scholarship differs from the one described here.

Property as a right *in rem* Neither of the definitions provided above fully accounts for the way in which legal scholars have traditionally seen property. Historically, the preoccupation with contracts has been due to privity. In principle, a contract between A and B has no effects for C. Similarly a contract between A and C has no effects for B. What happens if it is impossible to enforce both contracts at the same time, that is, if these two contracts are incompatible? For instance, A could have sold the same asset both to B and to C; who is then the owner of the asset, B or C? The answer is typically to be found in property law. Differently from contractual rights, property rights are *erga omnes*—that is, they apply also to third parties, as emphasized by Merrill and Smith (2000)—and *in rem*—that is, they are attached to assets and not to particular individuals and hence run with the asset irrespective of the asset owners, as emphasized by Hansmann and Kraakman (2002).

In this view, property solves the problems arising from *incompatible* (as opposed to incomplete) contracts. This is a fundamental problem in property law, in light of the fact that ownership has a sequential structure. The current owner's right depends on the previous owner's right, which in turn depends on a previous owner's right and so forth until the chain of transfers can be traced back to an original acquisition. At any juncture in the chain of transfers, mistakes, abuses or theft could create a bifurcation resulting in two competing claims on the same asset arising.

Every legal system has developed (property) institutions to deal with and alleviate similar problems, such as property and business registries (Arrunada, 2012; Bell and Parchomovsky, 2016).

Yet, the problem is more general.[5] Consider for instance a borrower A who pledges the same assets to B and to C or, as in Ayotte and Bolton (2011), a borrower A who promises to B that she will not borrow from C. Yet, she eventually does so and then fails to repay. How are the rights on A's assets to be allocated between B and C? This example shows that this definition of property does not apply only to physical assets. A general problem arises from the fact that contracting parties (say, A and B) cannot perfectly and costlessly give notice to third parties (say C) of their contractual arrangements, which could later enter into a contract with one of the original parties (say, A). This possibility gives rise to a trade-off. Upholding the rights of the contract that was first in time (B's contract) could create problems for innocent third parties (C) who enter into an incompatible contract at a later time. Vice versa, protecting the rights arising from the later contract (C's contract) would open the door for strategic behavior (to the detriment of B).

Property as right *in rem* addresses problems arising from incompatible rights that different contracts assign to different individuals; more generally, property defines rights that are valid irrespective of express agreements and hence requires supporting institutions that address the problem of notice. This notion of property is essential for understanding organizational law.

[5]For an overview of several scenarios in which this problem may arise see Dari-Mattiacci and Guerriero (2015).

1.2 The theory of the firm

This section introduces the theory of the firm,[6] which addresses the question of what distinguishes organizations from arm's length transactions. The incipit for this inquiry is generally attributed to Coase (1937), who noted that economic theory of his time made no difference between individuals and firms acting in the market, although the latter might reach impressive size and encompass the work of hundreds or even thousands of individuals. Coase noted that one of the key characteristics of firms was that parts of the production process where removed from the market and dealt with within. Identifying which transactions are better dealt with inside the firm and which in the marketplace would then lead to a theory of why firm exists and when they are more efficient than market transactions.

Coase argued that firms are there to economize on transaction costs—that is, the costs of using the market to complete transactions—at the price of incurring organizational costs. Firms grow up to the point that internal organization costs rise above the transaction costs saved. However, an important source of both transaction and organization costs is the fact that the principal has limited control over the agent. The degree of control that a firm has on its employees is not necessarily greater that the degree of control that a buyer exercises on a seller in the market. For instance, a large buyer may exert more power on a small-scale seller than an employer on her employee. Therefore, it is difficult to make sense of organizations as ways to replace market transactions with some form of control within a hierarchy, as control

[6]For a review of the literature see Holmström and Tirole (1989) and Foss, Lando, and Thomsen (2000).

can be exerted also in the market.

Alchian and Demsetz (1972) noted these limitation in Coase's approach and proposed to think of firms as ways to manage teams. Team production is problematic because marginal contributions are difficult to measure. Thus, the team—that is, the firm—hires a monitor whose task is to reward effort by team members. Holmstrom (1982) showed that the monitor cannot give each team member his marginal product if the budget has to be balanced, but in a firm third parties inject capital, so that employees do not need to balance their budget. Along these lines, Holmstrom and Milgrom (1991) showed that a firm is preferable to a contract when effort is multidimensional and some dimensions not measurable. The high-power incentives provided by markets would not work well because employees would only care about measurable dimensions. In contrast, in a firm, low-powered incentives are used to incentives both measurable and non-measurable effort (see also Barzel, 1997).

The theories illustrated above share a view of firms as ways to solve market failures (Arrow, 1969, 1974). In fact, these theories do not show that contracts cannot be engineered to support the mechanisms indicated above, such as, for instance, that contracts cannot be designed to provide low-powered incentives. Is a firm just a contract?

An alternative approach is to think of firms as ways to solve contract failures and, namely, contract incompleteness. Williamson (1971, 1975) identified the source of contract incompleteness in the combination of bounded rationality and uncertainty. In turn, an incomplete contract invites opportunism and hence gener-

ates the need for an effective technology to enforce the agreement the parties had in mind. An organization provides a sort of alternative enforcement system that may work more flexibly and effectively than courts and hence could be better capable of dealing with incomplete contracts. Transactions will be allocated inside or outside the firm depending on which "contract law" is better between the one administered by courts or the one administered by the manager. Essentially, however, this is a theory of differential costs of writing and enforcing contracts inside and outside the firm and hence reduces again the firm to a set of contractual arrangements and, namely, to something analogous to an arbitration clause.

A radically different, and now standard, perspective on the problems arising from incomplete contracts was provided by Grossman and Hart (1986) and Hart and Moore (1990). The Grossman-Hart-Moore theory stems from the recognition that contracts can be renegotiated so as to achieve the efficient outcome, and hence, contrary to Williamson's view, it is relatively unimportant which interpretation of the contract a court would enforce ex post. Ex ante, however, a party expects to earn a larger share of the joint surplus if it can steer renegotiation in her favor, securing a larger slice of the pie. In turn, the expectation of larger ex post gains provides incentives to make non-contractible investments ex ante. Since ex post bargaining power crucially depends on a party's control of essential firm assets—which confers holdup power in renegotiation—asset ownership can be used to protect crucial ex ante investments by giving the party making those investments greater bargaining power ex post.

What sets this theory apart from all previous approaches is the fact that the firm

is explicitly defined as a pool of assets (Grossman and Hart, 1986), rather than as a group of individuals. This is a fundamental intellectual step. Specific rights over firm assets can be assigned by contract, but any right that is not specifically assigned pertains to the asset owner. From this perspective, property confers the residual rights to control the assets after all contractually assigned rights have been enforced. Since contracts are naturally incomplete, it is impossible to specify control rights by contract under all circumstances and hence there will be a residual set of rights that pertains to the asset owner. It is thus relevant how property rights over firm assets are allocated. Quite differently from Berle and Means (1932), in this approach ownership *is* control.

In the model, at date 0 parties make ex ante investments, at date 1 they make management decisions, then (private) benefits are realized. Investments, decisions and profits are not contractible at date 0, but decisions can be costlessly renegotiated at date 1. Therefore, the ex post allocation will be efficient and, hence, the only problem is how to distribute the profits in a way that optimally incentivizes ex ante investments. In a simple two-firm setting, there are three options: (1) no integration, (2) firm 1 owns 2 and (3) firm 2 owns 1. The decision whether to integrate production in a single firm (and how) or to rely on a contract between firm 1 and firm 2 (option 1) depends on which party makes the most important ex ante investment, which should be protected through asset ownership. The theory also shows that complementary assets should be owned together, providing an alternative justification for vertical integration (the traditional explanation is based on the need to prevent double markup: Cournot, 1838; Ellet, 1839)

The Grossman-Hart-Moore theory of the firm is grounded in the view that a firm is a pool of assets and that ownership gives residual control rights over those assets. These premises are at odds with the nexus-of-contract approach to business organizations, which views the firm as a group of individuals (Jensen and Meckling, 1976) and control as separate from ownership (Berle and Means, 1932). In the next section, I will emphasize the property foundations of organizational law and reconcile the theory of the firm with a theory of how firms are legally organized.

1.3 The corporation as a firm with "legal entity" status

Most continental legal systems treat corporations as "associations of capital". The notion could not be more starkly opposed to the nexus-of-contracts approach, which stresses agency relationships among individuals. To some extent, this section describes how scholars thought of corporations before the onset of modern corporate governance theory. The corporate form is just one of the many possible ways in which a firm can be legally organized but it is useful to focus on it both for its economic importance and because it helps illustrate the theory. As a comparison, I will refer to the partnership as an alternative organizational form. There are many differences between partnerships and corporations: I will focus on whether the organization can rely on permanent capital.

The discussion will zero in on the notion of legal entity (or legal personality), what it entails and how it is achieved. Broadly speaking, the legal entity status allows a corporation to behave as a "person" under the law. In turn, this feature

requires, somewhat paradoxically, that the firm be "depersonalized", that is, legally detached from the individuals behind it. To provide a very sharp background for the analysis, it is useful to conjecture how a firm would operate in a world in which firms do not have relevance under the law, that is, where firms are reduced to a simple contract among individuals. We will use this example to illustrate the components of the corporate form introduced in the next section. Finally, we will investigate their historical emergence.

1.3.1 Elements of the corporate form and the role of law

In modern business organizations, to depersonalize business—that is, to detach a pool of assets from the individuals behind it—the law provides a set of proprietary rights that confer to an otherwise private contract effects that go beyond the parties involved. Property here does not assign residual rights of control as in the theory of the firm. Quite differently, this notion of property refers to rights *in rem*: rights that run with the assets and are enforceable *erga omnes*, irrespective of whether an individual was part in the original contract or not. As a result, potential conflicts may arise between mutually incompatible contractual arrangements; one of the primary functions of property rights in these cases is to resolve those conflicts. We will stress here the features of the corporate form and emphasize the difference between corporations and partnerships as two different degrees of separation between the business organization and the individuals behind it.

Representation (agency). A business organization operates through the actions of

(human) actors. While in economics the focus is on the conflict of interest and asymmetric information between the principal and the agent (Ross, 1973), in legal terms agency refers to the possibility for the agent to enter into contracts on behalf of the principal, so that the principal, not the agent, is a party in the contract. Agency law applies more generally, also covering agency relationships between individuals. Yet, in the context of business organizations, agency is a crucial feature, as without it the organization cannot operate. An agency relationship cannot be established by mere contractual rights. A key element is the fact that the agency contract between the agent and the principal produces effects for third parties who enter into contractual relationships with the principal through the agent. The agency contract applies *erga omnes*, possibly to any party with whom the agent contracts. It is important to stress that third parties were not part of the original contract between the principal—that is, the organization—and the agent. The potential for incompatible contracts is evident. The agents may exceed the scope of her mandate and make promises that the principal did not anticipate. In this case, the contract between the agent and the principal conflicts with the contract between the agent and a third party. The law of agency is precisely the set of rules designed to address these conflicts. In this sense, agency law defines property rights.

The next three features address together the problem of identifying a pool of assets as the organization's assets and disciplining claims on them. We will proceed by

addressing three different sets of claims in turn: claims by business creditors of the organizations, claims by personal creditors of the equity holders, claims by the equity holders themselves. These features are proprietary in the sense that they run with the business assets irrespective of a specific agreement with individual creditors or equity holders.

Limited liability. Limited liability regulates claims by business creditors and limits those claims to the organization's assets, so that personal assets of the equity holders cannot be attached by creditors of the organization. The proprietary nature of this arrangement is most evident when considering involuntary creditors of the organizations, such as tort victims.

Entity shielding. Entity shielding (Hansmann and Kraakman, 2000b; Hansmann, Kraakman, and Squire, 2006) concerns the opposite problem and disciplines personal creditors' claims on the organization's assets. The problem with those claims is that the personal exposure of an individual equity holder to debt makes the organization vulnerable to possibly inefficient liquidation. Entity shielding may protect the organization's assets more or less strongly. Weak entity shielding simply gives business creditors priority over personal creditors on firm assets. Strong entity shielding adds liquidation protection, barring personal creditors from being able to force the liquidation of the company to satisfy their claims. This is the form of protection seen in corporations.[7] Entity shielding can also be engineered to isolate different business

[7]A more extreme form is complete entity shielding, denying any claim on the organization's

units of a parent company from one another, so that the creditors of one unit cannot attach the other unit's assets or are subordinate to the other unit's creditors.

Capital lock-in. Shielding the organization from the personal creditors of the equity holders is not enough to guarantee that the organization's capital be stable over time. The equity holders themselves could be a substantial source of instability depending on whether they—including, importantly, their heirs—retain the right to withdraw capital from the organization. From a different angle, the question is whether participation in a business organization is at will or if equity holders commit their capital for a term, or indefinitely. At a very general level, this is a—possibly, the most—fundamental difference between a partnership and a corporation. Although a commitment for the short term may be allowed, partnership do not have permanent capital and participation is generally at will, which implies that individual partners retain the right to withdraw their capital and possibly force the liquidation of the partnership. Continental legal systems think of partnerships as "associations of persons". In contrast, capital in a corporation is generally committed indefinitely, so that individual shareholders cannot withdraw their capital at will. In continental legal systems, a corporation is a "association of capital". Exit is possible only through the sale of shares. However, note the important difference between withdrawal, which deprives the organization of capital, and trade in shares,

assets by personal creditors; this is usually associated with nonprofit corporations and charitable trusts.

which only replaces one investor with another without affecting the organizations' assets. The commitment of capital is an *in rem* feature and it is thus enforceable against heirs and other acquirers from the original equity holders.

Finally—and this is probably the most recognizable feature of the corporate form:

Tradable shares. Committing capital to a business entails a loss of liquidity for investors. To compensate for it, the commitment of capital is usually paired with share transferability, that is, the possibility to trade one's position in the organization on a market.[8] The flip side of tradability is the acceptance, on the part of the remaining shareholders, of a change in the identity of the trading investor. Tradability can be free or limited by specific conditions, such as the agreement of the other shareholders.

These features make it possible for a business organization to rely on a clearly identified and stable pool of assets, enter into contracts, own property and stand in court independently and largely irrespective of the individuals behind the organization. In theory, these features could be engineered in a multilateral contract between equity holders, (potential) creditors, managers, buyers, sellers, and other parties expecting to deal with the organization at some point in the future, including potential acquirers from the equity holders and their heirs. The impracticability of such contract is evident. A series of bilateral contracts runs the risk that two or more of these contracts will conflict and hence cannot be simultaneously enforced. The role of property rights in organizational law is to take over this coordination problem.

[8] But see Bolton and Samama (2013) for an analysis of restrictions on the

Yet, property rights are not equally important in all cases mentioned above. For instance, limited liability can in theory be achieved contractually by an agreement between the creditor and the organization to the effect that the creditor's rights are limited to the organization's assets at the cost of a higher cost of debt. Although seemingly fundamental to the modern notion of business organizations, this feature is both theoretically and, as we will see, historically of secondary importance when it comes to voluntary creditors. (With involuntary creditors, such as tort victims, the problem is of course different.) In contrast, entity shielding is of more central importance than limited liability because it is much more difficult to establish by contract. Since this provision limits the recourse rights of personal creditors, it raises the cost of debt for the equity holders and hence is vulnerable to free-riding. In a business organization with multiple equity holders, each equity holder has an incentive to reduce her personal cost of debt by deviating from an hypothetical agreement to shield the company from personal debts. This coordination problem makes it unlikely that a business organization with entity shielding can be sustained by contracts only and requires the law to step in and provide the necessary property rights. In turn, entity shielding makes the organization's assets more stable and less vulnerable to liquidation, it lowers the cost of debt for the company and simplifies monitoring by creditors—as they do not need to monitor the personal exposures of individual equity holders (Hansmann and Kraakman, 2000a,b).

1.3.2 Firms without legal-entity status

To stress the importance of property rights in business organizations, it is instructive to assume them away and follow the life of a firm constructed as a mere contract. In fact, there is no need to conjecture a fictitious counterfactual world: firms operating under traditional Roman law were in this situation since the Roman law did not grant the corporate form (or any other entity status) to private businesses (see Abatino, Dari-Mattiacci, and Perotti, 2011). Analysis of this case will also provide the starting point for the analysis of the evolution of the corporate form in the next section.

How does a firm deal with its clients, creditors, debtors and equity holders in such a world? Assume that, in the late Republican period—in the last two centuries BC—two individuals called Emeritus and Ennius—"e" as in equity holders—jointly put some capital into a business venture, buy essential assets, hire Marius—a manager—and incur debts with a creditor called Carus. All of them are Roman citizens, have free status and are legally independent (*paterfamilias*); under these conditions, they had full rights under the law.

To start with, imagine that Emeritus and Ennius send Marius to buy wine on credit from Carus. In economic terms Marius is an agent of Emeritus and Ennius, the principals, but his legal status is quite different. A practical question that needs to be addressed is who owns the wine and who is Carus' debtor. Ideally, we would expect the firm—that is, the collection of Emeritus and Ennius—to acquire rights and obligations from the transaction effected by Marius. However, the Roman law

did not recognize the legal principle of agency. Therefore, the wine is owned by Marius who also contracts a debt vis-à-vis Carus. In turn, Carus has no claim against Emeritus and Ennius as they were not parts in the contract; if Marius does not repay him, Carus cannot sue Marius' principals. The problem is that the Roman agency contract (*mandatus*) between the equity holders and their manager was limited by a strict application of the principle of privity of contracts and had no effects for Carus, a third party external to that contract. It only regulated the relationship between the principal and the agent.

To complete the transaction Marius needs to repay Carus, transfer the wine to his principals, and claim from them what he paid to Carus. The lack of external relevance for the agency contract creates both the need for additional transactions and exposes both Marius and Carus to financial risks. In turn, Emeritus and Ennius cannot commit through Marius to repay Carus.

To be sure, the situation would not be different if either Emeritus or Ennius went directly to Carus to buy the wine. Although Ennius and Emeritus were parts to a partnership contract (the *societas*), also this contract had purely private effects and no relevance for third parties. From the perspective of Carus, a contract he has with, say, Emeritus does not create liabilities or rights for Ennius and vice versa—that is, there is no mutual agency. As a result, if one of the partners raises capital through debt he only will be personally liable, but to what extent? The Roman law did not recognize the principle of limited liability in this case and hence the partner contracting debt will be unlimitedly liable. In turn, since the partnership contract does not have any other effect than creating rights and obligations between Ennius

and Emeritus, from the perspective of a third-party creditor there is no such a thing as firm assets. There are only assets that are owned jointly by two individuals. Thus, Carus can attach freely the "firm assets" limitedly to the part that belongs to Emeritus in case Emeritus does not repay, and can attach other personal assets Emeritus may have, without limitation. Carus cannot however attached Ennius' share in the firm assets or any other asset he may have.

What if Ennius has a personal creditor, say, Camillus, whom he did not repay? Since, again, the partnership contract had no external relevance, Camillus can attach the share of the "firm assets" that belong to Ennius, even though Camillus is not a creditor of the firm. The Roman law did not shield firm assets from the personal creditors of the equity holders and hence firms faced a risk of liquidation whenever one of the owners became insolvent. The lack of partitioning between personal and firm assets is again the product of the fact that the partnership contract is just that, a contract giving rise to purely contractual—*in personam*—rights.

What if Ennius needs to divest or, worse, dies? Since the partnership contract was irremediably linked to the individuals that created it, if a partner died the contract ceased to exit and the partnership was immediately dissolved. Heirs did not inherit shares in the partnership, they inherited directly a share in the jointly owned assets, outstanding credits and liabilities. Moreover, if Ennius suffers a liquidity shock and needs capital, he cannot easily sell his "shares". The process of replacing Ennius with a new equity holder was complex and effectively required liquidating the original partnership and creating a new one; not a smooth path. The most straightforward way for Ennius to exit is to force the liquidation of the firm.

Engrained principles of partnership and property law allowed him to do so at will. Importantly, the Roman law did not enforce a commitment to remain in business for the long term or indefinitely nor dit it enforce a commitment to own property in common for the long term—which could be a way to sidestep the limitations of partnership contracts.

To sum up, traditional principles of Roman law did not allow private parties to set up a business with partitioned assets (including limited liability and entity shielding), permanent capital, and tradable shares, which could act in the market (and under the law) through agents. There were two notable exceptions to this background set of rules. Partnerships set up by government leaseholders (*societates publicanorum*) were—for a relatively short period of time at the end of the Republic—allowed a structure that, according to Malmendier (2005, 2009), resembled closely that of modern corporations. These were, however, atypical businesses, dealing almost exclusively with public procurements and hence exercising functions, such as tax collection, public construction works, and supply for the army, which were of clear public relevance.[9]

A second and, for our purposes, more relevant exception concerned businesses run by slaves (Abatino, Dari-Mattiacci, and Perotti, 2011). Instead of hiring Marius, a free man, Emeritus and Ennius could jointly purchase Marcipor, a slave. This was a generally available solution, not limited to specific firms providing services to

[9]The mills of Toulouse provide a similar exceptional case for a much later period, in the first centuries after the year 1000 (Sicard, 2015). Also in this case, those businesses were not purely private. Rather they administered an important public utility and hence were not much different in function from public institutions that were traditionally allowed the corporate form, such as municipalities, hospitals and charities.

the state. The mechanism through which those businesses operated is interesting because it is both radically different and, in spirit, perfectly aligned with modern instantiations. One or more private individuals interested in setting up a limited liability company with a manager acting (from a legal point of view) as their agent could jointly purchase a slave and endow him with dedicated assets, called the *peculium*. They would then have to take some distance from management, which often meant posting a sign that publicly warned third parties that the slave was managing a business—for instance, a workshop—independently.

Slaves were considered objects under the law and hence could not enter into contracts, own property or stand in court. Slowly, however, magistrates (the *praetores*) started to extend some form of legal protection to individuals who dealt with slaves, creating remedies such as the *actio de peculio*, which recognized the liability of slave masters for debts incurred by their slaves limitedly to the *peculium* assets.[10] Technically, those assets remained property of the masters, but since the claims of the slave's contractual parties were now enforceable in court against the master, the slave could commit those assets by, for instance, borrowing on or selling them. In turn, masters could delegate managerial decisions to slaves without fear of being personally liable beyond what they had invested in the *peculium*.

Slave-run businesses had limited liability, could be managed by an agent (the slave), and shares in them could be relatively easily traded because one of the masters could sell his property interest in the slave and the *peculium* without causing the

[10]There were also other analogous cases in which slave creditors had actionable remedies, they are discussed in Abatino, Dari-Mattiacci, and Perotti (2011).

liquidation of the business. (However, slave-run businesses did not have permanent capital and entity shielding.) What is interesting is that remedies such as the *actio de peculio* created limited liability by, in fact, extending the liability of the master for obligations contracted by a slave from null to a positive measure. In contrast, modern implementations of limited liability entail a contraction of liability.

The way in which these features emerged in ancient Rome was surprisingly simple and leveraged, just like in modern entities, on the notion of property. The firm was, from a legal point of view, a pool of assets; the peculiarity of this construction was that the manager was one of those assets. The organization was therefore not purely based on the partnership contract, which continued to have only internal effects; it was instead grounded on joint ownership of a slave and dedicated assets. Business was depersonalized in ancient Rome by relying on a non-person (for the law) to manage it.[11]

1.3.3 The historical evolution of corporate features

The traditional Roman principles that reduced business organizations to private contracts served as the background legal principles for centuries after the fall of the Roman Empire. The two exceptions illustrated above did not have any traceable influence in legal history. The *societates publicanorum* were lost as Rome evolved away from its republican origins; emperors concentrated administrative power and did not favorably see a role for large private organizations providing public services (Malmendier, 2009). Slave-run businesses became unfeasible after

[11] For an analysis of incentives in the slave-master relationship see Dari-Mattiacci (2013).

the demise of large-scale chattel slavery. The modern version of the corporate form slowly emerged through centuries of commercial practice an coalesced as a bundle of features that developed at different speeds.

As economic activities and trade picked up during the middle ages, the possibly least desirable feature of the Roman law was the strict adherence to the principle of no representation, which severely constrained the ability of traders to act through agents. Although this principle was clearly rejected in legal scholarship only in 1625 by Hugo Grotius in his *De iure belli ac pacis* (Zimmermann, 1996, 41-44), in practice, courts and commercial communities had long before recognized the possibility that the agent could create legally binding commitments for the principal, so that agency was a key feature of medieval businesses.

Rules allowing for asset partitioning also developed during the middle ages. Limited liability for passive partners was a relatively uncontested possibility. Providing capital to a business without contributing to its management did not generally entail unlimited exposure to liabilities. In the Greco-Roman world the financing of maritime expeditions had long allowed for this option and analogous business forms, like the *commenda,* were common in the middle ages both in the east and in the west (Favali, 2004; Mignone, 2005).

Full limited liability of active partners in a private business enterprise emerged first through a contractual rather than legal innovation. An early instantiation was the limitation of the liability of the directors of the Dutch East India Company in 1623. Their exposure was already effectively limited by maritime law, which dealt with liabilities arising from loss of cargo at sea, and the company's 1602 charter,

which had the force of an *ad hoc* law and regulated liabilities arising from obligations toward employees. Given the limited relevance of tort law for such businesses in the 17^{th} century, the only residual source of liability were company bonds. The charter was silent about them and general principles implied that directors—that is, the company's managing partners—were personally liable for the company's debt (Gelderblom, de Jong, and Jonker, 2013). Contractual exposure, however, can be limited by contract. Since charter renewals failed to do that, the company directors simply wrote limited liability into the company bonds from 1623 on and the courts enforced the new provision. Only later did the principle percolate into the law to became a generally applicable feature of corporations (Punt, 2010).

In contrast, while entity shielding in its weak form—priority of firm creditors over personal creditors on firm assets—could be found in medieval businesses at least from the 13^{th} century (Hansmann, Kraakman, and Squire, 2006), asset partitioning, however, did not reach its full state until the 17^{th} century and so did tradability of shares. To be sure, although some businesses recognized the possibility to trade shares, tradability requires a liquid stock market to be an effective option and the first such market one did not emerge until the 17^{th} century.

In fact, strong entity shielding and tradable shares could not emerge before another fundamental change had taken place: the emergence of business organizations with permanent capital. While public bodies, such as monasteries, universities, and municipalities had long relied on permanent capital, the first private organizations with the same long-term horizon were the East India companies in the Dutch Republic first and in England later, which obtained permanent capital in 1612 and

1657, respectively. Overall, in a relatively short timespan in the beginning 17^{th} century, the Dutch Republic completed a long process of evolution of the features of the corporate form. Two of them, agency and limited liability had evolved in practice before being embedded in law. The remaining three features (strong entity shielding, tradable shares and permanent capital) evolved at once as a result of one particular legal innovation: the enforceability of a commitment to lock in capital for the long term, which was introduced for the first time in Western legal history in 1612 in the Dutch East India Company. We turn to this issue in the next section.

1.4 Capital lock-in and the separation between ownership and control

When the Dutch East India Company (VOC) was chartered in Amsterdam in 1602, the company could rely on agency and limited liability for passive investors, owing to previous legal developments, and on a national monopoly for trade with Asia, which was clearly defined in its charter. Conspicuously, the charter did not introduce limited liability for active investors (the company directors), who remained personally liable for company debts. In these respects, the VOC charter was almost identical to the charter of its main competitor, the English East India Company (EIC), chartered in 1600.

However, the two charters differed in a fundamental detail (Dari-Mattiacci et al., 2017). In the EIC, the initial subscription was to finance one fleet for one voyage. At the return of the fleet—mostly after two to three years for the EIC in this pe-

riod—assets would be liquidated and profits distributed; only then, possibly, a new subscription could be launched under the same umbrella. The VOC charter, instead, provided for a ten-year maturity, after which liquidation and distribution would follow. The difference was substantial, since it allowed the VOC to reinvest profits from the initial voyages into subsequent ones. In 1612 the 10-year term was extended indefinitely. The impact of this provision was disruptive for both legal and economic history. Arguably, it allowed the VOC is perform better on any measurable outcome than all its European competitors taken together, including the EIC.

One of the most resilient of the Roman law principles illustrated in the previous section was the idea that a partner could exit at will by forcing the liquidation of the partnership. Similarly, a tenant in common could exit at will by forcing the liquidation of the co-owned asset. The flip side of these principles was that an agreement to remain in a partnership or a joint ownership for the long term was not enforceable in court. As the EIC charter broke with this principle, it set in motion a series of additional changes.

Strong entity shielding is not practical without committed capital, and vice versa. The reason is that creditors and equity holders could collude to liquidate (possibly inefficiently) the company if either of them has a right to do so. Therefore, the introduction of permanent capital also meant that entity shielding against the investors' personal creditors could be made stronger. In turn, tradable shares are not necessary without committed capital. The EIC charter allowed trade in shares but there was very little of it, since investors had committed their capital only for the shortest possible duration, that of a return voyage. In contrast, trade in VOC

shares picked up immediately after the chartering of the company, owning to the longer maturity of the equity, the need to balance the inevitable loss of liquidity on the part of individual equity holders, and a simplified procedure for their transfer, which also improved notice of ownership.

Permanent capital gave the VOC a crucial advantage at the margin, allowing the company to invest more heavily on infrastructure and a large fleet stationed in Asia, which in turn made return trade voyages both faster and safer, and boosted company profits. The growing company both could and needed to massively borrow to keep up with its activities. In turn, the large debt exposure transformed the unlimited personal liability of the director into a reason for concern and spurred action on their part. After a series of failed attempts to have full limited liability written in the new charter, the directors simply decided to write it into the company bonds in 1623, a solution with the courts later upheld (Punt, 2010; Gelderblom, de Jong, and Jonker, 2013). Thought obtained contractually, limited liability was a byproduct of the scale of the business operations made possible by permanent capital.

Throughout the 17^{th} and 18^{th} century, the corporate status remained a privilege granted ad hoc by the state. In the 19^{th} century, however, a series of general incorporation statutes both in the United States and in Europe made the format available to any company satisfying certain predetermined conditions and procedures (Butler, 1985). According to Blair (2003), it was the lock-in of capital that made the corporate form so popular in the 19^{th} century in the United States, compared to other organizational forms, such as the partnership, whose capital could be withdrawn at will. Since it has locked-in capital, the corporation requires more severe checks

on directors than would be necessary in partnerships, which explains the different fiduciary duties imposed on corporate directors (Stout, 2005).

The lock-in of capital is conspicuous by its absence from the menu of options offered by traditional Islamic law. Kuran (2012) argues that the absence of ways to lock-in capital in private corporations and reliance on an inadequate trust-like institution held back the economic development of the Islamic world and set it on an suboptimal path that has lasted for centuries. The corporations that emerged in the North of Europe in the beginning of the 17^{th} century were motivated by the possibility to make enormous profits by trading with Asia directly. The Cape route effectively bypassed the local monopolies on sections of the traditional silk road to the East that had made Italian and Ottoman traders rich for centuries. In turn, the need for capital lock-in in the North came from the fact that equipping a ship for oceanic travel was about four times as expensive as doing the same for Mediterranean or North-Sea trade. The scale of the investment made it impossible that any individual, family or close kin could supply the necessary resources, and hence pushed traders to collect large amounts of capital from strangers, who could not be trusted with keeping their capital invested. This evolution required particularly favorable political conditions, characterized by relatively weak governments with a strong commitment to protect trade, such as they were in England after the Civil War and the Glorious Revolution and in the Dutch Republic (North and Weingast, 1989; Dari-Mattiacci et al., 2017).

Indefinite maturity is a defining characteristic of equity. Extant accounts of this feature in corporate finance leverage on the need for an infinite horizon to align

the interests of managers and owners (Fluck, 1998; Myers, 2000). In contrast, the analysis above suggests an alternative reason. The lock-in of capital emerges as an expansion of the set of enforceable promises among partners[12] and allows investors to protect the company from inefficient individual withdrawals, which, for instance, could be motivated by sudden liquidity needs.

Conceptualizing equity as committed capital yields novel insights about the relationship between ownership and control. To expand: the lock-in of capital and the separation between ownership and control are complementary features of the corporation. As we have seen above, historically the emerged together. The lock-in of capital facilitates the separation of ownership and control. Compared to a partnership (where individual withdrawals are allowed), incentives for equity holders to acquire information about the company's profitability in a corporation are diluted, because of lower marginal benefits in the face of similar costs. Being unable to withdraw assets, shareholders have weak incentives to control management. Conversely, the separation between ownership and control lowers the costs of locking in capita. The fact that potential equity sellers in the stock market are less likely informed reduces the degree of asymmetric information in the market and hence improves its liquidity. In turn, greater liquidity makes the restriction on the right to withdraw and liquidate less costly because investors with sudden liquidity needs can easily divest and exit without losing much value. Ex ante, the prospect of easy exit through the sale of shares makes investors more willing to commit their capital.

In this model, the advantages of having committed capital are felt especially

[12]For a theory of optimal enforcement of contracts see Goetz and Scott (1980).

when there is a large number of shareholders, while the partnership remains more viable for small groups. With uncommitted capital, an increase in the number of investors generates centrifugal forces that, due to the risk of individual liquidity shocks, make the organization particularly unstable. Most importantly, this analysis suggests that the separation between ownership and control is a feature, not a bug, of the corporate form. Namely, it reduces the private cost (in terms of loss of liquidity) of committing capital for the long term and makes it possible for large numbers of investors to form a business organization.

1.5 Applications

In this section, I introduce two applications that show the relevance of entity status at two topical moments in the life of a firm: when the firm borrows funds and when it trades essential assets. In both cases, the main focus will be on showing that the legal entity and the firm are two radically different notions and that important details are lost when only focusing on the firm without properly accounting for its organizational structure under the law.

1.5.1 Credit and bankruptcy

The first application concerns the relationship of the firm with its creditors. In a recent case discussed by Baird and Casey (2013), a firm is organized in multiple legal entities, say, a stadium and the adjacent parking lot. If the firm is in financial distress it may incur bankruptcy and, with it, creditors may be subject to

automatic stay, which limits their ability to attach the firm assets. The firm's organizational structure is relevant because entities, not firms, are subject to bankruptcy law. If the firm is organized in two separate entities and only one of them enters into bankruptcy, the creditors of the other entity are not subject to automatic stay.

While it is not possible to contract around bankruptcy law—that is, the firm cannot not waive a creditor's automatic stay in bankruptcy by contract—organizing the firm in several legal entities does allow some measure of flexibility in the way bankruptcy law applies. The crucial difference between contracting around bankruptcy and doing essentially the same though legal entities is that legal entities are property structures and, hence, the legal organization of the firm can be easily verified in public registries—more generally, is subject to notice—while contracts would not. But why would a firm give some creditors—that is, those of the entity at low risk of bankruptcy—such strong rights to start with?

Partitioning off assets in separate legal entities gives a creditor guaranteed on those assets stronger rights than secure credit. In particular, if the entity may is kept out of bankruptcy, the creditor will not be subject to automatic stay and hence will retain a right to withdraw the asset if not repaid in full. This hostage value, increases the likelihood that the firm will repay to start with and could on balance reduce the firm's cost of credit. Thus, allowing firms to tailor bankruptcy law through legal entities could be beneficial.

Ayotte (2018) identifies a trade-off that the law should address. Automatic stay induces debtors to borrow excessively from creditors who are informed about the firm's going concern value. These creditors are better positioned to assess the risks

in bankruptcy but may inefficiently push for continuation, because they can externalize some of the risks on earlier creditors. Instead, having the possibility to work around automatic stay through legal entities induces debtors to borrow excessively from uninformed lenders, who are now willing to lend at lower rates because they are protected by the withdrawal rights. This in turn results in inefficient liquidations ex post due to the exercise of those rights. Finally, if debtors are allowed to partition off assets into separate legal entities, they may do so inefficiently often because of inefficiencies caused by sequential contracting with different sets of creditors.

Therefore, the flexibility allowed by entities should be regarded with caution. What is important for our purposes is that analogous analysis cannot be carried out unless the important differences between a firm and its legal status are properly accounted for, that is, without a theory of business organizations.

1.5.2 Contract assignability

Similarly, legal entities can also be used as a way to bundle contracts that are complementary to each other. This approach complements the theory of the firm as property over complementary assets by extending the analysis of complementarities among contracts. Ayotte and Hansmann (2012, 2015) consider a firm whose only assets are contracts; say, a bundle of complementary licenses to distribute certain products. The question they address is whether the firm owner should be allowed to assign—that is, to sell–these contracts to third parties.

A trade-off arises from the need, on the one hand, to permit the owner to sell assets—contracts, in this case—to cover for liquidity shocks and, on the other hand,

the risk that once the contracts are bundled together, the owner might assign strategically only some of them to low-value third parties and externalize the costs of doing so on the parties to the contracts that remain bundled.

Legal entities allow parties to resolve this problem. If the firm has legal entity status, the party to the contract is the firm, not the firm owner. As a result, even if contracts are not assignable, the owner can cover for liquidity shocks by selling the firm. Sale, in fact, allows the owner to assign all contracts together as a bundle while, due to the lack of assignability, she cannot assign individual contracts, separating them from the bundle. In essence, legal entity status allows for an easily verifiable way—as above, through notice attached to the proprietary status of legal entities—in which contracts can be made assignable conditional on the whole bundle being assigned. As we have noticed above, the property rights supporting legal entity status substitute for the (impractical) multilateral contract that would be necessary to mimic this result.

1.6 Epilogue: business organizations as collections of individuals redux

Both the theory of the firm and the theory of business organizations illustrated in this chapter are squarely centered on assets. Firms and organizations, however, critically rely on the contribution of individual employees and managers. They bring human capital into the firm, which is often as valuable, and sometimes more valuable than the physical capital that the firm owns. Human capital is different from physical

capital because individuals cannot be owned and hence human capital cannot be easily committed for the long term (Hart and Moore, 1994).

Rajan and Zingales (1998) bring human capital to bear on the theories we are considering. The essential recognition is that giving a party contributing human capital to a business project property rights on essential assets might overshoot. The reason is that, since that party can take the asset with her if she leaves the firm, she might not have incentives to make firm-specific investments. In contrast, if the assets are owned by a third party and she only has *access* to them, she will be able to use the assets as long as she remains in the firm but will no longer be able to use them if she leaves. When a party has no value for the assets outside the firm, she will have optimal incentives to specialize investments to the firm's activities. By considering access to essential assets as an important component of a firm's organization, the authors stress the importance of individuals next to assets in defining what a firm is, and allow for the possibility that allocating control rights away from those making essential contributions might improve incentives.

Very loosely, this approach reconsiders some of the points made by Alchian and Demsetz (1972) about team production, but it remains nevertheless firmly grounded on the fact that ownership is a necessary component of organizations. Blair and Stout (1999) extend this approach to examine the legal organization of firms and the role and duties of corporate directors. In corporations, assets are owned by the entity, not by any of the individuals making human capital investments (who only have access to them), and for this reasons the corporation is managed by directors whose independence is guaranteed by law, so that they do not only cater to the

interest of the shareholders but of the corporation as a whole.

I conclude this chapter with a reflection on how the theory developed here relates with extant literature on organizations and, in particular, with the large body of scholarship on corporate governance. Corporate governance examines ways in which providers of finance assure that they receive a return on their investment in the face of agency problems caused by the separation of ownership and control (Shleifer and Vishny, 1997). The law offers a set of default contractual arrangements that can be tailored to the specific needs of each organization. In this chapter, I have showed that this "contract approach" to the study of corporations and other business organizations is complementary to a second, possibly more fundamental, "property approach". What I have called the theory of business organizations stresses the role of organizational law in defining property rights—or, more generally, claims—on firm assets. Through this lens, the separation of ownership and control is a feature, not simply a problem, of large business organizations.

Organizational law is a mixture of default rules, which set the reference points around which contracts are negotiated, and mandatory rules, which define the boundaries of such contracts and create a number of fundamental proprietary rights that allow business organizations to operate as fictitious "subjects" for the law. While both perspectives are important to understand how organizational law shapes organizations, the property approach is essential to distinguish organizational law from general contract law (Hansmann and Kraakman, 2000b), and business organizations from relational contracts (Goetz and Scott, 1981). Contracts do not own assets, stand in court, go bankrupt and trade in the marketplace, organizations sometimes

do.

The theory of business organizations explains when and how organizations are regarded as "bodies" (*corpora*), that is, fictitious "persons" under the law and can thereby act, in many ways, as human persons do. In turn, the personification of an organization requires detaching the organization's assets from the individuals who provide, manage and hold claims on them; that is, it requires to depersonalize business. Once this step is taken—we have seen two diametrically opposite ways in which this outcome was reached in history—the organization's assets can operate autonomously from the individuals behind them. Consequently, a business organization *is* a pool of assets with its relations to several classes of individuals—owners, creditors, managers, contractual counterparts, employees, and so forth—it is not a group of individuals.

While the theory of business organizations focuses on what organizations are and explains the relationship between the organization and the individuals with whom the organization interacts, corporate governance focuses on the relationships among those individuals. To expand, the perspective emphasized in corporate governance is the agency relationship between management and shareholders. Managers have a contract with the corporation which in turn is owned by the shareholders; they are not in a direct contractual relationship with the shareholders. However, through the lens of agency theory the latter is a relatively unimportant detail. What counts is that management can be seen as an agent of the shareholders. Yet, thinking of an organization as a nexus of contracts sheds too little light on the fact that relationships between individuals and the organization—that is, the organization's

assets—are characterized and regulated by rights *in rem*—that is, property rights.

2 Capital Lock-in, Liquidity, and the Separation of Ownership and Control

Abstract

Who should own firm assets, the collection of investors or a distinct legal entity? In a *partnership*, individual investors own firm assets and retain the right to unilaterally withdraw their capital at will. If, instead, firm assets are owned by a distinct legal entity (the *corporation*), investors implicitly waive this right, locking capital in the firm. Capital lock-in facilitates long-term investments but carries a risk of inefficient continuation of unprofitable projects. Withdrawal at will can lead to the inefficient liquidation of profitable projects. In this chapter I provide a theory of the capital lock-in and the choice of organizational form.

Keywords: liquidity, ownership and control, theory of the firm, legal entity, capital lock-in.

JEL codes: G30, K22.

2.1 Introduction

For more than a generation, corporate finance and legal scholarship have been dominated by two big ideas, whose influence can hardly be overstated: the notion that the corporation can be viewed as a nexus of contracts (Jensen and Meckling, 1976; Easterbrook and Fischel, 1989) and that it is affected by a potentially very problematic separation between ownership and control (Berle and Means, 1932). This chapter revisits both premises and proposes a novel perspective on business organizations.

The nexus of contract approach, while providing invaluable insights in the theory of corporate enterprises, suffers from a limitation. Thinking of corporations as contracts reduces organizational law to a menu of default contractual options among which the parties can choose. Even though none of its proponents probably took the theory to this extreme, the nexus of contract metaphor carries the risk of inducing a *merely* contractual perspective on business organizations. Recent scholarship (Hansmann and Kraakman, 2002) has stressed the role of organizational law in regulating claims on firm assets. This is no small task. Without organizational law, firm assets would be owned (possibly, jointly) by the firm owners, they would be sizable by their personal creditors and give raise to liabilities that would be guaranteed by the owners' personal assets. Moreover, the owners, rather than the firm, would acquire property, enter into contracts and stand in court to bring or defend against lawsuits. Organizing businesses of the scale we know today would be impossible, but this *was* the western world before the invention of organizational law

(Abatino, Dari-Mattiacci, and Perotti, 2011). It took centuries to develop the set of rules that allow us to say that firms have their own assets, clearly separated from the personal assets of the owners, and can enter into contracts, own property and stand in court in their own name through (human) agents. Those rules do not establish default contractual rights; they create mandatory proprietary rights (Hansmann, Kraakman, and Squire, 2006; Dari-Mattiacci et al., 2017).

This chapter presents the first formal inquiry into a property-rights theory of business organizations. The analysis starts from a fundamental question: should firm assets be owned jointly by the firm owners (an arrangement that we will refer to as *partnership*) or should they be owned by a separate legal entity (the *corporation*) which is in turn owned by the firm owners? This is the most fundamental way in which the law regulates claims on firm assets. In the partnership, owners retain the right to withdraw their part of firm assets. A withdrawal right allows each owner the power to force the liquidation of the firm: if assets are heavily complementary, the firm might not survive individual withdrawals.[13] In contrast, in a corporation owners do not have a claim on assets and cannot withdraw their part. Assets belong to the corporation and capital is therefore locked in. There is only one way to exit: the sale of one's shares to another investor. A sale changes the identity of one of the shareholders but has no effect on firm capital.

[13] Section 801(1) of the Uniform Partnership Act (1997) recites that a partnership at will (that is, not for a specified period of time or purpose) is dissolved and its business must be wound up upon notice of a partner's express will to withdraw. The remaining partners might unanimously decide to roll over their capital, form a new partnership and continue the business but asset complementarities and holdout problems might make this option unavailable or very costly. In the model, I will assume perfect complementarity and focus on automatic dissolution upon withdrawal by one of the partners.

Locked-in capital is an essential prerequisite to realize a full separation of personal versus business assets and liabilities, and to effectively regulate creditors' claims on these different pools of assets, which in turn is a necessary condition for share tradability and long-term investment (Blair, 2003; Stout, 2005; Hansmann, Kraakman, and Squire, 2006; Lamoreaux and Rosenthal, 2006). Historically, lock-in was central to the development of the modern corporate form in the 17^{th} century. The Dutch East India Company was the first trading corporation endowed with permanent capital, decades before its competitors. The lock-in of capital was a crucial determinant of the company's success and, in particular, it fostered long-term investment. Lock-in went hand in hand with a marked separation between ownership and control and a booming secondary market for shares (Dari-Mattiacci et al., 2017). Conversely, the lack of legal rules supporting business organizations with locked-in capital has been shown to have caused economic underdevelopment (Kuran, 2012).

While locking in capital has clear advantages, it also creates a liquidity problem for investors: absent the exit option given by the right of withdrawal at will, investors need an alternative way to exit. Tradability of shares provides a solution to this problem only if there is a liquid market for shares. A mere formal statement that shares can be traded without the unanimous consent of the other investors is not enough. In turn, liquidity is hindered by the fact that sellers might be asymmetrically informed about firm profitability. Therefore, liquidity is restored by tradable shares only if sellers can credibly commit not to (excessively) monitor managers.[14]

[14]In this setting liquidity is enhanced when some information is removed from the market in the

Given even moderate costs of monitoring, such commitment can be provided by an otherwise pernicious common-pool problem in monitoring that emerges when the number of investors grows large. The direct implication of this mechanism is that the separation of ownership and control, far from being necessarily pathological (as in Berle and Means, 1932), is in fact an essential feature of corporations as it allows for a liquid market for shares, which is in turn necessary to balance the disadvantages of lock-in.

In the equilibrium that will emerge in the model presented here, partnerships form among few investors; partners monitor the manager because free-riding in monitoring is not too serious when only few monitors are involved. In turn, the liquidation option prevents the manager from inefficiently continuing all projects with poor prospects while forcing the liquidation of some profitable ones due to the unilateral withdrawal of partners in need of cash. In contrast, a corporation forms among many investors who, due to free-riding, do not monitor the manager intensely. As a result of the lack of unilateral withdrawal rights, the manager continues all projects, including inefficient ones, but will never have to liquidate profitable ones. The loss of liquidity due to lock-in is balanced by a secondary market whose liquidity is enhanced by low monitoring levels and large numbers of outstanding shares.

Two additional implications will emerge from the analysis. First, partnerships are plagued by inefficient liquidation of profitable projects due to the partners' idiosyncratic liquidity needs; by contrast, corporations are affected by inefficient con-

spirit of Pagano and Volpin (2012) and Holmstrom (2015).

tinuation of unprofitable projects due to the lack of shareholder oversight. Second, the traditional managerial agency-problem is solved in different ways. In partnerships incentives are provided by monitoring: the manager is monitored and hence induced to select good over bad projects. In corporations incentives are provided by the allocation of residual control rights to the manager: monitoring might be low but the manager is sure to be able to continue all projects, which restores incentives.

This chapter is organized as follows. The remaining of this introduction connects the present analysis with the extant literature. Section 2.2 presents the model. Sections 2.3.1 and 2.3.2 solve the model for the corporation and the partnership, respectively. Section 2.4 compares these two different organizational forms in terms of monitoring levels, loanable funds and share value at issuance, and characterizes the manager's choice of organizational form, delivering the main message of the chapter. Section 2.6 concludes with a set of empirical implications and further extensions. Technical proofs are in the Appendix.

2.1.1 Property rights in firms and business organizations

The theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990) stresses the importance of property rights as characterized by residual control rights on assets, which solve problems arising from incomplete contracts. At a very fundamental level, this notion of property is orthogonal to the notion of property in legal scholarship. In the latter, the problem that property solves is not one of incomplete contracts; it is one of *incompatible* contracts. Since contracts are usually bilateral affairs, a contract between A and B might create claims that are in contrast with

the claims generated by a another contract between A and C. For instance, A might pledge the same security to both B and C. The problem arises because A, B and C cannot typically sit at the contracting table together, so that property rules are required to decide which of the contracts prevails (Merrill and Smith, 2000; Hansmann and Kraakman, 2002; Ayotte and Bolton, 2011). While in the theory of the firm property is required because a fully complete contract is unachievable at reasonable costs, in the theory of business organizations property is necessary because a grand multilateral contract is impractical.

These two lines of research have remained largely disconnected. The theory of the firm stops short of providing a theory of how the firm should be legally organized and the theory of business organizations lacks a formal implementation.[15] I operationalize the notion of property in a way that is compatible with both the theory of the firm and the theory of business organizations. The lock-in of capital is the fundamental property arrangement that makes it possible for organizational law to regulate claims on firm assets by all investors (equity and debt holders) and to legally partition these assets away from the personal assets of the owners. These are proprietary arrangements in that they prevail over possibly incompatible contractual

[15]There are, however, two notable exceptions. Ayotte and Hansmann (2015) present a formal model of legal entities where the entity status allows the bundled assignability of contracts that have more value together than if taken in isolation, thereby mitigating the risk of opportunistic transfers that the assignment of individual contracts would create. Ayotte (2018) studies formally the effect of legal entity status on the possibility to withdraw assets during bankruptcy. These two papers stress that legal entity status waves contract or bankruptcy rules that would otherwise apply and that the waiver might be beneficial thanks to the fact that the legal entity status, being a proprietary matter, involves a degree of notice that mitigates the negative effects to third parties. The present study is very close in spirit to them but addresses a different problem: the lock-in of capital that comes with legal entity status.

claims that parties may held (Hansmann and Kraakman, 2002). (Limited liability is but one example of the importance of such a partitioning.)

Yet, the right to withdraw one's capital at will can be viewed as a—possibly, the most fundamental—control right on firm assets—and capital lock-in as the lack thereof—so that my approach can be seen as expanding the theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990) in a yet-untapped direction. The theory of the firm asks whether a single manager or a single investor should own firm assets. I introduce a collection of identical investors and ask the following question: how should we regulate the exercise of the residual control rights held by this collection of owners? The partnership gives individual residual-control rights to each of them while the corporation does not and runs into collective action problems.

2.1.2 The legal origins of the corporate form

The question of who owns firm assets is the question to be answered to distinguish a corporation, which has "legal entity status" or "corporate personhood", from other types of firms, which do not. The historical evolution of business forms from the middle ages onward suggests that the corporation emerged out of the need to lock in capital for the long term when new trade opportunities required unprecedented amounts of investment for a much longer time span than previously done (see Dari-Mattiacci et al., 2017, for an extensive discussion and references). These new trade opportunities came from the onset of Atlantic trade in the late sixteenth century. In particular, trade with Asia allowed north-European merchants to bypass the middle-

men that had dominated the silk route for centuries and to trade directly in spices, textiles and other valuable commodities. Up to that time, trade was organized in single-purpose partnerships that formed among few investors and dissolved at the return of the ships. Reinvestment was not rare but it was crucially dependent on unanimous consent. This model worked well for trade within Europe and with North Africa but the scale of investment needed to finance the larger and more expensive fleets traveling to Asia exposed the limitations of short-term equity: it was impossible to make long-term investments in trading posts and forts and to station fleets in Asia if each partnership had to be dissolved upon returning. Rolling over the capital to the next partnership was impractical and fraught with hold-out problems.

Both England and the Dutch Republic played a crucial role in this period, but the organizational structure of their respective East India companies—EIC and VOC, respectively—differed markedly along a few dimensions. First of all, the Dutch VOC had medium-term capital by 1602 and permanent capital by 1612, while the EIC struggled to introduce it until 1657 due to its different political environment. Permanent capital allowed the Dutch to outspend the English in long-term Asian assets, which in turn made trade more expedient and allowed the company to leverage on economies of scale more efficiently. The gap in the performance of the two companies during this period is remarkable. Yet, that was not the only effect of lock-in.

The VOC had a famously liquid market for shares, with no match in England. Yet, the difference was not due to the fact that trading shares in the EIC was not

allowed. In fact, it was. Liquidity derived from the fact that, due to lock-in, many small non-monitoring investors joined in the financing effort and trade occurred among the equally ill-informed investors of a centrally managed corporation. Control and ownership were less clearly separated in the EIC, where shareholders had more substantial voice and official meetings were regularly called. Moreover, trade would concern not the EIC as such but one of the partnerships that operated a single or a handful of voyages under the EIC flag, which in turn were smaller in size, different from each other and often of idiosyncratic value. This situation magnified the asymmetric-information problem and made trade a rare occurrence compared to the VOC. The model that I will present in the following will examine the relationship between lock-in, liquidity and the separation between ownership and control in a formal way and produce results that are in line with these stylized facts.

2.1.3 Relation to the literature

Next to the connection to the theory of the firm and the theory of business organizations, this chapter is related to the literature that, starting with Adam Smith (1776) and most commonly associated with Berle and Means (1932), inquires into the costs and benefits of the separation between decision-making power and risk-bearing in business organizations. Such a separation is problematic but has been recognized to generate three sets of benefits related to the superiority of hierarchical decision-making over market allocation, scale economies in decision-making and risk-diversification (Coase, 1937; Chandler, 1977; Williamson, 1979; Fama and Jensen, 1983). I add a novel advantage to this list.

The trade-off presented in the present analysis reverses the common interpretation of the free-riding problem among dispersed shareholders as causing agency problems (Jensen and Meckling, 1976) and instead gives it a positive twist: free-riding among shareholders is necessary in order to *reduce* the incentives to monitor—which are provided by the speculative side of monitoring—thereby reducing adverse selection and enhancing the liquidity of the secondary market for shares. If liquidity is not provided by the market, liquidity needs can create detrimental liquidations; however, differently from Diamond and Dybvig (1983), liquidation is efficient if forced by monitors. The latter aspect points to a detrimental effect of liquidity in partnerships: it induces investors to rely on exit rather than voice (Coffee, 1991; Bhide, 1993), which creates external effects.

Monitoring takes two forms in the model: active monitoring reduces the manager's private benefits from choosing a bad project, while speculative monitoring enhances the informativeness of prices in the secondary market, as in Aghion, Bolton, and Tirole (2004). In their model, active monitoring occurs inside the firm while speculative monitoring is the domain of external investors. I consider internal investors who can monitor both actively and speculatively. In the vein of Edmans (2009), incentives to monitor are due to its speculative aspect, that is, to the possibility to sell upon learning that the project is unprofitable, the "Wall Street Rule" of voting with one's feet. In his model, managerial discipline follows from the effect that trade by blockholders has on price. Instead, in my model the (dispersed) speculative monitors will at the same time actively monitor and hence constrain management. Monitoring, however, is not the only way to incentivize

managers. In a corporation with low monitoring levels, managers are incentivized by the prospect of (inefficient, from the shareholders' point of view) continuation. That is, leaving some "initiative" to managers works as a substitute of direct control by shareholders. As in Burkart, Gromb, and Panunzi (1997), while control by shareholders might be ex post efficient, it reduces managerial gains and hence the manager's incentives.

Differently from Diamond (2004), the prospect of liquidation reduces the manager's incentives to choose the good project because it deprives her from the benefits of control and hence makes long-term investment inferior to short-term private gains, so that denying the investors the option to liquidate can improve incentives. More broadly, the choice between the corporate and the partnership form that this chapter analyzes can be framed in terms of the optimal allocation of control over continuation decisions when contracts are incomplete (Aghion and Bolton, 1992).

Closely related, Fluck (1998) and (Myers, 2000) focus on the indefinite maturity of corporate equity as necessary in order to align the incentives of managers and owners and contrast it with definite-term agreements in partnerships.[16] Instead, in the present chapter, duration is indefinite both in corporations and in partnerships since investors can withdraw at will if they act collectively. What changes between the two organizational forms in my model are the withdrawal rights of individual investors.

[16]There is also a related literature on efficient partnership dissolution (Cramton, Gibbons, and Klemperer, 1987), which is not a concern here.

2.2 Model

2.2.1 Informal summary

The model characterizes a trade-off between inefficient liquidation of valuable projects due to individual liquidity shocks and inefficient continuation of unprofitable ones due to lack of shareholder oversight. In the model, managers do two things: they choose between good and bad projects and they decide whether to continue a project or liquidate it after a signal has been realized. The typical agency problem emerges because managers derive private benefits from running bad projects and from continuing unprofitable ones. Monitoring by investors can cure both problems. Monitoring is "active" in the sense that it reduces the private benefits from bad projects and hence induces the manager to opt for good ones. At the same time, monitoring is "speculative" in that it allows monitors to learn the firm profitability and hence intervene in the manager's continuation decision.

Partnerships and corporations balance this trade-off in different ways. What is crucial is that in a partnership each individual partner can force the liquidation of the company and hence block inefficient continuation decisions, while in a corporation this is not possible. Clearly, even if individuals do not have the power to liquidate the corporation, a qualified majority of them has. For simplicity, however, and without loss of generality I assume that coordination costs due to the need to exchange information and vote are prohibitively high. This assumption allows us to contrast the corporation, where inefficient continuation is the rule, with the partnership, where this problem can be avoided. Relaxing this assumption would mitigate

the inefficient-continuation problem in the corporation but it would not eliminate it, as long as coordination costs are present. This would simply make the results less sharp without providing additional insights.

A second crucial assumption that I make for simplicity is that assets are perfectly complementary. Think of a machine that has no value if taken apart. This exacerbates the inefficient-liquidation problem that affects partnerships because it turns each individual withdrawal into the automatic liquidation of the firm. In reality, firms might continue to operate, possibly at lower efficiency, even if part of the assets were liquidated. I exclude this possibility and focus on the sharpest scenario of perfect complementarity. Relaxing this assumption would mitigate the inefficient-liquidation problem but it would not eliminate it, as long as assets are sufficiently complementary so that liquidation follows from withdrawal by a sufficiently large fraction of the partners. As above, the results would not be qualitatively affected.

The trade-off between inefficient continuation and inefficient liquidation plays out as follows. In a partnership, investors can withdraw their capital at will and hence prevent the inefficient continuation of the firm. To do so, however, they need to monitor the manager and thereby learn whether the project is successful. On the downside, monitoring puts them in an informational advantage vis à vis external investors, who refrain from trading with them or do so at depressed prices. The external market for partnership shares shrinks, thereby making exit through liquidation the only valuable option for both liquidity-strapped partners (who trigger possibly inefficient liquidations) and monitors who have discovered the poor firm

prospects (and hence trigger liquidation efficiently). Hence, partnerships might inefficiently dissolve: if an investor experiences a liquidity shock and needs to cash out, the only option may be to liquidate the firm.

The balance between efficient and inefficient liquidations is affected by the number of investors. With only few investors the aggregate liquidity risk—that is, the probability that at least one investor suffers a liquidity shock and hence triggers liquidation—is low and monitoring is high, thereby putting at thumb on the scale on the side of efficient liquidations. The chance that at least one investor experiences a liquidity shock increases rapidly in the number of investors, hence making the inefficient liquidation problem more severe. At the same time, monitoring decreases due to a common-pool problem among investors—liquidation by a monitor creates positive externalities for other investors—further unbalancing the result. Partnerships perform well with few investors but become very unstable as the number of investors grows, which negatively affect firm value.

In contrast, in a corporation, shareholders cannot withdraw their shares. There will never be inefficient liquidation because the only exit option for a shareholder with liquidity needs is the sale of shares. Since liquidation is not an option, increasing the number of shareholders does not carry a liquidation risk and corporations remain stable even with a large shareholder base. Individual monitoring levels decrease with the number of shareholders as in the partnership but for a slightly different reason. Here there is no externality due to efficient liquidations, but the price one can obtain when selling the shares of an unprofitable firm decreases with the number of investors. The reason is that the price becomes more information-

efficient as the number of shareholders increases. Hence buyers can more easily tell profitable and unprofitable firms apart and price them differently. In turn, the gain from monitoring is reduced because of the reduced expected price of shares if the project is bad. This mechanism plays a role in partnerships too, but here it is the only channel through which monitoring levels decrease. Thereby, monitoring levels are higher in a corporation than in a partnership if the number of investors is large and vice versa if the number of investors is small. Corporations perform better than partnerships when there are many investors.

The model endogenously generates the separation between ownership and control as a consequence of the lock-in of capital. Quite counter-intuitively, given an optimal choice of organizational form, the few partners in a partnership have a right to withdraw their capital and find it advantageous to monitor the manager intensely; in contrast, the many shareholders in a corporation have their capital locked in the corporation and nevertheless find it advantageous not to monitor the manager (or to do so relatively less intensely). This apparently puzzling result squares well with the empirical reality where the separation of ownership and control is a feature of large corporations rather than of small partnerships and where voice is the dominant form of control in a partnership while corporations rely on exit. In fact, exit can replace voice only if there are potential buyers out there. The disperse ownership that is typical of a corporation would be dysfunctional in a partnership because it would bring about too high liquidation rates. In contrast, in a corporation it functions as a commitment not to monitor and hence allows for the development of an external market for shares that operates under conditions of "sufficiently symmetric" infor-

mation.

2.2.2 Setup and timing

In the model there are three sets of players—an entrepreneur/manager, primary-market investors (which I will simply call "investors") and secondary-market investors (which I will call "outsiders")—who act over five dates: date 0 (investment), date 1 (monitoring), date 2 (trade), date 3 (continuation versus liquidation), and date 4 (project payoff). I compare two alternative organizational forms, the partnership and the corporation, chosen at date 0. The only difference between the two is that in a partnership investors have the right to withdraw their capital unilaterally at date 3, while in a corporation they do not have such a right and hence continuation is the only option, that is, capital is locked in the corporation. All else is the same, including the possibility to exit by selling one's shares.[17] The timing of the game is summarized in Table 1 and illustrated below. The table also highlights the variables that are private information of one or more parties, while all unmarked variables are common knowledge.

At date 0, an entrepreneur/manager owns assets A and a productive idea that needs an investment equal to I to yield a return qRI if the project is successful, where $R > 1$ is the return per unit of investment and q is a stochastic variable that takes value 1 with probability p and 0 with probability $1 - p$. I take I and A to be integers. If I shares of unitary nominal value are issued, the manager can retain

[17] Commonly, trade may be restricted in partnerships. The model can be easily extended to partnership with non-tradable shares and all results are preserved.

at most A shares and sell $I - A$ shares to investors. If the manager successfully raises enough capital, she chooses between a bad and a good project, $p \in \{p_L, p_H\}$, respectively. Note that p is the probability that the project is successful, that is, that $q = 1$. The bad project yields $q = 1$ with probability $p_L = 0$—that is, it yields zero for sure—and hence it is optimal for investors not to invest if they anticipate that this project will be chosen. The good project yields $q = 1$ with probability $p_H > 0$, or $p_H R > 0$ per share in expectation.

Following Holmstrom and Tirole (1997), project p_L (the bad project) yields a positive private benefit b if the manager is monitored by at least one investor (monitoring efforts are perfect substitutes), and $B > b$ if the manager is not monitored. In contrast, project p_H (the good project) yields no private benefit. Monitoring by investors at date 1 reduces the manager's private benefit from the bad project and makes the good project relatively more appealing to her.

	Actions	Private information (everything else is common knowledge)
Date 0 (Investment)		
A	The manager chooses project $p \in \{p_L, p_H\}$ and the organizational form	Only the manager observes the choice of project
B	The manager invests A, n investors invest 1 each	
Date 1 (Monitoring)		
A	Nature draws the monitoring costs $c_i \sim \mathrm{U}(0,1)$ Each investor i may monitor	Only the investor observes his monitoring cost Only the manager observes monitoring choices
B	The project p_L yields a benefit b or $B > b$ to the manager depending on monitoring	
Date 2 (Trade)		
A	Nature draws the liquidity shocks $l_i \sim \mathrm{B}(1, \lambda)$ and the firm's profitability $q \sim \mathrm{B}(1, p)$	Only the investor observes his l_i Only monitoring investors observe q
B	Investors may offer their shares for sale Sales are effected at the market price	
Date 3 (Liquidation versus continuation)		
A	Remaining investors may liquidate, if the organizational form allows	
B	The payoffs from liquidation (L) is realized or the project is continued	
Date 4 (Project payoff)		
	Continued projects yield qR	

Table 1: Timing, actions and information

While in Holmstrom and Tirole (1997) investment follows monitoring—and hence there is no commitment problem associated with monitoring—in the present model the choice of the project occurs a date earlier than monitoring, the manager's choice of the project will depend on the equilibrium level of monitoring that she expects to be chosen by investors at date 1, which in turn depends on a stochastic monitoring cost. For the same reason, the investor's decision to invest at date 0, will also depend on their expectations about the date-1 monitoring, which in turn determines whether the manager will choose the good project. Therefore, a high-enough equilibrium level of monitoring at date 1 will be a necessary condition for project financing at date 0 in the equilibrium. The assumption that the entrepreneur chooses the project before monitoring decisions are made is realistic in many settings and is a key driver of the model.

	Bad project (unmonitored)	Bad project (monitored)	Good project
Probability of success	p_L	p_L	p_H
Manager's private benefit	B	b	0

Table 2: Projects

Assuming that the project p_H is financed at date 0, at date 2 two things happen. First, investors are exposed to a liquidity shock with probability λ, that is, to the possibility that they need cash at date 3 and hence cannot wait until the date-4 payoff is realized. Those who experience the shock need to exit immediately by trading their shares or liquidating the company. Second, monitors learn the project profitability q. If $q = 0$, it is imperative to exit immediately through trade or liqui-

dation. As a result, if the project is profitable ($q = 1$) only liquidity sellers will offer their shares for sale on the market and will trade with outsiders in a condition of symmetric (lack of) information about firm profitability. If instead the project is not profitable ($q = 0$), both liquidity sellers and strategic seller (the monitors) will be on the market and outsiders will face a positive share of asymmetrically informed traders.

Outside buyers will try to infer whether the project is profitable or not, and hence determine the maximum price they are willing to pay, depending on the volume of sales. Yet, they can do so only imperfectly because both the number of liquidity sellers and the number of strategic sellers are stochastic variables, depending on the occurrence of the liquidity shock and the magnitude of the monitoring costs, respectively. The market will reflect this information by pricing shares at higher levels if the offer is limited and at lower levels if the offer is large. As a result the price might be higher or lower than the expected value of the shares. In expectation, the market price will be lower than the expected value of the shares pR because of adverse selection by the strategic sellers. The difference between the two shrinks when the market is better able to discriminate between profitable and unprofitable projects.

All sellers have the same reservation price of 0, because late payoffs are worth nothing to liquidity-stripped investors and, similarly, a project known to be unprofitable is worth nothing to strategic sellers. Yet, if liquidation is an option, as it will be the case in a partnership, sellers will only be willing to sell if the market price is above the early-liquidation value L per share, while they will always sell if the

liquidation option is not available, that is, in a corporation. I capture this aspect of the problem by allowing sellers to place limit orders on the market. Intuitively, the limit will be L for partnership shares and 0 for corporate shares.[18] Only in a partnership, if the price is too low (which in turn happens when too many sellers are on the market) trade will fail to provide a valuable exit option and liquidation will be triggered at date 3. Firms that are not liquidated yield a return qR—that is, either R or 0—per share at date 4.

2.2.3 Players

Manager (choice of project) The manager is concerned about two things: the returns she earns from her A shares and the fact that the project might be liquidated prematurely at date 3, in which case the project yields AL for sure but the manager bears a positive loss-of-control cost. For simplicity and without loss of generality I capture this aspect of the problem by assuming that the liquidation value of the firm is zero for the manager.[19] Therefore, for the manager the bad project has a value only equal to private benefit. In contrast, the good project has a value that depends on the probability that the project is continued, which I denote with Γ and will be a function of the investors' decisions going forward. In case of continuation, the project yields $Ap_\Gamma R$ to the manager, where $p_\Gamma = p_H$ if the project is always continued—that is, if $\Gamma = 1$—and $p_\Gamma > p_H$ if the project is discontinued with a pos-

[18] Recall that, for simplicity, I assume that early liquidation never occurs in a corporation. See the discussion of this assumption in Section 2.2.1

[19] Given a positive loss-of-control cost k, our assumption is that $k = AL$. While somewhat restrictive, this assumption greatly simplifies the analysis. Doing away with it would make the results less sharp since liquidation would be lesser of a punishment for managers choosing bad projects.

itive probability, which, as we will see, includes the discontinuation of unprofitable projects and hence enhances the expected value of the continued projects above their unconditional probability of success. [20] The manager will choose the good project if

$$A\Gamma p_\Gamma R \geq Mb + (1-M)B \tag{1}$$

where M is the probability that at least one investor monitors the manager and hence the private benefit of the bad project will be b. Conversely, with probability $1-M$ no investor monitors the manager and the private benefit deriving from the good project is B. Note that the manager chooses the good project more often—that is, for lower levels of monitoring—if the probability of continuation is large enough. The inequality in (1) can be rewritten as follows

$$M \geq \frac{B - A\Gamma p_\Gamma R}{B-b} \tag{2}$$

showing that, at the equilibrium, either the probability of monitoring at date 1 or the continuation probability at date 3 (or both) have to be sufficiently large for the manager to have incentives to choose the good project at date 0. Thus, leaving control on the continuation decision to the manager can substitute for low monitoring levels by investors.[21]

[20] I assume here that the manager cannot sell her shares if the project turns out to be unprofitable. Insider trading law may prevent the manager from doing so.

[21] We will see that in a corporation $\Gamma = 0$, while in a partnership $\Gamma > 0$ is a function of monitoring. as discussed in the text. Note also that, if $(1-\Gamma)Ap_H R < b$ the inequality cannot be satisfied because the right-hand side is greater than 1 while $M \leq 1$ (hence the manager inevitably chooses the bad project); instead, if $(1-\Gamma)Ap_H R \geq B$ the inequality is always satisfied because the right-hand side is less than 0 while $M \geq 0$ (hence the manager always chooses the good project).

Investors (monitoring and liquidity shocks) Investors own an amount 1 of capital each; thus, $n \equiv I - A$ investors are needed to finance the project at date 0. Upon investment, at date 1 each investor i can monitor the manager at a cost c_i, which is independently drawn from the uniform distribution $\mathrm{U}[0,1]$. Monitoring has two consequences:

1. At date 1, the benefit from choosing the bad project p_L is reduced from B to b if at least one investor monitors (monitoring is "active");

2. At date 2, those who chose to monitor at date 1 privately learn the realization of q (monitoring is "speculative").

In the present model, investors take simultaneously the role of *active* and *speculative* monitors. Contrast this setup with Aghion, Bolton, and Tirole (2004), where these two roles are taken by two different actors. Active monitoring exhibits the traditional common-pool problem, because effective monitoring by one investors directly benefits other investors, in a very stark way: active monitoring produces no private benefits because it simply acts as a punishment on managers who choose p_L at date 0. Absent the speculative aspect of monitoring, there would be no monitoring in equilibrium. Therefore, in the model, the possibility to gain from the private information that monitoring gives acts as a motivation to monitor. Differently from Holmstrom and Tirole (1997), where monitoring has a *preventive* effect, here monitoring has a *deterrent* effect only if it is incentive compatible, because it takes place after the manager has chosen the project.

Monitoring is unobservable to others and hence other investors and, crucially,

outsiders will not know if a particular investor is a monitor. This is an important determinant of the adverse selection problem in the secondary market. In equilibrium, an investor will monitor if his monitoring cost is below a certain threshold μ, which will depend, as we will see, on the private benefits accruing from asymmetric information. Given the uniform distribution of c_i, μ will also represent the probability that an investor of unknown type is a monitor. Therefore, the probability that at least one of n investors is a monitor in equilibrium has the following form:

$$M \equiv 1 - (1 - \mu)^n$$

which increases in n and in μ.[22] It is this equilibrium probability that determines the entrepreneur's choice of project at date 0, accounted for above.

At date 2, next to learning by monitors, an individual liquidity shock occurs with probability λ and determines the liquidity-type of each investor.[23] An investor i of type l_i derives utility

$$U_i(Y_3, Y_4) = l_i Y_3 + (1 - l_i) Y_4$$

from his proximate level of consumption Y_3 (at date 3) and his future level of con-

[22]This formulation possibly gives too much weight to the effectiveness of monitoring by one, however small, individual investor in a big organization and may result in aggregate monitoring levels M going up in n even as the individual monitoring level μ goes down with n. However, this feature does not affect the results (see especially Proposition 4) while using a different function form would greatly complicate the analysis.

[23]More precisely, an investor i has a two-dimensional type (c_i, l_i), where the two dimensions are independently drawn: the liquidity-type of an investor is independent of his cost-type.

sumption Y_4 (at date 4). There is a safe and inexpensive storage technology, so that present returns can be transferred to the future but not vice versa: the projects returns are not pledgeable and hence an investor cannot borrow against them to finance his current consumption. Therefore, the probability λ determines whether an investor wants to consume now ($l_i = 1$, with probability λ) or later ($l_i = 0$, with probability $1-\lambda$) as in Diamond and Dybvig (1983).[24] The probability that at least one of the n investors experiences a liquidity shock at date 2 is:

$$\Lambda \equiv 1 - (1-\lambda)^n$$

Outsiders (trade) Outsiders own (enough) capital and are there only to buy shares in the company if any of the inside investors sells. The problem they face is that both monitoring and liquidity shocks are unobservable and hence they will trade under asymmetric information. In particular, an outside buyer will not be able to discern whether she is buying from a liquidity seller—who has experienced a liquidity shock and hence is selling shares in a project of expected value equal to pR—or a strategic seller—who is trying to divest from a project that she has discovered through monitoring to be unsuccessful and hence worth 0 for sure.

[24]To make the effect of liquidity shocks as sharp as possible, I am effectively assuming that they make investors value future consumption at zero. This assumption could be relaxed to allow for a positive future consumption value at the cost of making the analysis more cumbersome. Equivalently, we could interpret λ as the probability that the investor discovers an alternative and more profitable business opportunity and hence would like to divest and switch to it.

2.2.4 Trade in the secondary market

At date 2 a competitive market-maker observes the flow of share offers and announces the price. Since there is an infinite supply of buyers, the price is set at the buyers' reservation price. The amount of shares offered for sale reveals information about the profitability of the project (as in Kyle, 1985). Since liquidity sellers are always on the market, a larger offer flow suggests that also strategic sellers might be on the market and hence that the project might be unsuccessful. Both the number of liquidity sellers and that of strategic sellers are stochastic, and hence the offer flow does not perfectly reveal the quality of the project. Sellers observe the price and decide whether to sell or not; that is, they put limit offers that are effected only if the price is above a predetermined threshold. Buyers always buy at their reservation price.

Note that, since there is noise, the price will typically be higher than zero (the value of a share in the company if the project is unsuccessful) and lower than R (the value of a share in the company if the project is successful). In expectation, liquidity sellers will bear a trading cost—a wedge between price and value—due to the asymmetry of information. The trading costs will be shown to decrease in the number of outstanding shares.

All sellers offer shares for sale simultaneously. The market-maker sees that a number ν of the n outstanding shares are offered for sale and uses this information to update her belief about the probability that the project is profitable, the prior being p. Given a—known, for now—individual monitoring probability equal to μ,

we have the following lemmas.

Lemma 1. *After observing the offer flow ν, the posterior probability of success is*

$$\Pr[q = 1 \mid \nu] = \frac{p\lambda^{\nu}}{p\lambda^{\nu} + (1-p)(\lambda + (1-\lambda)\mu)^{\nu}(1-\mu)^{n-\nu}}$$

which increases in λ, p, and n, decreases in ν and becomes more information sensitive (that is, steeper in ν) as μ increases.

Proof. See Appendix. □

The posterior probability of success accounts for the fact that strategic sellers refrain from selling shares in good projects. The numerator is the probability that the ν sellers are liquidity sellers, that is the probability that the project is good (p) times the probability that exactly ν investors have experienced a liquidity shock (λ^{ν}). The denominator is the total probability of having ν sellers, that is, the probability that the project is good and only liquidity sellers sell plus the probability that the project is bad ($1-p$) and both liquidity and strategic sellers sells conditional on the latter having monitored the manager (and all others $n-\nu$ not monitoring).

Intuitively, if the prior probability of success p increases, this will reflect positively on the posterior. Likewise, if the probability of a liquidity shock λ increases, the chance that a seller is a liquidity seller goes up and so does the posterior, because many sales are a weaker signal that the project is bad. If instead the probability of monitoring goes up the effect is different. Having a high probability of monitoring makes it easier for buyers to discriminate between situations where the project is

likely to be successful (when there are few sellers on the market) and situations where the project is likely to be unprofitable (when there are many sellers on the market). Thus, a higher probability of monitoring makes both the presence (bad news) and the absence (good news) of strategic sellers more easy to disentangle from the background noise, which is due to the presence of liquidity sellers. Therefore, an increase in μ makes the flow of offers more informative and hence the posterior more sensitive to it: the posterior probability of success will hence more steeply decrease in ν. Finally, more sellers on the market relative to the volume of outstanding shares (higher ν or lower n) makes the posterior go down because seeing more sellers might indicate that also strategic sellers are on the market.

Figure 1 shows the density of ν for two different values of μ. As μ grows, the density becomes bimodal, which makes it easier to tell cases of strategic sale apart from liquidity sales.

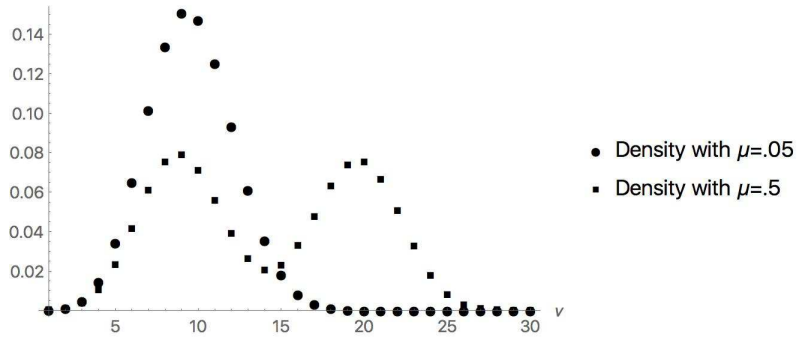

Figure 1: Density of the number of sellers ($p = .5$, $\lambda = .3$ and $n = 30$)

Similarly, Figure 2 shows how the posterior changes with ν for different values of μ. With a high μ, the posterior becomes steeper in ν, with a clear tendency to

take one of two values (0 or 1) in most of the cases.

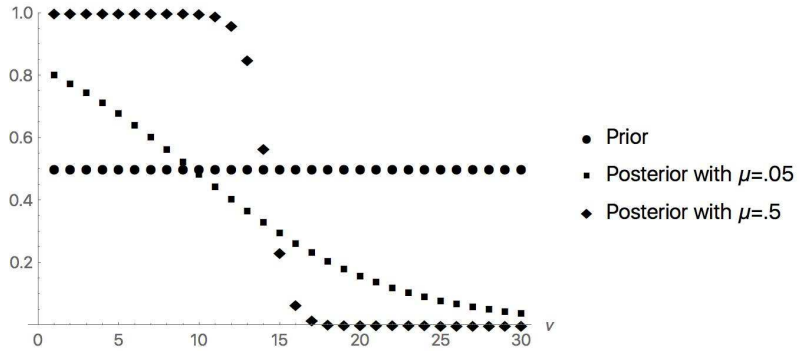

Figure 2: Posterior probability of success ($p = .5$, $\lambda = .3$ and $n = 30$)

The market-maker sets a price that matches the expected value of the project given the information publicly available. The price reflects the posterior probability of success of the project and is equal to the ratio of good projects over all projects on the market times the expected value of a project.

Lemma 2. *The market-maker sets a price equal to*

$$P(\nu) = \frac{\lambda}{\lambda + (1-\lambda)\,\mu \Pr[q = 0 \mid \nu]} \Pr[q = 1 \mid \nu] R$$

which increases in R, n, λ and p, decreases in ν and becomes more information sensitive (that is, steeper in ν) as μ increases. In addition, there is a cutoff level of μ such that $P(\nu)$ decreases in μ below the cutoff and increases in μ above the cutoff (the cutoff is equal to zero for some parameter values).

Proof. See Appendix. □

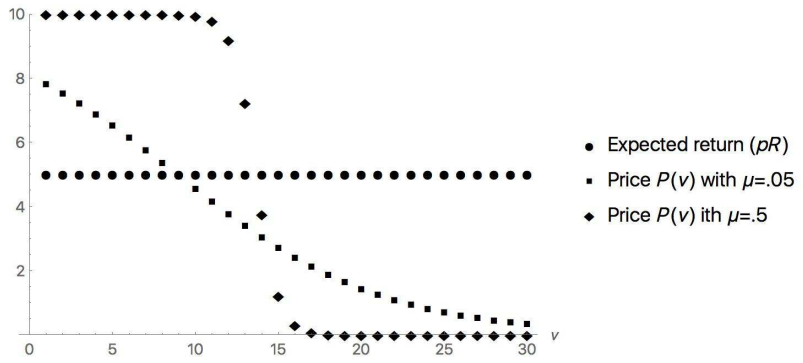

Figure 3: Price of shares ($p = .5$, $\lambda = .3$, $R = 10$ and $n = 30$)

The fraction $\frac{\lambda}{\lambda+(1-\lambda)\mu \Pr[q=0|v]}$ is the probability that an individual seller is a liquidity seller and hence that the project has average value $\Pr[q = 1 \mid v] R$ per share. This probability accounts for adverse selection in the denominator: with probability λ an investor has a liquidity shock and enters the market; with probability $(1-\lambda)\mu$ an investor is a monitor who does not have a liquidity need. However, due to adverse selection, monitors will enter the market only if the project is unprofitable, that is with the posterior probability $\Pr[q = 0 \mid v]$. The price is characterized by the same intuitive comparative statics as the posterior probability of success and, in particular, decreases in the number of shares offered for sale, v, and becomes more informative as the monitoring probability μ increases.

We are interested also in the date-2 price that can be expected at date 1, when the offer flow is not know yet. Liquidity sellers expect to trade at an average price contemplating both the possibility that the project is profitable and the opposite possibility that it is not.[25] In contrast, strategic sellers will only trade unprofitable

[25]Recall that liquidity sellers attach a value zero to later returns, including from good projects.

projects. In turn, if a project is unprofitable, all strategic sellers sell and the price, due to the high volume of trade v, will be relatively low. Hence the strategic sellers' expected price at date 1 has to be made conditional on $q = 0$ (if $q = 1$ strategic sellers are not on the market). The following lemma fully characterizes the expected prices.

Lemma 3. *The expected price is*

$$\overline{P} \equiv E[P] = \sum_{v=0}^{v=n} P(v) \Pr[v]$$

which increases in R, n, λ and p, and initially decreases while later increases in μ.

The expected price conditional on $q = 0$ is

$$P_0 \equiv E[P \mid q = 0] = \sum_{v=0}^{v=n} P(v) \Pr[v \mid q = 0]$$

which increases in R, λ and p, and decreases in n and μ.

The expected price conditional on $q = 1$ is

$$P_1 \equiv E[P \mid q = 1] = \sum_{v=0}^{v=n} P(v) \Pr[v \mid q = 1]$$

which increases in R, λ, p, n and μ.

Proof. See Appendix. □

Hence their reservation price is 0 or, if they have the power to liquidate, *L*.

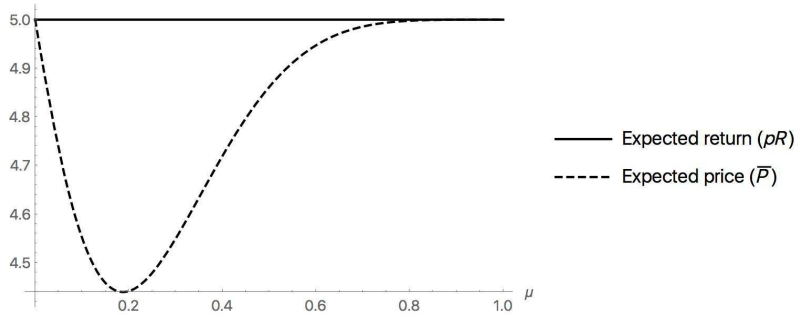

Figure 4: Expected price as a function of monitoring ($p = .5$, $\lambda = .3$, $R = 10$, and $n = 30$)

While most of the comparative statics is intuitive, the effects of n and μ call for some comments. As we have observed, an increase in μ makes the price more information sensitive in the sense that it becomes easier for buyers to distinguish between profitable and unprofitable projects by looking at the number of shares for sale. This makes the expected price of unprofitable projects decrease in μ. Simultaneously, the price of good projects, that is, the price conditional on $q = 1$, increases in μ. Either of these two effects might dominate. The reason is that an increase in μ brings about more precise information but also a more serious problem of adverse selection. Therefore, which of these two effects dominates depends on the level of μ. When μ is small, the negative effects of adverse selection dominate the positive effect of increased information efficiency and the expected (unconditional) price decreases in μ. At higher levels of μ the positive effect dominates and the price increases in μ.

A change in the number of outstanding shares has similar but not identical effects. An increase in n makes inference from the number of shares for sale more

precise and hence increases the wedge between the price of profitable and the price of unprofitable projects as μ does. Yet, an increase in n carries no negative consequences and hence this positive effect causes the loss due to adverse selection to go down monotonically and the price to increase correspondingly as n grows large. In the limit, the market prices profitable and unprofitable projects correctly, neutralizing the workings of adverse selection, and the expected price is equal to the ex ante value of projects, pR. Figure 5 illustrates these results: the more the conditional prices of good and bad project (top and bottom curves) diverge, the smaller the cost of trade becomes—that is, the closer the (unconditional) expected price gets to the expected return of the project.

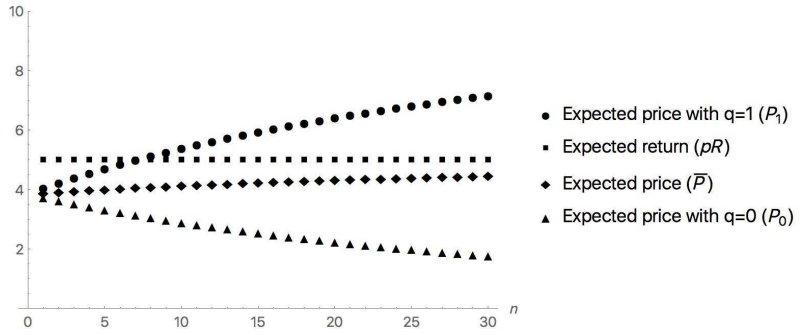

Figure 5: Expected price ($p = .5$, $\lambda = .3$, $\mu = .25$, and $R = 10$)

2.2.5 Continuation or liquidation decision

The project has a positive liquidation value per share equal to $L < 1$, so that if the project is to be liquidated for sure, it is not worth investing in it. The first-best continuation decision at date 3 consists of liquidating the project if $q = 0$ and continuing if $q = 1$. I the additional assumption that $p_H R > 1$, so that the expected

returns of the good project are greater than the initial investment, irrespective of the continuation decision. Therefore, it is optimal to invest in the good project even when the liquidation option is not available. Given this assumption, we have $pR > L$ and hence it is not profitable to liquidate the project if the value of q is unknown. These assumptions eliminate essentially uninteresting cases from the analysis.

Given this setup, an inside investor has two possible reasons to either force the liquidation of the firm or try to sell his shares on the secondary market: he might have monitored the firm and learned that the project is unsuccessful ($q = 0$) or he might have experienced a liquidity shock.

At date 3 the manager always prefers to continue rather than to liquidate, because, as emphasized above, her liquidation value net of the loss of control is zero. Absent a decision by the investors, the project will continue. In a partnership, each partner holds the right to veto continuation as he can unilaterally force the liquidation of the company. In a corporation, instead, continuation is the norm.

2.2.6 Organizational choice

Our goal is to determine whether the business should be organized as a partnership or as a corporation at date 0. There are three problems that the choice of the business form has to balance, each occurring at a different date in the future:

1. Providing the entrepreneur with incentives to choose project p_H at date 0, which in turn requires providing investors with sufficient incentives to monitor at date 1;

2. Providing liquidity through the secondary market at date 2;

3. Assuring the optimal continuation decision at date 3.

How these three problems are balanced will determine both the financial viability—that is, the possibility for the manager to rise enough funds—and the ex ante value of the firm. Conditional on the project being financed, we will look for the organization form that maximizes ex ante value of the firm.

2.3 Equilibrium monitoring

Let us start by assuming that for a given organizational form the manager has chosen the good project and investors have provided the necessary capital at date 0. We can then determine the equilibrium level of monitoring chosen by investors at date 1. Since the monitoring choice depends on whether exit is restricted to trade or is also allowed through liquidation, monitoring will be different depending on the organizational form. In each organization form, we will look for the Nash equilibrium of the game played by the inside investors—who choose the monitoring level as a best response to the price arising in the secondary market—and the outside buyers—whose reservation price is the best response to the monitoring level.

2.3.1 Corporations

In a corporation, continuation at date 3 is assured by the fact that investors cannot force the liquidation of the company. Consequently, both liquidity sellers and strategic sellers are willing to sell for any positive price at date 2; the former because

they value late payoffs at 0 and the latter because they know the project will yield a payoff equal to 0. (Thus, limit orders will be entered by sellers with a limit equal to 0.) Since exit by trade is the only way to gain from monitoring, each investor decides whether to monitor at date 1 based on his expectation about the buyers' reservation price at date 3. In turn, each buyer decides his reservation price based on his expectation about the (unobserved) investors' monitoring choices at date 2.

The share price $P(v)$ that emerges in the secondary market is calculated in Lemma 2 as the market-maker's best response to the monitoring level μ. In turn, in the equilibrium, we must also have that the investors' monitoring choice is the best response to the buyers' reservation price $P(v)$, which in turn determines the price at which exit will take place.

Each investor i monitors if the expected payoff from monitoring is weakly greater than the expected payoff from not monitoring:

$$(1-\lambda)\left(pR+(1-p)\,\mathrm{E}_{v\geq 1}\left[P(v)\mid q=0\right]\right)+\lambda\,\mathrm{E}_{v\geq 1}\left[P(v)\right]-c_i\geq(1-\lambda)\,pR+\lambda\,\mathrm{E}_{v\geq 1}\left[P(v)\right]$$

(Note that the expectations about the price are conditioned on at least investor i being on the market and hence are not the same as $\overline{P}$ and P_0 defined above, which also allow for $v=0$.) The value of going forward without selling, $(1-\lambda)\,pR$, is unaffected by monitoring and appears on both sides of the inequality. Likewise for $\lambda\,\mathrm{E}_{v\geq 1}\left[P(v)\right]$, investors who experience a liquidity shock sell irrespective of the profitability of the project and hence monitoring is irrelevant in that state. Instead, information about profitability has value when one can turn a zero-value investment

into a positive-value sale in a fraction $(1-\lambda)(1-p)$ of the cases, that is, when the investor does not need liquidity and the project is unprofitable.[26] Figure 6 depicts the state tree for an investor with unknown monitoring cost, who will draw $c_i \leq \mu$ (and hence monitor with probability μ) or $c_i > \mu$ (and hence not monitor with probability $1-\mu$).

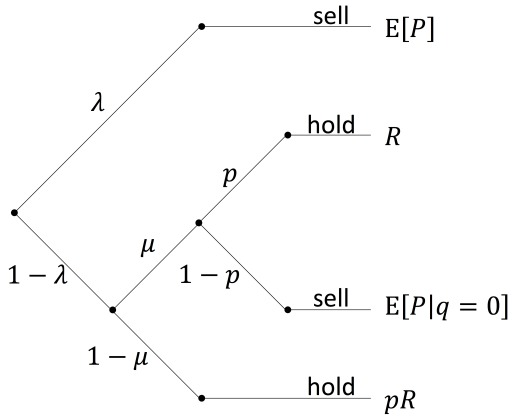

Figure 6: Liquidity shocks, monitoring and exit in corporations

More concisely, an investor monitors if

$$c_i \leq (1-p)(1-\lambda)\,\mathrm{E}_{v\geq 1}\left[P(v) \mid q=0\right] \equiv C_\kappa(\mu) \tag{3}$$

Given a probability of monitoring $\mu = \Pr[c_i \leq \mu]$, μ is also the level of c_i that

[26]Note that the timing of trade makes it impossible for sellers to learn the profitability of projects from the market price. Note however that this is not a strong assumption. The uninformed sellers' reservation price is the same as the buyers' reservation price, as the two groups of traders are equally informed. In turn, the buyers' reservation price is, by construction, equal to the expected value of the shares given the information publicly available on the market. Therefore, uninformed sellers are indifferent between holding on to their shares and selling them. This implies that an uninformed investor cannot profit from information held by monitors.

makes the investor indifferent between monitoring and not monitoring and hence makes (3) hold as an equality. Since the right-hand side of (3) is a decreasing function of μ, we have the following lemma:

Lemma 4. *The equilibrium level of monitoring in a corporation solves*

$$\mu = C_{\kappa}(\mu)$$

The solution, μ_{κ}, is unique; μ_{κ} initially increases and then decreases in n.

Proof. See Appendix. □

Note that, quite intuitively, the individual monitoring probability decreases in the number of investors n when n is sufficiently large owing to the fact that a larger n makes it easier for buyers to discriminate between profitable and unprofitable projects and hence reduces the price of bad projects and erodes the benefits of monitoring. Note an important implication. In a liquid market for shares the large volume of trade assures that the market price is very close to the value of shares—and hence the cost of trade due to asymmetric information is minimal. The gain from monitoring derives from the fact that the monitor can dump shares of value 0 on the market and obtain a positive price from uninformed buyers who cannot distinguish between strategic and liquidity sales. As the market prices shares more accurately—which occurs when n is large—the gains from monitoring go down. The dilution of the incentives to monitor is not due to free-riding among monitors. In fact, the gains from monitoring are perfectly internalized by the monitor. The

dilution comes instead from the information efficiency of the market. By removing liquidation as an exit option, the corporate form "forces" investors to trade on the market thereby increasing trade volume, making the market more efficient and reducing the incentives to monitor.

2.3.2 Partnerships

In a partnership investors retain the right to withdraw their capital, thereby forcing the liquidation of the company unilaterally. Liquidation gives investors L per share and hence it will occur only if the price $P(v)$ is below L.[27] (That is, sellers will enter limit orders with limit equal to L.) A breakdown of trade due to depressed prices has positive and negative effects. On the negative side, it makes an individual investor's liquidity shock damaging for the company as a whole since some of the projects that will be liquidated are profitable; these are inefficient liquidations. On the positive side, a breakdown of trade reduces the risk of inefficient continuation that plagues corporations; these are efficient liquidations.

On the one hand, compared to the corporation, where monitoring investors can only exit by selling, in a partnership the value of monitoring is enhanced by the fact that exit yields either the market price or the liquidation value, whichever is higher. On the other hand, however, liquidation allows investors who do not monitor to benefit from information gathered by monitors, who force the liquidation of

[27] Recall that L is the price obtained by selling assets on the market and is (by assumption) independent of the profitability of the project. Think of a case in which the machinery that the entrepreneur purchased for this specific project is resold and, prior to being put to an alternative use, needs to be reconfigured.

bad projects, which creates a free-riding problem in monitoring and dampens the incentives to monitor as compared to the corporation. Which of these two effects prevails depends, among other things, on the number of investors, which affects the occurrence of inefficient liquidation, the extent of the free-riding problem and the equilibrium price in the secondary market.

Let

$$\overline{v} \equiv \max \{v \mid P(v) \geq L\}$$

be the maximum volume of offers such that the share price is weakly greater than the liquidation value. Since the price increases in n, also the cutoff $\overline{v}$ increases in n. Given that the price of shares $P(v)$ decreases in the volume of sales v, we have $P(v) \geq L$ if $v \leq \overline{v}$ and $P(v) < L$ if $v > \overline{v}$. A high $\overline{v}$ makes liquidation less likely. Liquidation occurs if any investor experiences a liquidity shock and the price is below the liquidation value or if, given that no investor has experienced a liquidity shock and the project is unprofitable, any investor monitors and the price, conditional on $q = 0$, is below the liquidation value. A high $\overline{v}$ has a beneficial effect, because it reduces the risk of inefficient liquidations, but it also has a detrimental effect, because it prevents efficient liquidations. (see Figure 7).

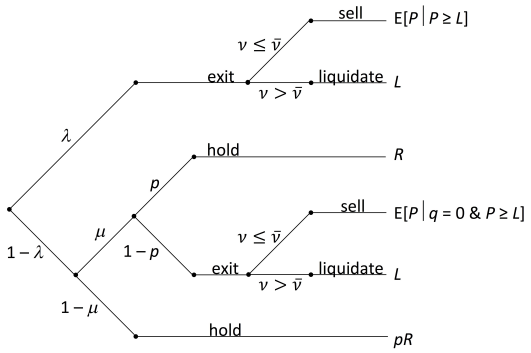

Figure 7: Liquidity shocks, monitoring and exit in partnerships

Following the same equilibrium concept as above, an investor monitors if:

$$c_i \leq \left\{ \begin{array}{ll} (1-p)(1-\Lambda)(1-\mu)^{n-1} L & \text{if} \quad \overline{\nu} \leq 1 \\ (1-p)(1-\lambda)\mathrm{E}_{1\leq\nu\leq\overline{\nu}}[P(\nu) \mid q=0] & \text{if} \quad \overline{\nu} > 1 \end{array} \right\} \equiv C_\pi(\mu)$$

If the price is below the liquidation value for any positive level of the flow of offers, that is, if $\overline{\nu} \leq 1$, then liquidation is always a better option than trade. In this case, monitoring yields a private benefit only if the present investor is the only monitor—that is, if no other investor monitors, with probability $(1-\mu)^{n-1}$—and if no investor experiences a liquidity shock, including the present investor—that occurs with probability $1-\Lambda$.

If instead for some positive level of offers the price is higher than the liquidation value, that is, if $\overline{\nu} > 1$, then the investor trades if $\nu \leq \overline{\nu}$ and liquidates otherwise. However, liquidation is the best option only if $\nu > \overline{\nu} > 1$, that is, when there are other investors who would want to liquidate the company anyway. In this case, the present investor is not pivotal in the decision to liquidate and hence there is no

private benefit from monitoring.

Note that when monitoring leads to the liquidation of the company there is a free-riding problem among investors as action by any monitor generates a positive externality consisting of the liquidation of an unprofitable project, which benefits all other investors. (Note also that if L approaches zero, the monitoring probability would be the same as in a corporation because $\overline{v}$ would approach n.)[28]

Lemma 5. *The equilibrium level of monitoring in a partnership, μ_π, solves:*

$$\mu_\pi = \max\{\overline{\mu} : \mu \leq C_\pi(\mu) \, \forall \mu \leq \overline{\mu}\}$$

Proof. See Appendix. □

2.3.3 Comparison

In a corporation, due to the lock-in of capital, exit by investors is only possible through the sale of shares. In contrast, investors in a partnership can either sell or unilaterally force the liquidation of the company. The possibility of liquidation creates two countervailing effects. On the one hand, investors in a partnership liquidate only when the liquidation value is above the price, which improves monitoring incentives because it grants exiting investors the maximum between the two—this is the first line in the expression for $C_\pi(\mu)$. On the other hand, since liquidation could

[28]Note that in a partnership with non-tradable shares, the monitoring decision reduces to $c_i \leq (1-p)(1-\Lambda)(1-\mu)^{n-1}L$. Since the right-hand side decreases monotonically in μ and in n, the solution to $\mu = (1-p)(1-\Lambda)(1-\mu)^{n-1}L$ is unique and decreases in n. Moreover, the comparison between the partnership and the corporation introduced in the next section holds (qualitatively) also in this case, with a much simpler proof which can be inferred easily from the proof of Proposition 1.

be efficiently triggered by another monitor or by a liquidity-strapped investor, the possibility of liquidation generates a common-pool problem in monitoring, which dampens the incentives to monitor—this is the second line in the expression for $C_\pi(\mu)$. Which of these two effects prevails depends, among other factors, on the number n of investors.

Proposition 1. *There is a firm size $\hat{n} \geq 0$ such that the equilibrium monitoring level is larger in a partnership for small n and in a corporation for large n; that is, $\mu_\kappa < \mu_\pi$ if $n < \hat{n}$ and $\mu_\kappa > \mu_\pi$ if $n > \hat{n}$.*

Proof. See Appendix. □

As the number of investors grows large, the equilibrium monitoring level in a corporation decreases because the price becomes more information sensitive, making it less likely that a monitoring investor will be able to sell shares in an unprofitable project for a high price in the secondary market. This effect dampens the incentives to monitor. In a partnership, there is an additional effect contributing to lowering monitoring levels: a free-riding among monitors which arises because an efficient liquidation benefits all investors. As a result, for large n, equilibrium monitoring levels in a partnership will be lower than in a corporation.

2.4 Organizational choice

Having solved the model for the equilibrium monitoring level chosen by the investors at date 1 and the optimal price response in the secondary market at date 2,

we can now investigate the determinant of organizational choice at date 0. We will consider the problem from three different perspectives: maximizing the value of the firm, in terms of returns on investment; the investor's preferred choice, which also takes into account the investors' idiosyncratic liquidity needs and monitoring costs; and, finally, the manager's perspective. We will assume throughout that the manager's own invested funds A are enough to guarantee that the manager choose project p_H. We will return to this problem momentarily.

2.4.1 Value of the firm at date 4: Inefficient continuation versus inefficient liquidation

As a first order effect, the lock-in of capital alters the way in which an organization balances the fundamental trade-off between the inefficient liquidation of profitable projects and the inefficient continuation of unprofitable ones. In a corporation (with locked-in capital) projects are never liquidated because control of the continuation decision at date 3 is handed over to the manager, who has a stake in the continuation of all projects.[29] In a partnership, however, investors retain control over the continuation decision as there is no lock-in of capital, which, in turn, exposes the company to the risk of liquidations triggered not only by the discovery that the project is unprofitable but also by individual liquidity shocks. The latter are inefficient liquidations.

[29]Recall that we are assuming away the possibility for investors to coordinate and collectively decide to shut down the project. This is without loss of generality. See the discussion above in Section 2.2.1.

First-best	$W \equiv pR + (1-p)L$
Corporation	$W_\kappa \equiv pR$
Partnership	$W_\pi \equiv \Gamma p_\Gamma R + (1-\Gamma)L$

Table 3: Expected returns of projects

In the first best, profitable projects should be allowed to continue and yield R while unprofitable ones should be discontinued and yield L—rather than 0, which they would yield if allowed to continue. In a corporation, all projects are continued. The profitable projects yield R while the unprofitable ones, which are inefficiently continued, yield 0. In contrast, in a partnership there is a positive probability that the project will be discontinued, possibly inefficiently. With probability Γ the project is continued; yet, continued projects no longer yield success in p cases because they are positively filtered by monitoring investors. Conditionally on continuation, the probability of success p_Γ must be bigger than p.

Simple application of Bayes' rule suggests, however, that the net effect must be negative:

$$\begin{aligned} \Gamma p_\Gamma &= \Pr[\text{continuation}] \Pr[\text{success} \mid \text{continuation}] \\ &= \Pr[\text{success} \cap \text{continuation}] \\ &< \Pr[\text{success}] \qquad\qquad = \quad p \end{aligned}$$

The intuition is that, although the continued projects are conditionally more likely to succeed, liquidations affect both profitable and unprofitable projects creating a loss, because profitable projects that are liquidated early yield L rather than R. The term $\Gamma p_\Gamma R < pR$ captures the inefficient-liquidation problems that plagues

organizations without committed capital. There is, nevertheless, an upside. Discontinued projects yield L and unprofitable projects may be among those liquidated earlier in a partnership. Both effects are captured by the term $(1-\Gamma)L$, which must be different from $(1-p)L$ because not all unprofitable projects are liquidated—suggesting that the the former term could be less than the latter—and some profitable ones are—suggesting the opposite. The liquidation probability is equal to:

$$1-\Gamma \equiv \Lambda \Pr\left[P(\nu) < L\right] + (1-\Lambda)(1-p) M \Pr\left[P(\nu) < L \mid q = 0\right]$$

The first addendum captures the risk of inefficient liquidations that are triggered by individual liquidity shocks. Since liquidity-strapped investors need to exit irrespective of the profitability of the project, they might trigger (inefficiently) the liquidation of profitable projects. The second addendum accounts for the efficient liquidations, which are triggered by monitors upon learning that the project is unprofitable.

It is easy to see that either organization could yield the largest returns to investment. If L is close to zero, we have that $W_\kappa = pR > \Gamma p_\Gamma R = W_\pi$ because, as we have observed, $\Gamma p_\Gamma < p$. On the other hand, if L is close to pR, then the partnership yields $W_\pi = \Gamma p_\Gamma R + (1-\Gamma) pR > pR = W_\kappa$ because $p_\Gamma > p$. The choice of organization form will crucially depend on how the organization balances the trade-off between locking in capital—exacerbating the inefficient continuation problem—and failing to do so—opening the door to inefficient liquidations.

2.4.2 Value of investment at date 0: Liquidity and the separation between ownership and control

Investors invest if share value is higher than the cost of the investment, which we normalized to 1. In a corporation the ex ante value of one share is given by

$$\begin{aligned} V_\kappa &= (1-\lambda)\left(pR+(1-p)\,\mu_\kappa \mathrm{E}_{\nu\geq 1}\left[P(\nu)\mid q=0\right]\right)+\lambda \mathrm{E}_{\nu\geq 1}\left[P(\nu)\right]-\tfrac{\mu_\kappa^2}{2} \\ &= (1-\lambda)\,pR+\lambda \mathrm{E}_{\nu\geq 1}\left[P(\nu)\right]+\tfrac{\mu_\kappa^2}{2} \end{aligned}$$

where the first term is the value of the investment if the investor does not experience a liquidity shock, and hence sells only if his cost of monitoring at date 1 is below μ (that is, with probability μ) and the project is unprofitable; the second term is the value of the investment if the investor experiences a liquidity shock and the third term is the expected monitoring cost at the equilibrium, $\int_0^{\mu_\kappa} c\,dc = \frac{\mu_\kappa^2}{2}$. Recall that investors in a corporation suffer a loss of liquidity due to their inability to liquidate at date 3; this loss is reduced if the secondary market is liquid. Hence share value is higher in liquid markets, that is, when $P(\nu)$ is high; $P(\nu)$ is the price that sellers obtain when selling shares of expected value equal to $pR > P(\nu)$, where the difference between the two is the cost of trade due to asymmetric information. Similarly, investors benefit from lower monitoring costs.

The second line in the expression above is obtained by substituting the equilibrium level of monitoring $C_\kappa(\mu_\kappa) = \mu_\kappa$ into the first line and can be read as depicting the payoff for non-monitoring investors who do not experience a liquidity

shock, the payoff of non-monitoring investors who experience a liquidity shock and the net benefits of monitoring.

As the number of investors increase, the net benefit of monitoring decreases because the price becomes more information sensitive and hence the price of unprofitable projects goes down (Lemma 3). At the same time, the price of average projects goes up because of the same reason and hence the liquidity loss due to the lock-in of capital is reduced. As n grows, $\mathrm{E}_{v\geq 1}\left[P\left(v\right)\right]$ approaches the expected value of the project pR and μ_{κ} approaches 0; hence, the ex ante value V_{κ} approaches the expected returns of the project pR.

As the number of investors increases, liquidity in the secondary market and the separation between ownership and control emerge as complementary features of corporations. If investors are many, the price in the secondary market is more information sensitive and is close to the real value of the project. In turn, this dampens the incentives to monitor (because bad projects are priced low), relaxing the investors' individual control on the manager's actions and increasing the price of average projects in the secondary market. With high expected prices, the liquidity cost of locking in the capital is reduced to a minimum, boosting the ex ante value of the investment.

In a partnership, there is the additional option to liquidate the firm but also a

possibility that somebody else will liquidate the firm, possibly inefficiently.

$$\begin{aligned} V_\pi &= \sum_{v=1}^{v=\overline{v}} \left((1-\lambda) \left(p \frac{R \Pr[v|q=1]}{\sum_{v=1}^{v=n} (\Pr[v|q=1])} + (1-p) \frac{\mu P(v) \Pr[v|q=0]}{\sum_{v=1}^{v=n} (\Pr[v|q=0])} \right) + \lambda \frac{P(v) \Pr[v]}{\sum_{v=1}^{v=n} (\Pr[v])} \right) \\ &\quad + \sum_{v=\overline{v}+1}^{v=n} \left((1-\Lambda) \left(p \frac{R \Pr[v|q=1]}{\sum_{v=1}^{v=n} (\Pr[v|q=1])} + (1-p) \frac{ML \Pr[v|q=0]}{\sum_{v=1}^{v=n} (\Pr[v|q=0])} \right) + \Lambda \frac{L \Pr[v]}{\sum_{v=1}^{v=n} (\Pr[v])} \right) \\ &\quad - \frac{\mu^2}{2} \end{aligned}$$

where the first line is as in a corporation because the price on the secondary market is high enough for exit through sale to be feasible. The second line depicts both the advantages and the disadvantages of a partnership, which accrue when the price is low and the only exit option is liquidation.

On the one hand, the partnership brings along a risk of inefficient liquidation of good projects in a fraction $p\Lambda$ of the cases, which increases with the number of investors, n. On the other hand, the partnership allows for the efficient liquidation of bad projects.

Proposition 2. *The ex ante value of the investment is larger in a partnership for small n and in a corporation for large n.*

Proof. See Appendix. □

2.4.3 The manager's choice of organizational form

To capture the manager's interest in continuation, we have assumed that the manager cannot sell her shares in an unprofitable project (due to insider trading regulations) and does not benefit from liquidation (the loss-of-control cost is equal to the liquidation value).

Therefore, the manager's expected payoff from the corporation and from the partnership are, respectively:

$$\begin{aligned} \Pi_\kappa &= ApR \qquad \text{(corporation)} \\ \Pi_\pi &= A\Gamma p_\Gamma R \quad \text{(partnership)} \end{aligned}$$

Since we have shown that $\Gamma p_\Gamma < p$, the value of the investment for the manager is maximized when the corporation is chosen ex ante. The manager prefers the corporate form because it benefits from more initiative, even if subjected to more monitoring. The intuition is that monitoring only eliminates bad projects but this is a condition for investors to invest. Further monitoring from the perspective of the manager is only costly if it leads to a loss of control (liquidation) which does not happen in a corporation.

Proposition 3. *The manager has incentives to choose the corporate form inefficiently often.*

Proof. See text. □

2.5 Financing of projects

The expected returns from investment in project p_H for the manager is Ap_HR in a corporation (because there is always continuation and hence $\Gamma = 1$) and only $A\Gamma p_\Gamma R < Ap_HR$ in a partnership because there is a positive chance of liquidation. The entrepreneur chooses the project before monitoring takes place but anticipates the equilibrium level of monitoring, which is motivated by speculative prospects.

The entrepreneur will choose p_H if

$$\begin{array}{rcll} A & \geq & \frac{M_\kappa b+(1-M_\kappa)B}{p_H R} & \equiv \quad A_\kappa \qquad \text{(corporation)} \\ A & \geq & \frac{M_\pi b+(1-M_\pi)B}{\Gamma p_\Gamma R} & \equiv \quad A_\pi \qquad \text{(partnership)} \end{array} \tag{4}$$

We know that $\Gamma p_\Gamma < p_H$, thus $A_\pi < A_\kappa$ is possible only if $M_\pi > M_\kappa$ and so large to overcome the firm effect. For large n, we have $\mu_\kappa > \mu_\pi$, which implies $M_\kappa > M_\pi$ which yields that the entrepreneur needs to invest more of his own funds in a partnership than in a corporation. For large n, partnerships are characterized by more inside equity and less external funding. For small n, we have $\mu_\kappa < \mu_\pi$ and Γ small and hence the ranking could be reversed and the manager could invest less of her own funds in a partnership (this is easy to verify with $n = 1$).

Proposition 4. *For small n, partnerships may require less manager's equity and yield greater ex ante value for investors. For large n corporations require less manager's equity and yield greater ex ante value for investors.*

Proof. See text. □

Relating this finding with Berle and Means (1932), the separation between ownership and control emerges endogenously in the model. With large n, corporations are the optimal organizational structure and are characterized by relatively low levels of manager's funds A_κ and of shareholder involvement, as measured in terms of the individual monitoring level μ.

2.6 Conclusion

The analysis presented here has emphasized the role of capital lock-in in drawing a line between different organizational forms. The traditional view has it that corporations are affected by a pathologic separation between ownership and control. I have shown that this is far from obvious. By locking in capital, investors transfer the power to decide on continuation to the manager. Management becomes entrenched in the sense that it will liquidate too few projects. However, an entrenched management has stronger incentives to invest in good projects at the outset (because it can count on continuation) and this reduces the need for shareholder oversight. A large number of uninformed shareholders results in a particularly liquid secondary market which in turn balances the loss of liquidity due to capital lock-in. Thus, the separation between ownership and control has two advantages: it ensures a liquid market ex post and reduces monitoring costs ex ante. The lock-in of capital in a corporation, however, has a major disadvantage: it opens the door to inefficient continuation of unprofitable projects. Monitors exit by selling their shares and hence information about lack of profitability is not timely transmitted to other investors.

The partnership, which does not lock in capital, carries a reduced risk of inefficient continuation but has its own idiosyncratic flaw: the possibility that profitable projects be inefficiently liquidated. Understanding the conditions under which a partnership is to be preferred to a corporation requires unpacking the determinants of this trade-off. With only few investors, the aggregate liquidity risk is low: there is a small probability that at least one of the investors is subject to a liquidity shock

and hence triggers liquidation (possibly inefficiently). At the same time, incentives to monitor are relatively strong because, due to the small number of investors, free-riding among monitors is not too problematic. As the number of investors increases, however, both problems become more serious. The aggregate risk of liquidity shocks increases radically, making partnerships very vulnerable to inefficient liquidations. At the same time, free-riding among monitors reduces the aggregate monitoring level, weakening the partnership's ability to police the continuation of unprofitable projects.

The corporation is not vulnerable to liquidity shocks and, since liquidation is not an option, is not subject to the free-riding in monitoring that affects the partnership. Therefore, the trade-off between inefficient continuation and inefficient liquidation favors the partnership for small numbers of investors and the corporation for large ones.

The theory of the choice between the partnership and the corporation presented in this chapter suggests a number of applications and possible extensions that I illustrate here.

Liquidity in the stock market. The problem analyzed here is similar to the one examined by Gorton and Pennacchi (1990): uninformed traders pay a trading cost due to the presence of informed traders in the market. Their solution is to split the cash flows into multiple securities, for instance, debt and equity, which appeal to uninformed and informed investors, respectively. In contrast, however, equity is usually very liquid. The analysis presented here explains

that this is the case because in a large corporation most of the insiders are uninformed and this in turn is due to the fact that the price reflects information relatively accurately and hence incentives to become informed are diluted. At the same time, the trading costs generated by asymmetric information are reduced and liquidity (defined as in Gorton and Pennacchi, 1990) is enhanced.

Dispersion of ownership. The analysis points to a beneficial effect of dispersed ownership: it enhances liquidity, which in turn makes dispersed ownership by uninformed investors possible. We have seen that share value at issuance increases in the number of investors. The analysis is limited by the assumption that each investor invests a unit of capital. Relaxing this assumption would allow the investors' base to be expanded by requiring a smaller outlay by each of them. It is plausible to conjecture that share value would increase due to a further decrease in the monitoring level. This observation can shed light on two common policies: bankers try to disperse ownership widely at IPO and antitakeover protection—in the form of hinderance to the concentration of shares—is commonplace in companies that go public or are coming out of bankruptcy.

Insider trading. The analysis also points out that monitoring can be too low for the manager to have incentives to choose the good project. Monitoring is supported by the speculative gains of trade under asymmetric information. Insider trading regulations curb these incentives and there is an optimal toehold that induces enough monitoring without creating excessive trading costs

in the secondary market.

Takeovers. While I have remarked that antitakeover provisions can have a beneficial effect on the dispersion of shares, they may also have negative effects. Corporations are plagued by a problem of inefficient continuation: they live inefficiently long due to the private benefits that entrenched management derives from remaining in power. In the model, dispersed investors cannot coordinate to overrule management in the continuation decision. The specter of an hostile takeover could reduce this problem as it exposes management to dismissal if the company is run inefficiently.

Imperfectly complementary assets. In the analysis, I have assumed that assets are perfectly complementary so that if one investor, no matter how small his part, withdraws his capital, the firm has to be liquidated. In reality, complementarities are important but might not be so dramatic. Firms might be able to run, albeit less efficiently, on a subset of the initial assets and produce more profits than the liquidation value. If this is the case, one liquidity shock might not be fatal, but many will be. There will be a threshold number of investors who withdraw capital in a partnership above which the partnership will be liquidated. Allowing for this possibility might induce two interesting effects in the model. On the one hand, firms running on weakly complementary assets will probably resist liquidity shocks more easily and hence the advantages of the corporation will be weaker. Comparatively, we should observe that the more heavily complementary assets are, the greater the advantages of the

corporate form become. On the other hand, allowing individual withdrawals of capital might create runs on partnership assets which curb the effect just described. First-comers will be able to sell their share back to the company while late-comers will only be able to share in the (lower) liquidation value.

Inside liquidity provision. The model excludes the possibility for inside liquidity. Cash-rich insiders might be willing to buy the shares of liquidity-strapped partners. In turn, this possibility reduces the aggregate costs of liquidity shocks and makes partnerships more resilient. At the same time, however, this possibility opens the door to potential problems of hold-out and adverse selection. Inside buyers might be uninformed and hence ignore whether the seller is a liquidity seller or a strategic one. In turn, this replicates the problems that we have seen emerging in the secondary market. Inside buyers, however, could be monitors who know the value of the company. Monitors will not be subject to asymmetric information but may fall victim of holdout by sellers who try to extract a higher price from them than the liquidation value.

Other differences between partnerships and corporations. In the analysis I have focused on what I consider to be the most fundamental difference between the partnership and the corporation: the possibility for individual investors to withdraw the capital invested. There are, however, many other relevant differences. Different tax and liability regimes apply to partnerships and corporations, the law allows for a certain degree of tailoring, and there exist other

organizational forms that might be seen as lying in between the partnership and the corporation. I have done so not to introduce confounding factors in the analysis. I do not deny the importance of these factors but leave their analysis to future research.

Partnerships with non-tradable shares. In the analysis, I have assumed that partnership shares can be traded without restriction in a market that functions in the same way as the market for corporate stocks, so that, as emphasized, we could zero in on the effect of the lock-in of capital without introducing confounding factors. This is commonly not the case. However, the results of the analysis apply unchanged to the case of partnerships with non-tradable shares, with the benefit of much simpler math. Non-tradability of shares has the effect of reducing monitoring levels even further in a partnership because it eliminates a possibly valuable exit option through trade and only leave liquidation as the only way out. Monitoring levels in a partnership with non-tradable shares decrease in the number of investors more rapidly than in the corporation because of the free-riding problem created by the liquidation option. However, with few partners, liquidation might be a more valuable option than trade (as it is also when shares are tradable) leading to higher monitoring levels than in the corporation in this case.

3 Liquidity and Control within Organizations

Abstract

The commitment of financial resources to a project is essential for long-term investment but brings about both a loss of control and a loss of liquidity for investors. Therefore, investors are ordinarily given an exit option. In this chapter, I contrast three common ways to exit: tradability of one's equity position, liquidation rights and redemption rights. I show that they balance liquidity and control very differently. Large safe projects are better associated with tradability, because the risk of inefficient continuation is low and the market provides enough liquidity. Small risky projects are better associated with redemption rights, because they can sort inefficient liquidations from inefficient continuations. Liquidation rights are desirable when redemption rights fail because of high costs of capital or the risk of runs on the company's cash.

Keywords: liquidity, control, redemption, tradability, exit.
JEL codes: G30, K22.

3.1 Introduction

To capture the benefits of long-term investment, investors may elect to commit their capital to a project for an analogously long term. Commitment, however, comes at a cost, as it deprives an individual investor of the option to pursue an alternative opportunity along the way. Moreover, this liquidity cost is accompanied by a loss-of-control cost, as the possibility to pull out is a very valuable safeguard against managerial opportunism (Sahlman, 1990). The rules governing business organizations restore liquidity in a variety of ways, essentially disciplining an investor's exit from the organization. Different exit provisions, however, affect control in different ways.[30]

At one extreme, individual investors can be allowed to exit by forcing the liquidation of the company. Traditional legal principles dating back to the Roman law allowed partners to dissolve a partnership at will. The same principle of exit at will governed the joint ownership of assets (tenancy in common). Although time commitments are enforceable under some conditions, liquidation rights have been a typical feature of partnerships for centuries (Hansmann, Kraakman, and Squire, 2006, 1393). Two salient examples of successful partnerships are the Bardi, Peruzzi and Medici banks in 14^{th}- and 15^{th}-century Florence and the companies that made the Industrial Revolution in 19^{th}-century England (Hunt and Murray, 1999; Harris,

[30]It is important to note at the outset that the collection of investors (or a qualified majority of them) can always act to discontinue a project (Hansmann, Kraakman, and Squire, 2006, 1338). Nevertheless, coordination costs may preclude this option, making individual exit the only feasible solution. To zero in on the problems of interest, I ignore coordinated exit and focus on individual exit only. Moreover, exit through IPO or acquisition is a form collective exit that is not considered here. Finally, the focus is on equity, not on debt.

2000). Liquidation rights make investment for the long term dependent on the continual agreement of all the investors, which in turn is more easily manageable in small-size, close-kin groups. While giving investors full control over the continuation of the project—and hence guaranteeing that a project is efficiently liquidated if an investor discovers that the project is unprofitable—liquidation rights run the risk of inefficient liquidations of profitable projects triggered by investors with liquidity needs.

At the other extreme, investors can be allowed to exit by trading their shares. Tradability is possibly the most fundamental feature of public corporations. When investors exit by trading their shares on the secondary market, their capital remains invested in the company. The first modern corporation was the Dutch East India Company (VOC), chartered in 1602 in Amsterdam. The VOC was both the first private company with fully committed capital and the first one with a liquid secondary market for shares. These two features are complementary: if capital is fully committed, tradability is necessary to restore liquidity. By contrast, the English East India Company (EIC, chartered in 1600) had formally tradable shares, but trade was initially rare and the secondary market illiquid, arguably because the EIC did not have committed capital until 1657 (Dari-Mattiacci et al., 2017). Allowing exit only through trade carries the risk of inefficient continuation of unprofitable projects. Since investors with private knowledge of poor profitability can exit through trade, their private information does not directly result in the liquidation of unprofitable projects (Coffee, 1991; Bhide, 1993). Sales may depress share price, but price is a noisy signal of profitability because also investors with liquidity needs and no

private information are on the market.

To emphasize: in a stereotypical corporation capital is locked in for the long term and exit is possible only through trade, while in a stereotypical partnership capital is uncommited and exit is possible only by forcing the liquidation of the company.[31] In between these two extreme exit options, redemption rights allow investors to force the company to repurchase their shares for a predetermined redemption price, which is generally equal to the purchase price plus accrued but unpaid dividends. Redemption rights are commonly included in venture capital (VC) financings (Kaplan and Stromberg, 2003, 291) and considered an important safeguard against "walking dead" companies, which barely stay alive without being particularly profitable.[32] Redemption rights, however, may be regarded as a catch, as investors may want to redeem precisely when the company is unprofitable and hence has no cash to pay for redemption.[33]

However, as I will show in the following, the exercise of redemption rights may sort projects, leading to liquidation with high probability if the project is unprofitable—thus, over-performing tradability—and with low probability if the project is profitable—thus over-performing liquidation rights. The intuition is simple. Investors motivated by liquidity needs will redeem their shares independently of the

[31] A partnership with tradable shares is an uninteresting hybrid for our purposes, as our results would remain largely unchanged if we considered this possibility.

[32] Redemption usually needs to be requested by a qualified percentage of holders. Yet, an investor can opt out and refuse to redeem. In the model I will abstract from these complications and look at redemption as an individual decision. The key mechanisms behind my results would remain the same in a more complex model.

[33] Venture capital financings have many defining characteristics that are not examined here, see for instance Black and Gilson (1998); Gilson and Schizer (2003); Smith (2005); Cumming (2005, 2008).

profitability of the project. In contrast, investors motivated by private information—that is, those who know the project's profitability—will redeem only if the project is unprofitable. As a result, the number of redeeming investors—which will be a stochastic variable in the model presented below—will tend to be larger if the project is unprofitable; hence, the company will be pushed into insolvency and consequent liquidation relatively more often when liquidation is efficient because the project is unprofitable.

A recent Delaware case illustrates both the virtues and the problems with redemption rights. In ODN Holding[34] a VC and the company board allegedly colluded to cause the company to engage in growth-reducing, cash-generating transactions, the only purpose of which was to make redemption by the VC possible to the detriment of common stockholders.

If the company is doing so poorly that the VC wants to redeem its shares, it is in the interest of all investors that the company be liquidated. The beneficial sorting of projects under redemption rights, however, comes with two types of costs. The first cost is due to the need for the company to hold (or generate) cash in order to be able to satisfy a certain number of redemption requests. The second cost is due to the possibility of runs on the company's cash, which in turn is due to the fact that the redemption price is generally larger than the liquidation value of the company and hence informed redeemers may be able to create a negative externality for other investors, as ODN Holding nicely illustrates. As we will see, a necessary condition

[34]The Frederick Hsu Living Trust v. ODN Holding Corporation, C.A. No. 12108-VCL, 2017 WL 1437308 (Del Ch. Apr. 25, 2017). See Reder (2017).

to avoid runs is that the company holds enough cash. These costs may weigh against the use of redemption rights for more than a selected class of shareholders.

Although they are commonly combined, I will analyze tradability, liquidation rights and redemption rights in isolation in order to characterize them as sharply as possible. These different exit options impact control and liquidity in very different ways. On the one hand, liquidation rights overshoot when exit is motivated by a liquidity need because they imply the liquidation of the company irrespective of the investor's motive. In a sense, they give investors too much control (as in Burkart, Gromb, and Panunzi, 1997). On the other hand, tradability is at the opposite end of the spectrum, because it never leads to the liquidation of the company, giving investors too little control on continuation (as in Bhide, 1993). Somewhat in between, redemption rights may lead to liquidation only if the number of redemption requests exceeds a certain threshold (above which the company is insolvent), which has a beneficial sorting effect.

Which exit modality is more efficient depends on factors such as the number of investors, the incidence of liquidity shocks and the riskiness of the projects. Large safe projects are better associated with tradability, because the risk of inefficient liquidation is low and the market provides enough liquidity. Small risky projects are better associated with redemption rights, because they can sort inefficient liquidations from inefficient continuations. Liquidation rights are desirable when redemption rights fail because of high costs of capital or the risk of runs on the company's cash.

These results are broadly consistent with the empirical literature documenting

the more frequent use of redemption rights and other control rights on the continuation decision when the potential conflict of interest between the entrepreneur and the shareholders is more severe (Cumming, 2008). Since this particular conflict of interest arises when the project is unprofitable, risky projects are more likely to be associated with stronger control rights. Accordingly, Winton and Yerramilli (2008) find that risky projects are more likely to be financed through venture capital financing, which is characterized by more intense monitoring of the continuation decision, rather than with bank financing, characterized by laxer monitoring.[35]

The theoretical analysis that is most closely related to the model presented below is the one by Aghion, Bolton, and Tirole (2004), which focuses on trade as an exit option while I also consider liquidation and redemption. There is a large related literature on private versus public ownership (see Röell, 1996, for an overview). This literature, however, generally assumes fully committed capital, while here the degree of commitment is an important factor in the analysis. Commitment can effectively be limited by staged-investment agreements. The literature focusing on venture capital stage financing (Tian, 2011) examines the relationship between a single venture capitalist and the entrepreneur. In contrast, the presence of several investors is a crucial factor in my analysis.

While focused on business organizations, the approach developed here could provide insights as to why and under what circumstances commercial parties may

[35]Note, however, as emphasized below, that the literature on venture capital focuses on redemption rights held by a single investor (the venture capital firm). In contrast, a crucial element of my model is that fact that multiple investors may exercise their redemption rights independently of each other.

deliberately enter into low-commitment relational contracts as opposed to more detailed—and more easily enforceable—agreements (Goetz and Scott, 1981; Scott, 2003, 2006).

3.2 Model

3.2.1 Entrepreneur and production technology

We consider a project p, which yields a return qR per unit of capital invested, where $q = 1$ with probability p and $q = 0$ with the complementary probability $1 - p$, so that p is the probability that the project is profitable and npR is the expected return from the investment of n units of capital. If the project is liquidated early, assets can be sold at a reduced price equal to $L < 1$ per unit of capital initially invested; hence, nL is the liquidation value of the company. I assume that to run the project, an amount of investment n is needed. Think of a project requiring the purchase of a single machine which costs n, is expected to generate npR if the project runs to the end and can be resold at $nL < n$ if the project is discontinued early. To assure that investment is in principle optimal, let the expected profit be larger than the investment, that is, $pR > 1$.

An entrepreneur is endowed with a project p but has no funds and hence needs external capital. The entrepreneur may decide to discontinue the project at an early stage if it turns out that the project is unprofitable—that is, if she discovers $q = 0$. To stress the potential conflict of interests between the entrepreneur and the investors, I assume that the entrepreneur derives private benefits from running the project until

the end and hence will have no incentives to discontinue an unprofitable project early, while investors would like to do so because, if liquidated early, the project yields L per unit of capital even if unprofitable, while it yields 0 if continued to the later date. Different exit modalities give investors different degrees of control over the continuation decision, as I will illustrate momentarily.

3.2.2 Inside and outside investors

(Inside) investors invest, for simplicity, 1 unit of capital each and only care about final returns or, if they experience a liquidity shock, about interim returns.[36] Investors can elect to monitor the entrepreneur at a (random) cost. Monitoring is speculative: if an investor monitors, he learns the profitability q of the project. Investors are also subject to a random liquidity shock which makes them value later returns at zero. Therefore, there are two possible reasons for investors to exit: a liquidity reason—that is, the realization of a liquidity shock—and a strategic reason—that is, private knowledge that the project is unprofitable. Since both the liquidity shock and the monitoring costs are privately known, outsiders cannot distinguish between these two exit motives when they observe an exit decision.[37]

Inside investors operate on the primary market only. An infinite number of outside investors operate on a competitive secondary market and will buy shares at their expected value given the information publicly available on the market (if trade

[36]Endogenizing the amount of capital invested by each investors is an interesting extension of the model but one that is unlikely to alter the main message of the analysis.

[37]The presence of some informed outside investors would not alter the results provided that there are enough uninformed outside investors.

is allowed).

3.2.3 Exit options

The model focuses on three stylized ways in which investors can exit: trade, liquidation and redemption. With trade, exit is allowed only by selling shares on the secondary market. With liquidation, exit is allowed only by liquidating the project, which occurs at the request of any individual investor. With redemption, exit is allowed by making a redemption request to the entrepreneur. If the entrepreneur holds enough cash, all redemption requests will be honored and the project will continue. If the entrepreneur does not hold enough cash, the company becomes insolvent and is liquidated prematurely. Those who posted a redemption request have priority on the available cash plus the liquidation value of the company. All other investors then share the residual liquidation value, if anything is left. Effectively, a redemption request turns a stockholder into a creditor with priority over (other) stockholders. Although extreme, this characterization captures the main problem with redemption, that is, the fact that it may generate an advantage over other (non-redeeming) stockholders. (Note that exit through liquidation corresponds to the case of redemption when the entrepreneur holds no cash but a liquidation request does not give priority over other investors.)

Although redemption ordinarily needs to be requested by a (majority of) a class of investors, dissenting investors are usually allowed to opt out. To capture this aspect of the problem, I model redemption as an individual decision. Since the project does not produce any value in the interim period, I assume that redemption

yields the restitution of the initial investment, which is equal to 1 (the redemption price). Redemption is thus more valuable than liquidation but less valuable than the expected value of the project. Absent a liquidity shock or private information, it is therefore inefficient to redeem.

3.2.4 Timing and setup

An entrepreneur with no funds is endowed with a project p at date 0. To run the project, the entrepreneur needs funds equal to n. Since investors invest 1 unit of capital each, the entrepreneur needs to raise capital from n investors on the primary market. The entrepreneur may also collect additional capital to hold as cash. We denote retained cash as $\hat{v}$; thus, in total the entrepreneur raises $n+\hat{v}$ units of capital from an many investors. Note that, given a redemption price equal to 1, $\hat{v}$ is also the number of redemption requests that the entrepreneur can satisfy without becoming insolvent.

At date 1, each investor draws a random monitoring costs: this cost is equal to 0 with probability μ and is prohibitively high ($C > R$) with the complementary probability $1-\mu$. If the cost is 0, the investor monitors the entrepreneur. Monitoring is speculative (as in Aghion, Bolton, and Tirole, 2004). By monitoring, the investor learns the value of q at date 2 so that, if $q = 0$, the investor knows that the project is unprofitable and may decide to exit. At date 2, the investor may also experience a random liquidity shock with probability λ. If the investor experiences a liquidity shock, the value of money in the future becomes 0 and the investor needs to cash out now on the investment (an in Diamond and Dybvig, 1983).

Both investors who have experienced a liquidity shock and investors who have monitored and discovered that the project is unprofitable value the final project returns qR at 0; hence, they prefer to exit at date 2 rather than to wait until date 4. (We allow also all other investors to exit; we will examine when they will elect to do so momentarily.)

At date 3, depending on the exit modality, the date-2 exit decisions may have different consequences for the organization. Exit through trade does not affect the organization, the capital remains locked in and the project continues with probability 1. Exit through liquidation discontinues the project with probability 1 at the request of a single investor. Finally, exit through redemption may or may not result in liquidation.

Table 4: Timing, actions and information

	Actions	Private information (everything else is common knowledge)
Date 0 (Investment)		
A	The entrepreneur is endowed with a project p The entrepreneur chooses the exit modality	
B	The entrepreneur chooses how much cash $\hat{v}$ to retain $n+\hat{v}$ investors invest 1 each	
Date 1 (Monitoring)		
A	Nature draws the monitoring costs $c_i \in \{0, C\}$	Only investor i observes his c_i
B	Each investor i decide whether to monitor	
Date 2 (Exit)		
A	Nature draws the liquidity shocks $l_i \sim \mathrm{B}(1, \lambda)$ and the firm's profitability $q \sim \mathrm{B}(1, p)$	Only investor i observes his l_i Only monitoring investors observe q
B	Investors may opt for exit (trade, liquidation or redemption)	
Date 3 (Liquidation versus continuation)		
A	The firm may be forced to liquidate depending on the exit modality	
B	The payoff from liquidation (L) is realized or the project is continued	
Date 4 (Project payoff)		
	Continued projects yield qR	

If at date 1 the entrepreneur has acquired enough cash to satisfy all outstanding redemption requests, the project continues. This is the case if the number ν of redemption requests is less than or equal to $\hat{\nu}$. If instead the redemption requests exceed the available cash, the project is liquidated; this happens when $\nu > \hat{\nu}$. Redemption requests are posted simultaneously by investors. Continued projects yield qR at date 4. Table 4 summarizes this setup.

3.3 Exit

3.3.1 Demand for exit and its information value

An important factor in the analysis is the number of investors who genuinely prefer exit at date 2. Those are investors who either experience a liquidity shock (a "liquidity exit" with probability λ) or those who, without liquidity shock, monitor and discover that the project is unprofitable, that is, they learn $q = 0$ (a "strategic exit" with probability $(1-\lambda)(1-p)\mu$). We will examine momentarily the possibility for runs on the company's cash by investors who neither experienced a liquidity shock nor monitored (those who monitored and discovered $q = 1$ clearly have no incentive to exit). For now, we focus on genuine exit decisions.

Since both liquidity exits and strategic exits are random variables, the number of investors who desire to exit is also a random variable, which we denote by ν. There are two states of the world. If the project is profitable ($q = 1$), then ν has a binomial distribution $\Pr[\nu \mid n, q = 1] = \mathrm{B}(n, \lambda)$ because the only investors who desire to exit are those with a liquidity shock. If the project is unprofitable ($q = 0$), then ν has a

binomial distribution $\Pr[\nu \mid n, q=0] = \mathrm{B}(n, \lambda + (1-\lambda)\mu)$, which is analogously intuitive. Now those who want to exit are the investors with a liquidity shock and the investors without a liquidity shocks who have monitored. It is easy to see that $\Pr[\nu \mid n, q=0]$ has a greater success rate and hence leads to a larger demand for exit. This means that the number of investors who elect to exit can serve as a noisy signal of the probability of success for the project: if only few investors elect to exit, the project is more likely to be profitable than when many investors decide to do so.

Aggregating the previous conditional probabilities, we have that the unconditional number of investors electing to exit is randomly distributed according to

$$\begin{aligned}\Pr[\nu \mid n] &= p\Pr[\nu \mid n, q=1] + (1-p)\Pr[\nu \mid n, q=0] \\ &= \binom{n}{\nu}\left[p\lambda^{\nu} + (1-p)(\lambda + (1-\lambda)\mu)^{\nu}(1-\mu)^{n-\nu}\right](1-\lambda)^{n-\nu}\end{aligned}$$

The conditional probability of success given the number of exit demands is:

$$\begin{aligned}\Pr[q=1 \mid n, \nu] &= \frac{\Pr[\nu \mid n, q=1]\Pr[q=1]}{\Pr[\nu \mid n]} \\ &= \frac{p\lambda^{\nu}}{p\lambda^{\nu} + (1-p)(\lambda + (1-\lambda)\mu)^{\nu}(1-\mu)^{n-\nu}}\end{aligned} \tag{5}$$

which is decreasing in ν (see chapter 2 for the derivation of both formulas). The more people elect to exit the lower the posterior probability of success for the project. This suggests that seeing many exit demands is bad news. This relationship will be an important element of the analysis.

3.3.2 Price on the secondary market

When exit is only possible through trade, investors may offer their shares for sale on the secondary market. To eliminate the possibility for multiple equilibria, I assume that, if indifferent, the investor holds on to his share. The number of shares offered for sale is equal to the number of investors who elect to exit, ν. I assume that ν is common knowledge, that is, that a competitive market maker sees the flow of offers ν and determines the highest price that uninformed outside investors are willing to pay for one share. The market price is hence equal to the expected value of the shares, which in turn equal to R times the conditional probability that the project is profitable given ν. That is:

$$P(\nu,n) = \frac{p\lambda^{\nu+1}}{p\lambda^{\nu+1}+(1-p)(\lambda+(1-\lambda)\mu)^{\nu+1}(1-\mu)^{n-\nu}}R$$

It is easy to see that other investors have no incentive to offer their shares for sale. Since shares are traded for their expected value given publicly available information, uninformed investors are indifferent between selling and holding their shares and we assumed that they always elect to hold. Informed investors (the strategic sellers) earn information rents on the market, since they are selling shares in a project they know is worth 0 but they obtain a positive price.

Liquidity sellers make a loss, due to the fact that, in expectation, the price is less than the expected value of a project of unknown profitability, pR. This happens because liquidity sellers sell projects irrespective of their profitability, hence they sell shares of value pR, but outside investors discount the fact that strategic sellers

adversely select the projects they put on the market and hence price shares at less than pR in expectation. Adverse selection by strategic sellers causes liquidity sellers to bear a trading cost $pR - \mathrm{E}_{\nu>0}[P(\nu,n)] > 0$.

3.3.3 Liquidation and project profitability

The probability of liquidation depends on the exit modality. If exit is through trade, the project is never liquidated and hence the probability of liquidation is equal to 0. If exit is only through liquidation, the probability of liquidation is equal to the probability that at least one investor elects to exit:

$$\begin{aligned}\Pr[\nu > 0 \mid n] &= 1 - \Pr[\nu = 0 \mid n] \\ &= 1 - (1-\lambda)^n [p + (1-p)(1-\mu)^n]\end{aligned}$$

It is easy to see that other investors—those not experiencing a liquidity shock and those with no private knowledge that the project is unprofitable—do not have any incentive to demand the liquidation of the company. If $\nu > 0$ the company will be forced to liquidate by somebody else. If $\nu = 0$, there is no investor who has discovered that the project is unprofitable (or ν would not be zero) and hence, using (5), the conditional probability of success for the project is

$$\Pr[q = 1 \mid n, \nu = 0] = \frac{p}{p+(1-p)(1-\mu)^n} > p$$

Thus, the project's expected returns are larger than $pR > L$ and hence it is never optimal to liquidate the project early. This shows that, as in the case of exit through

trade, also when exit is through liquidation there are no runs—that is, no demand for exit—by those investors who do not have liquidity or strategic motives to exit.

Things are more complex with redemption rights. Given a redemption price equal to 1, the number of redemption requests motivated by liquidity or strategic considerations is equal to the number of investors who want out, ν. If $\nu > \hat{\nu}$, the company cannot pay the redemption amounts out of current cash, becomes insolvent and is therefore liquidated. The probability of liquidation is thus $\Pr[\nu > \hat{\nu} \mid n + \hat{\nu}]$.

Since $\Pr[q = 1 \mid n + \hat{\nu}, \nu]$ decreases in ν, redemption sorts projects. Those continued are characterized by $\nu \leq \hat{\nu}$ and have a higher conditional probability to succeed than those liquidated, which are characterized by $\nu > \hat{\nu}$. That is:

$$\Pr[q = 1 \mid n + \hat{\nu}, \nu \leq \hat{\nu}] > \Pr[q = 1 \mid n + \hat{\nu}, \nu > \hat{\nu}] \text{ for all } \hat{\nu} \text{ and } n$$

On the one hand, uninformed inside investors can leverage on the sorting effect of redemptions by holding on to their shares. If the project is not liquidated they will know that the project has a relatively high chance of success. If instead the project is liquidated, it is relatively unlikely to succeed. This suggests that uninformed inside investors should refrain from redeeming their shares; by holding they can free-ride on information held by others. On the other hand, conditional on liquidation, redeeming investors share in the company's cash and the liquidation value, while all other investors only receive the residual liquidation value, which could generate a run on the company. For the moment, we assume away the problem of runs. We return to it in Section 3.5, where we show that runs can occur if the entrepreneur

does not hold enough cash.

3.4 Liquidity versus control

In this section, I will unpack the effect of the different exit modalities on liquidity and control within the organization.

3.4.1 Liquidity provision within the organization

Table 5 below summarizes the expected "price" that investors facing a liquidity shock can obtain for their shares under different exit modalities. It is important to recall that an investor with liquidity needs elects to exit irrespective of the profitability of the project. With tradability, exiting investors obtain an expected market price which is less than the expected project value because of adverse selection by informed investors.[38] This cost of trade decreases as the number of investors increases, that is, the market becomes more liquid when the number of investors goes up. When the exit modality is liquidation, the exit price is simply the liquidation value of the shares, which, by hypothesis, is less than the initial investment.

If the exit modality is redemption, the exit price depends on the number of redeeming investors as follows. If they are less than the available cash ($\nu \leq \hat{\nu}$), redemption does not lead to liquidation and the redeeming investors obtain the predetermined redemption price, 1. When $\nu > \hat{\nu}$, the available cash is not enough to satisfy all redemption requests and the company is forced to liquidate. However,

[38]The expectation is calculated over all possible realizations of ν.

since, by assumption, redeemers have priority over other investors, as long as cash plus the total liquidation value are enough to satisfy the redemption requests—that is, if $v \leq \hat{v} + nL$—redeeming investors obtain the full redemption price of 1. When this is not the case, the available resources are shared pro rata among the redeeming investors (with all other investors obtaining nothing from liquidation). The expected exit price with redemption is larger than the liquidation value L, because investors share in assets of per-share value equal to L plus some cash with unitary per-share value, which is larger than L. In addition, the expected exit price with redemption is less than 1 for the same reason (if the company only held cash and no assets, the exit price would be 1).

	Price of early exit
Tradability	$\mathrm{E}_{v \geq 1}[P(v,n)] < pR$
Liquidation	$L < 1$
Redemption	$L < \sum_{1 \leq v \leq \hat{v}+nL} [\Pr[v \mid n+\hat{v}]] + \sum_{v > \hat{v}+nL} \left[\Pr[v \mid n+\hat{v}] \frac{\hat{v}+nL}{v}\right] < 1$

Table 5: Liquidity

Exit through redemption provides therefore better liquidity than exit through liquidation. The intuition is straightforward: the company is holding cash—which retains its value over time—in addition to assets—which are productive in expectation over the long term but lose value in the interim period. Tradability may or may not outperform redemption depending on the parameters. The exit price through redemption is bounded above by 1. In contrast, with tradability, the exit price could become very close to $pR > 1$ if n is particularly large, but could also be depressed

below 1 when the cost of trade is large due to a small n. Therefore, liquidity is highest with redemption if n is small and with trade if n is large.

3.4.2 Control within the organization

Within the model, the issue of control is essentially a question of continuation versus liquidation at date 3. In the first best, continuation is efficient if $q = 1$, while liquidation is efficient if $q = 0$. No exit modality achieves the first best; inefficient continuation needs to be balanced against inefficient liquidation. The loss with inefficient continuation is L (because the project yields zero if continued) while the loss with inefficient liquidation is $R - L$ (because the project would yield R if continued but is liquidated instead).

With tradability, all $q = 1$ projects are continued (there are no inefficient liquidations), but also all $q = 0$ projects are, which is inefficient. If the exit modality is liquidation, projects may be liquidated in both states of the world. Good projects may be inefficiently liquidated due to an investor's liquidity shock. This eventuality becomes more likely when the number of investors n increases. Intuitively, since *any* investor can liquidate the company, the more investors the larger the risk that this occurs inefficiently. Bad project may be inefficiently continued if no investor monitors and no investor experiences a liquidity shock. As n increases, the probability that a bad project continues goes to zero. In the extreme, with very large n, liquidation rights result in inefficient liquidation with probability close to 1 and in inefficient continuation with probability close to 0. This suggests that, with large n, tradability and liquidation rights suffer from diametrically opposite problems.

While trade results in inefficient continuation of unprofitable projects, liquidation rights result in inefficient liquidation of profitable ones.

If the exit modality is redemption, projects are sorted. If the project is profitable ($q = 1$), redemption allows the company to absorb some exit demands without liquidating. This is an improvement over liquidation rights, which result in liquidation at the request of *any* investor. In contrast redemption rights result in liquidation only if the redeeming investors are more than $\hat{v}$. Therefore, the probability of inefficient liquidation is lower than with liquidation rights, although it is higher than with trade.

If the project is unprofitable, the opposite reasoning applies. Redemptions result in more projects being continued than with liquidation rights and in less projects being continued if compared with tradability.

	Probability of inefficient continuation (given $q = 0$)	Probability of inefficient liquidation (given $q = 1$)
Tradability	1	0
Liquidation	$(1-\lambda)^n(1-\mu)^n$	$1-(1-\lambda)^n$
Redemption	$\Pr[v \leq \hat{v} \mid n+\hat{v}, q=0]$	$\Pr[v > \hat{v} \mid n+\hat{v}, q=1]$

Table 6: Control

To sum up, with respect to inefficient continuation, trade has the worst performance, liquidation is the best, redemption is somewhere in between. Instead, with respect to inefficient liquidation, trade performs the best, liquidation the worst, redemption is again somewhere in between. The sorting effect of redemption yields intermediate values of both type-I and type-II errors.

Comparing the performance of the different exit modalities is straightforward. It is easy to see that it is always possible to choose $\hat{v}$ so that redemption rights perform better than liquidation rights. At least, if $\hat{v} = 0$, the two modalities are identical. Therefore, redemption is always to be preferred over liquidation.

The choice between redemption and trade depends on the parameters of the game and, in particular, on the riskiness of the project, which is captured by the probability of success, p, and on the prevalence of liquidity shocks, λ, which could in turn be a proxy for the efficiency of the credit market.

With low p—these are high-risk, high-yield projects—trade performs very poorly because inefficient continuations weigh heavily on the balance. With high-p projects, instead, trade performs well. We would therefore expect that risky projects be associated with redemption rights and safe projects be associated with tradability.

Similarly, the likelihood of a liquidity shock, λ, only negatively affects the performance of redemption rights. Therefore, if λ is large, trade performs better and if λ is small redemption performs better. This result could be interpreted as suggesting that in settings where liquidity needs can be satisfied elsewhere—for instance, through an efficient credit market—redemption rights are more likely to emerge.

The ex ante project value net of investment is accounted for in the next table. It is easy to see that, keeping pR constant, the project value under liquidation rights is larger when n, p and λ are small. Since redemption rights can be engineered to perform better than liquidation rights, this observation proves the claims above.

	Net project value
Tradability	$pR-1$
Liquidation	$p\left[(1-\lambda)^n R+\left[1-(1-\lambda)^n\right]L\right]$ $+(1-p)\left[1-(1-\lambda)^n(1-\mu)^n\right]L-1$
Redemption	$\frac{n}{n+\hat{v}}p\left(\Pr\left[v\leq\hat{v},n+\hat{v}\mid q=1\right]R+\Pr\left[v>\hat{v},n+\hat{v}\mid q=1\right]L\right)$ $+\frac{n}{n+\hat{v}}(1-p)\Pr\left[v>\hat{v},n+\hat{v}\mid q=0\right]L$ $+\frac{\hat{v}}{n+\hat{v}}-1$

Table 7: Project value net of investment

3.4.3 Summary

The previous analysis suggests that tradability will be associated with projects characterized by large initial investments (large n), relatively safe but possibly moderate returns (large p relative to R) and inefficient credit markets (large λ). Vice versa, redemption rights will be associated with projects characterized by small initial investments (small n), relatively risky but possibly high returns (small p relative to R) and efficient credit markets (small λ). In the next section, we will examine the costs associated with redemption rights, which in turn will define the scope for liquidation rights.

3.5 The costs of cash

There are two costs associated with the use of redemption rights. On the one hand, to be effective redemption rights require companies to hold some cash. The amount of cash held determines the likelihood that redemption requests will result in the liquidation of the company. In the model, the need to hold cash requires the en-

trepreneur to rise more initial capital than she would otherwise do if exit were allowed either through trade or through liquidation. In turn, this may have direct or indirect costs for the entrepreneur, such as a higher cost of capital or the risk of not being able to find a large enough number of investors.

On the other hand, as we have suggested above, tradability and liquidation rights are immune from runs. The intuition is that trade is a purely individual decision with no consequence for other investors and takes place at a price that reflects available information on the secondary market. Hence, uninformed investors with no liquidity needs derive no benefits from trading. Conversely, liquidation rights perfectly internalize negative information: if the project is unprofitable, investors with private information will force the liquidation of the company to exit—because no other exit option is available. Therefore, uninformed investors with no liquidity needs have again no incentives to demand liquidation.

Redemption rights lie somewhat in between. The decision to redeem is private but has possibly negative effects for other investors. The reason is that a redeemer's claim has priority over other investor's claims on the company's cash and assets. Although somewhat extreme, this feature captures the idea that redemption rights allow a redeemer to exit for a convenient price, which is possibly higher than the liquidation value of the project. This generates the potential for runs, that is, creates incentives for investors with no private information or liquidity needs to redeem their shares. To show that this is a possibility, it is enough to focus on the outcome in which all and only the investors with either a liquidity shock or private knowledge that the project is unprofitable request redemption, while all other investors hold

their shares. We need to show that this outcome may not be an equilibrium.

Since redemptions are placed simultaneously, we look for pure-strategy Nash equilibria and focus on a representative uninformed inside investor with no liquidity needs. We are interested in establishing whether the situation in which only the ν investors with liquidity or strategic reasons to redeem do so and all other investors hold to their shares (including monitors who learn that the project is good) is an equilibrium. If this is not the case, there can be a "run on the company's cash" equilibrium where (some) uninformed investors with no liquidity needs redeem their shares.

We focus therefore on the payoff of a representative investor who does not experience a liquidity shock and does not monitor. Recall that the entrepreneur has collected funds equal to $n+\hat{\nu}$ at date 0. Only a portion n of these funds are productive, while the remaining funds, $\hat{\nu}$, are held as cash and they do not yield or lose value as time passes. In total, the company's return at date 4 is $nqR+\hat{\nu}$ and the company's liquidation value at date 3 is $nL+\hat{\nu}$.

If only ν investors request redemption, then the investor under analysis expects to receive the following payoff if he holds his share

$$\begin{aligned}\Pi^H \equiv\ & \sum_{\nu=0}^{\nu=\hat{\nu}} \left(\Pr[\nu \mid n+\hat{\nu}] \left[\tfrac{\hat{\nu}-\nu}{n+\hat{\nu}-\nu} + \tfrac{n}{n+\hat{\nu}-\nu}\Pr[q=1 \mid n+\hat{\nu},\nu]R\right]\right) \\ & + \sum_{\nu=\hat{\nu}+1}^{\nu=\hat{\nu}+nL} \Pr[\nu \mid n+\hat{\nu}] \tfrac{nL+\hat{\nu}-\nu}{n}\end{aligned}$$

where the first summation captures the case in which there is enough cash to satisfy the (genuine) redemption demands and the project is continued and, with

some probability, is successful. In this case, the payoff at date 4 is equal to the residual cash ($\hat{v} - v$) plus the conditional expectation to receive R. Both residual cash and returns are shared among the $n + \hat{v} - v$ non-redeeming investors. The second summation captures the eventuality that the redemption demands exceed the available cash and the firm is liquidated. In this case, the non-redeeming investors only share in the residual liquidation value of the company, after the redeeming investors are paid. If $v > \hat{v} + nL$ the available cash and the liquidation value are not enough to satisfy redeeming investors and there are no assets left to share among non-redeeming investors.

If instead the investor redeems, then he earns

$$\Pi^R \equiv \frac{1}{\Pr[v > 0 \mid n + \hat{v}]} \left(\sum_{v=1}^{v=\hat{v}+nL} \Pr[v \mid n + \hat{v}] + \sum_{v=\hat{v}+nL+1}^{v=\hat{v}+n} \Pr[v \mid n + \hat{v}] \frac{\hat{v} + nL}{v} \right)$$

where the summation now starts at $v = 1$ because the present (uninformed) investor is redeeming. The first summation refers to the case where redemption requests are honored; in which case the investor receives the redemption price of 1. The second summation refers to the case in which the redemption requests cannot be honored, in which case the investor receives his share of the available cash plus a pro-rata share of the liquidation value. The condition for the no-run situation to be an equilibrium is $\Pi^H \geq \Pi^R$.

For $\hat{v}$ small enough this condition is violated. To see how, consider $\hat{v} = 0$. Then we have:

$$\Pi^H = \sum_{v=1}^{v=nL} \Pr[v \mid n] \frac{nL - v}{n}$$

and

$$\Pi^R > \sum_{v=1}^{v=nL} \Pr[v \mid n] + \sum_{v=nL+1}^{v=n} \Pr[v \mid n] \frac{nL}{v}$$

which clearly results in $\Pi^H < \Pi^R$. If the company does not hold enough cash, redemption rights may result in runs.

3.6 Conclusion

I have presented a simple model of exit from a company. Exit modalities balance the need to commit capital to a project for the long term—which may generate the risk of inefficient continuation of unprofitable projects due to managerial entrenchment—and the need to provide liquidity and control to investors—which in turn may result in too many liquidations of profitable projects. The analysis has contrasted three exit modalities: trade, liquidation rights and redemption rights.

I have shown that redemption rights are optimal when projects are risky, require moderate amounts of initial investments (and the involvement of relatively small groups of investors) and occur in an environment with relatively well-developed credit markets (which can absorb most liquidity needs). In the opposite scenario, tradability is the optimal exit modality. This also suggests that companies will abandon exit through redemption and move to tradability as they move away from

the initial, risky phase of investment and mature into larger, more profitable and less risky endeavors.

Liquidation rights are, in general, suboptimal choices because of the risk of inefficient liquidation associated with them but may be preferred when the cost of holding cash is too high. This may be the case when the risk of runs makes redemption rights impractical.

Bibliography

Abatino, B., G. Dari-Mattiacci, and E. C. Perotti. 2011. "Depersonalization of Business in Ancient Rome." *Oxford Journal of Legal Studies* 31 (2):365–389.

Acemoglu, Daron and Simon Johnson. 2005. "Unbundling Institutions." *The Journal of Political Economy* 113 (5):949–995.

Aghion, P., P. Bolton, and J. Tirole. 2004. "Exit Options in Corporate Finance: Liquidity versus Incentives." *Review of Finance* 8 (3):327–353.

Aghion, Philippe and Patrick Bolton. 1992. "An Incomplete Contract Approach to Financial Contracting." *Review of Economic Studies* 59 (3):473–494.

Alchian, Armen A. and Harold Demsetz. 1972. "Production, Information Costs, and Economic Organization." *The American Economic Review* 62 (5):777–795.

Armour, John and Michael J. Whincop. 2007. "The Proprietary Foundations of Corporate Law." *Oxford Journal of Legal Studies* 27 (3):429–465.

Arrow, Kenneth. 1969. *The Organization of Economic Activity: Issues Pertinent to the Choice of Market versus Non-Market Allocation*. Washington. DC: Joint Economic Committee of Congress.

———. 1974. *The Limits of Organization*. New York, NY: Norton.

Arrunada, Benito. 2012. *Institutional Foundations of Impersonal Exchange*. Chicago: University of Chicago Press.

Ayotte, Kenneth. 2018. "On the Mandatory Stay of Secured Creditors in Bankruptcy." In *Research Handbook in Corporate Bankruptcy Law*, edited by Barry E. Adler, working paper. Edward Elgar.

Ayotte, Kenneth and Patrick Bolton. 2011. "Optimal Property Rights in Financial Contracting." *Review of Financial Studies* 24 (10):3401–3433.

Ayotte, Kenneth and Henry Hansmann. 2012. "Legal Entities as Transferable Bundles of Contracts." *Michigan Law Review* 111 (5):715–759.

———. 2015. "A Nexus of Contracts Theory of Legal Entities." *International Review of Law and Economics* 42:1–12.

Baird, Douglas G. and Anthony J. Casey. 2013. "No Exit? Withdrawal Rights and the Law of Corporate Reorganizations." *Columbia Law Review* 113 (1):1–52.

Barzel, Yoram. 1997. *Economic Analysis of Property Rights*. Cambridge: Cambridge University Press, 2nd ed.

Bell, Abraham and Gideon Parchomovsky. 2005. "A Theory of Property." *Cornell Law Review* 90 (2):531–615.

———. 2016. "Of Property and Information." *Columbia Law Review* 116 (1):237–286.

Berle, Adolf and Gardiner Means. 1932. *The Modern Corporation and Private Property*. New York: Macmillan.

Besley, Timothy and Maitreesh Ghatak. 2012. "Property Rights and Economic Development." In *Handbook of Development Economics, Vol. V*, vol. 45, edited by Dani Rodrik and Mark Rosenzweig, chap. 68. Amsterdam: Elsevier, 4525–4595.

Bhide, Amar. 1993. "The hidden costs of stock market liquidity." *Journal of Financial Economics* 34 (1):31–51.

Black, Bernard S and Ronald J Gilson. 1998. "Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets." *Journal of Financial Economics* 47 (3):243–277.

Blair, Margaret M. 2003. "Locking in Capital: What Corporate Law Achieved for Business Organizers in the Nineteenth Century." *UCLA Law Review* 51 (2):387–456.

Blair, Margaret M. and Lynn A. Stout. 1999. "A Team Production Theory of Corporate Law." *Virginia Law Review* 85:247–328.

Bolton, Patrick. 2014. "Corporate Finance, Incomplete Contracts, and Corporate Control." *Journal of Law, Economics, and Organization* 30 (S1):1–18.

Bolton, Patrick and Frédéric Samama. 2013. "Loyalty-Shares: Rewarding Long-term Investors." *Journal of Applied Corporate Finance* 25 (3):86–97.

Burkart, Mike, Denis Gromb, and Fausto Panunzi. 1997. "Large Sharehold-

ers, Monitoring and the Value of the Firm." *Quarterly Journal of Economics* 112 (3):693–728.

Butler, Henry N. 1985. "Nineteenth-Century Jurisdictional Competition in the Granting of Corporate Privileges." *The Journal of Legal Studies* 14 (1):129–166.

Calabresi, Guido and A. Douglas Melamed. 1972. "Property Rules, Liability Rules, and Inalienability: One View of the Cathedral." *Harvard Law Review* 85 (6):1089–1128.

Chandler, Alfred D. 1977. *The Visible Hand*. Harvard (MA): Harvard University Press.

Choi, Albert and George Triantis. 2010. "Strategic Vagueness in Contract Design: The Case of Corporate Acquisitions." *The Yale Law Journal* 119 (5):848–924.

Coase, R. H. 1960. "The Problem of Social Cost." *The Journal of Law and Economics* 3 (1):1–44.

Coase, R.H. 1937. "The Nature of the Firm." *Economica* 4 (16):386–405.

Coffee, John C. Jr. 1991. "Liquidity versus Control: The Institutional Investor as a Corporate Monitor." *Columbia Law Review* 91 (6):1277–1368.

Cournot, Antoine A. 1838. *Researches into the Mathematical Principles of the Theory of Wealth*. New York, NY: Macmillan, translatio ed.

Cramton, Peter, Robert Gibbons, and Paul Klemperer. 1987. "Dissolving a Partnership Efficiently." *Econometrica* 55 (3):615–632.

Cumming, Douglas. 2008. "Contracts and Exits in Venture Capital Finance." *Review of Financial Studies* 21 (5):1947–1982.

Cumming, Douglas J. 2005. "Capital Structure in Venture Finance." *Journal of Corporate Finance* 11 (3):550–585.

Dari-Mattiacci, Giuseppe. 2013. "Slavery and Information." *The Journal of Economic History* 73 (1):79–116.

Dari-Mattiacci, Giuseppe, Oscar Gelderblom, Joost Jonker, and Enrico C. Perotti. 2017. "The Emergence of the Corporate Form." *Journal of Law, Economics & Organization* 33 (2):193–236.

Dari-Mattiacci, Giuseppe and Carmine Guerriero. 2015. "Law and Culture: A Theory of Comparative Variation in Bona Fide Purchase Rules." *Oxford Journal of Legal Studies* 35 (3):543–574.

Diamond, Douglas W. 2004. "Presidential Address, Committing to Commit: Short-term Debt when Enforcement is Costly." *Journal of Finance* 59 (4):1447–1479.

Diamond, Douglas W. and Philip H. Dybvig. 1983. "Bank Run, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91 (3):401–419.

Easterbrook, Frank H. and Daniel R. Fischel. 1989. "Corporate Contract, The." *Columbia Law Review* 89 (7):1416–1448.

Edmans, Alex. 2009. "Blockholder Trading, Market Efficiency, and Managerial Myopia." *The Journal of Finance* 64 (6):2481–2513.

Ellet, Charles Jr. 1839. *An Essay on the Laws of Trade, in Reference to the Works of Internal Improvement in the United States*. Richmond, VA: P.D. Bernard.

Fama, Eugene F. and Michael C. Jensen. 1983. "Separation of Ownership and Control." *The Journal of Law and Economics* 26 (2):301–325.

Favali, Lydia. 2004. *Qirad islamico, commenda medievale e strategie culturali dell'occidente*. Torino: Giappichelli.

Fleck, Robert K and F Andrew Hanssen. 2006. "The Origins of Democracy: A Model with Application to Ancient Greece." *The Journal of Law & Economics* 49 (1):115–146.

Fluck, Zsuzsanna. 1998. "Optimal Financial Contracting: Debt versus Outside Equity." *Review of Financial Studies* 11 (2):383–418.

Foss, Nicolai J., Henrik Lando, and Steen Thomsen. 2000. "The Theory of the Firm." In *Encyclopedia of Law and Economics, vol. 3*, edited by Boudewijn Bouckaert and Gerrit De Geest. Cheltenham: Edward Elgar, 631–658.

Gelderblom, Oscar, Abe de Jong, and Joost Jonker. 2013. "The Formative Years of the Modern Corporation: The Dutch East India Company VOC, 1602-1623." *The Journal of Economic History* 73 (4):1050–1076.

Gilson, Ronald J. and David M. Schizer. 2003. "Understanding Venture Capital Structure: A Tax Explanation for Convertible Preferred Stock." *Harvard Law Review* 116 (3):874.

Goetz, Charles J and Robert E Scott. 1980. "Enforcing Promises: An Examination of the Basis of Contract." *The Yale Law Journal* 89 (7):1261–1322.

———. 1981. "Principles of Relational Contracts." *Virginia Law Review* 67 (6):1089–1150.

———. 1985. "The Limits of Expanded Choice: An Analysis of the Interactions between Express and Implied Contract Terms." *California Law Review* 73 (2):261–322.

Gorton, Gary and George Pennacchi. 1990. "Financial Intermediaries and Liquidity Creation." *The Journal of Finance* 45 (1):49–71.

Grossman, Sanford J and Oliver D Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94 (4):691–719.

Hansmann, Henry and Reinier Kraakman. 2000a. "Organizational law as asset partitioning." *European Economic Review* 44 (4-6):807–817.

———. 2000b. "The Essential Role of Organizational Law." *Yale Law Journal* 110 (3):387–440.

———. 2002. "Property, Contract, and Verification: The "Numerus Clausus" Problem and the Divisibility of Rights." *Journal of Legal Studies* 31 (S2):S373–S420.

Hansmann, Henry, Reinier Kraakman, and Richard Squire. 2006. "Law and the Rise of the Firm." *Harvard Law Review* 119 (5):1333–1403.

Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science* 162 (3859):1243–1248.

Harris, Ron. 2000. *Industrializing English Law: Entrepreneurship and Business Organization, 1720-1844*. Cambridge: Cambridge University Press.

Hart, Oliver and John Moore. 1990. "Property Rights and the Nature of the Firm." *Journal of Political Economy* 98 (6):1119–1158.

———. 1994. "A Theory of Debt Based on the Inalienability of Human Capital." *Quarterly Journal of Economics* 109:841–879.

Heller, Michael A. 1998. "The Tragedy of the Anticommons: Property in the Transition from Marx to Markets." *Harvard Law Review* 111 (3):621–688.

Heller, Michael A and Rebecca S Eisenberg. 1998. "Can Patents Deter Innovation? The Anticommons in Biomedical Research." *Science* 280 (5364):698–701.

Holmstrom, Bengt. 1982. "Moral Hazard in Teams." *The Bell Journal of Economics* 13 (2):324–340.

Holmstrom, Bengt and Paul Milgrom. 1991. "Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design." *Journal of Law, Economics, & Organization* 7:24–52.

Holmstrom, Bengt and Jean Tirole. 1997. "Financial Intermediation, Loanable Funds, and the Real Sector." *The Quarterly Journal of Economics* 112 (3):663–691.

Holmstrom, Brengt. 2015. "Understanding the Role of Debt in Financial Markets, Bank for International Settlements Working Paper No. 479."

Holmström, Brengt and Jean Tirole. 1989. "The Theory of the Firm." In *Handbook of Industrial Organization, vol. 1*, edited by Richard Schmalensee and Robert D. Willig. Amsterdam: Elsevier, 61–133.

Hunt, Edwin S. and James Murray. 1999. *A History of Business in Medieval Europe, 1200- 1550*. Cambridge: Cambridge University Press.

Jensen, Michael C. and William H. Meckling. 1976. "Theory of the firm: Managerial behavior, agency costs and ownership structure." *Journal of Financial Economics* 3 (4):305–360.

Kaplan, Steven N. and Per Stromberg. 2003. "Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts." *Review of Economic Studies* 70 (2):281–315.

Kuran, Timur. 2012. *The Long Divergence: How Islamic Law Held Back the Middle East*. Princeton, NJ: Princeton University Press.

Kyle, Albert S. 1985. "Continuous Auctions and Insider Trading." *Econometrica* 53 (6):1315–1335.

Lamoreaux, Naomi R. and Jean-Laurent Rosenthal. 2006. "Corporate Governance and the Plight of Minority Shareholders in the United States before the Great Depression." In *Corruption and Reform: Lessons from America's Economic*

History, edited by Edward L. Glaeser and Claudia Goldin. Chicago: University of Chicago Press, 125–152.

Malmendier, Ulrieke. 2005. "Roman Shares." In *The Origins of Value: The Financial Innovations that Created Modern Capital Markets*, edited by William N. Goetzmann and K. Geert Rouwenhorst. Oxford: Oxford University Press, 31–42.

Malmendier, Ulrike. 2009. "Law and Finance "at the Origin"." *Journal of Economic Literature* 47 (4):1076–1108.

Merrill, Thomas W. and Henry E. Smith. 2000. "Optimal Standardization in the Law of Property: The Numerus Clausus Principle." *Yale Law Journal* 110 (1):1–70.

Mignone, Giovanni. 2005. *Un contratto per i mercanti del mediterraneo*. Napoli: Jovene.

Myers, Stewart C. 2000. "Outside equity." *Journal of Finance* 55 (3):1005–1037.

North, Douglass C and Barry R Weingast. 1989. "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England." *The Journal of Economic History* 49 (4):803–832.

Pagano, Marco and Paolo Volpin. 2012. "Securitization, Transparency, and Liquidity." *The Review of Financial Studies* 25 (8):2417–2453. URL +.

Parisi, F. 2002. "Entropy in Property." *The American Journal of Comparative Law* 50 (3):595–632.

Punt, Hendrik M. 2010. *Het vennootschapsrecht van Holland*. Leiden: PhD Dissertation, University of Leiden.

Rajan, Raghuram and Luigi Zingales. 1998. "Power in a Theory of the Firm." *Quarterly Journal of Economics* 113 (1):387–432.

Reder, Robert S. 2017. "Delaware Court Refuses to Dismiss Common Stockholder's Challenge to Redemption of Preferred Stock Owned by Controlling Stockholder." *Vanderbilt Law Review En Banc* 70:235–248.

Robbe, Ubaldo. 1975. *La "hereditas iacet" e il significato della hereditas in diritto romano*. Milan: Giuffre.

Röell, Ailsa. 1996. "The Decision to Go Public: An Overview." *European Economic Review* 40 (3):1071–1081.

Ross, Stephen A. 1973. "The Economic Theory of Agency: The Principal's Problem." *The American Economic Review* 63 (2):134–139.

Sahlman, William A. 1990. "The structure and governance of venture-capital organizations." *Journal of Financial Economics* 27 (2):473–521.

Scott, Robert E. 2003. "A Theory of Self-Enforcing Indefinite Agreements." *Columbia Law Review* 103 (7):1641–1699.

———. 2006. "The Law and Economics of Incomplete Contracts." *Annual Review of Law and Social Science* 2 (1):279–297.

Shleifer, Andrei and Robert W Vishny. 1997. "A Survey of Corporate Governance." *The Journal of Finance* 52 (2):737–783.

Sicard, Germain. 2015. *The Origins of Corporations: The Mills of Toulouse in the Middle Ages*. New Haven, CT: Yale University Press.

Smith, Adam. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. London: W. Strahan and T. Cadell.

Smith, D. Gordon. 2005. "The Exit Structure of Venture Capital." *UCLA Law Review* 53:315–356.

Stout, Lynn A. 2005. "On the Nature of Corporations." *University of Illinois Law Review* 2005 (1):253–268.

Tian, Xuan. 2011. "The Causes and Consequences of Venture Capital Stage Financing." *Journal of Financial Economics* 101 (1):132–159.

Williamson, Oliver E. 1971. "The Vertical Integration of Production: Market Failure Considerations." *The American Economic Review* 61 (2):112–123.

———. 1975. *Markets and Hierarchies: Analysis and Antitrust Implication: A Study in the Economics of Internal Organization*. New York: Free Press.

Williamson, Oliver E. 1979. "Transaction-Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics* 22 (2):233–261.

Winton, Andrew and Vijay Yerramilli. 2008. "Entrepreneurial Finance: Banks versus Venture Capital." *Journal of Financial Economics* 88 (1):51–79.

Zimmermann, Reinhard. 1996. *The Law of Obligations: Roman Foundations of the Civilian Tradition*. Oxford: Oxford University Press.

Appendix

Proof of Lemma 1

Proof. First note that $\Pr[v \mid q=1]$ is the probability that liquidity sales v_λ plus strategic sales v_μ add up to v, conditional on $q=1$. Note that there cannot be strategic sales, because the project is profitable, so that $v_\mu = 0$ and $v_\lambda \sim \mathrm{B}[n,\lambda]$, where B denotes the binomial distribution. We have:

$$\begin{aligned}\Pr[v \mid q=1] &= \Pr[v_\lambda = v] \\ &= \binom{n}{v}\lambda^v(1-\lambda)^{n-v} \\ &= \mathrm{B}[n,\lambda]\end{aligned}$$

$\Pr[v \mid q=0]$ is the probability that liquidity sales v_λ plus strategic sales v_μ add up to v, conditional on $q=0$. Note that $\left(v_\mu \mid v_\lambda = i, q=0\right) \sim \mathrm{B}[n-i,\mu]$, because a strategic sale takes place only among those investors who are not subject to a liquidity shock, so that

$$\Pr\left[v_\mu \mid v_\lambda = i, q=0\right] = \binom{n-i}{v_\mu}\mu^{v_\mu}(1-\mu)^{n-i-v_\mu}$$

The distribution of v_λ, instead, is unaffected by the realization of q, because liquidity sales occur irrespective of the profitability of the project. Therefore, we

have

$$\begin{aligned}
\Pr[\nu \mid q=0] &= \textstyle\sum_{i=0}^{i=\nu} \left[\Pr[\nu_\lambda = i] \cap \Pr\left[\nu_\mu = \nu - i\right] \mid q=0\right] \\
&= \textstyle\sum_{i=0}^{i=\nu} \left[\Pr[\nu_\lambda = i] \Pr\left[\nu_\mu = \nu - i \mid \nu_\lambda = i, q=0\right]\right] \\
&= \textstyle\sum_{i=0}^{i=\nu} \left[\binom{n}{i} \lambda^i (1-\lambda)^{n-i} \binom{n-i}{\nu-i} (\mu)^{\nu-i} (1-\mu)^{n-\nu}\right] \\
&= \binom{n}{\nu} \textstyle\sum_{i=0}^{i=\nu} \left[\binom{\nu}{i} \left(\frac{\lambda}{(1-\lambda)\mu}\right)^i\right] (1-\lambda)^n (1-\mu)^n \left(\frac{\mu}{1-\mu}\right)^\nu \\
&= \binom{n}{\nu} \left(\frac{\lambda+(1-\lambda)\mu}{(1-\lambda)\mu}\right)^\nu (1-\lambda)^n (1-\mu)^n \left(\frac{\mu}{1-\mu}\right)^\nu \\
&= \binom{n}{\nu} (\lambda + (1-\lambda)\mu)^\nu (1-\lambda)^{n-\nu} (1-\mu)^{n-\nu} \\
&= \binom{n}{\nu} (\lambda + (1-\lambda)\mu)^\nu (1-\lambda-(1-\lambda)\mu)^{n-\nu} \\
&= \mathrm{B}[n, \lambda + (1-\lambda)\mu]
\end{aligned}$$

Note that

$$\begin{aligned}
\binom{n}{i}\binom{n-i}{\nu-i} &= \tfrac{n!}{i!(n-i)!} \tfrac{(n-i)!}{(\nu-i)!(n-\nu)!} \\
&= \tfrac{n!}{\nu!(n-\nu)!} \tfrac{\nu!}{i!(\nu-i)!} \\
&= \binom{n}{\nu}\binom{\nu}{i}
\end{aligned}$$

which justifies line 4. Using the Binomial Theorem, we have

$$\begin{aligned}
\textstyle\sum_{i=0}^{i=\nu} \left[\binom{\nu}{i} \left(\frac{\lambda}{(1-\lambda)\mu}\right)^i\right] &= \left(\frac{\lambda}{(1-\lambda)\mu} + 1\right)^\nu \\
&= \left(\frac{\lambda+(1-\lambda)\mu}{(1-\lambda)\mu}\right)^\nu
\end{aligned}$$

which justified line 5. $\Pr[\nu]$ is easily obtained by aggregating the preceding results

over the probability distribution of q:

$$\begin{aligned}
\Pr[v] &= \Pr[q=1]\Pr[v \mid q=1] + \Pr[q=0]\Pr[v \mid q=0] \\
&= p\binom{n}{v}\lambda^v(1-\lambda)^{n-v} + (1-p)\binom{n}{v}(\lambda+(1-\lambda)\mu)^v(1-\lambda)^{n-v}(1-\mu)^{n-v} \\
&= \binom{n}{v}\left[p\lambda^v + (1-p)(\lambda+(1-\lambda)\mu)^v(1-\mu)^{n-v}\right](1-\lambda)^{n-v}
\end{aligned}$$

Using Bayes' rule and simplifying, we have:

$$\begin{aligned}
\Pr[q=1 \mid v] &= \frac{\Pr[v|q=1]\Pr[q=1]}{\Pr[v]} \\
&= \frac{p\lambda^v}{p\lambda^v + (1-p)(\lambda+(1-\lambda)\mu)^v(1-\mu)^{n-v}}
\end{aligned}$$

which proves the formula in the Lemma. The comparative statics is straightforward.

□

Proof of Lemma 2

Proof. First note that:

$$\begin{aligned}
\Pr[q=1 \mid v] &= \frac{\Pr[v|q=1]\Pr[q=1]}{\Pr[v]} \\
&= \frac{\binom{n}{v}\lambda^v(1-\lambda)^{n-v}p}{\binom{n}{v}\left[p\lambda^v + (1-p)(\lambda+(1-\lambda)\mu)^v(1-\mu)^{n-v}\right](1-\lambda)^{n-v}} \\
&= \frac{p\lambda^v}{p\lambda^v + (1-p)(\lambda+(1-\lambda)\mu)^v(1-\mu)^{n-v}}
\end{aligned}$$

Buyers know that each seller on the market is either a liquidity seller, with probability $\frac{\lambda}{\lambda+(1-\lambda)\mu\Pr[q=0|v]}$, or a strategic seller, with probability $\frac{(1-\lambda)\mu(1-\Pr[q=1|v])}{\lambda+(1-\lambda)\mu(1-\Pr[q=1|v])}$.

Liquidity sellers sell shares of value $\Pr[q=1 \mid \nu]R$, while strategic sellers sell shares of zero value, because they adversely select whether to put up their shares for sale. Therefore, the price is:

$$\begin{aligned} P(\nu) &= \frac{\lambda}{\lambda+(1-\lambda)\mu(1-\Pr[q=1|\nu])}\Pr[q=1 \mid \nu]R \\ &= \frac{p\lambda^{\nu+1}}{p\lambda^{\nu+1}+(1-p)(\lambda+(1-\lambda)\mu)^{\nu+1}(1-\mu)^{n-\nu}}R \end{aligned}$$

Using $1-\Pr[q=1 \mid \nu]=\Pr[q=0 \mid \nu]$ we have the expression in the Lemma. The comparative statics is straightforward. With respect to μ, it is enough to note that the derivative $\frac{\partial P(\nu)}{\partial \mu}$ equal to

$$\operatorname{sign}\left[\frac{\partial P(\nu)}{\partial \mu}\right] = \operatorname{sign}\left[(\lambda+(1-\lambda)\mu)(n+1)-(\nu+1)\right]$$

which is increasing in μ and is weakly positive if

$$\lambda+(1-\lambda)\mu \geq \frac{\nu+1}{n+1}$$

and negative otherwise. Note that if $\mu=1$, the inequality is always satisfied and hence $\frac{\partial P(\nu)}{\partial \mu}>0$ for μ sufficiently large. Note also that, if $\mu=0$, the inequality becomes

$$\lambda \geq \frac{\nu+1}{n+1}$$

which may or may not be satisfied for some values of $\nu<n$. In particular, if $\lambda<\frac{1}{n+1}$, $\frac{\partial P(\nu)}{\partial \mu}>0$ for all μ and ν; if, instead, $\lambda>\frac{1}{n+1}$, we will have that, for sufficiently low values of ν, $\frac{\partial P(\nu)}{\partial \mu}<0$ if μ is small and $\frac{\partial P(\nu)}{\partial \mu}>0$ if μ is large,

where the cutoff level is given by $\mu = \frac{\nu+1}{(n+1)(1-\lambda)} - \frac{\lambda}{1-\lambda}$. □

Proof of Lemma 3

Proof. Omitted. □

Proof of Lemma 4

Proof. From the expression for $\Pr[\nu \mid q=0]$ in the proof of Lemma 1 it is easy to see that $\mathrm{E}_{\nu\geq 1}[P(\nu) \mid q=0]$ decreases in μ, $\lim_{\mu\downarrow 0} \mathrm{E}_{\nu\geq 1}[P(\nu) \mid q=0] > 0$ and $\lim_{\mu\uparrow 1} \mathrm{E}_{\nu\geq 1}[P(\nu) \mid q=0] = 0$. Therefore, there exists a unique μ_κ such that $\mu_\kappa = C_\kappa(\mu_\kappa)$.

$$
\begin{aligned}
\mathrm{E}_{\nu\geq 1}[P(\nu) \mid q=0] &= \frac{\sum_{\nu=1}^{\nu=n} P(\nu)\Pr[\nu|q=0]}{\sum_{\nu=1}^{\nu=n}\Pr[\nu|q=0]} \\
&= \frac{\sum_{\nu=1}^{\nu=n} P(\nu)\Pr[\nu|q=0]}{1-\Pr[\nu=0|q=0]} \\
&= \frac{\sum_{\nu=1}^{\nu=n} \frac{p\lambda^{\nu+1}}{p\lambda^{\nu+1}+(1-p)(\lambda+(1-\lambda)\mu)^{\nu+1}(1-\mu)^{n-\nu}} R\binom{n}{\nu}(\lambda+(1-\lambda)\mu)^{\nu}(1-\lambda)^{n-\nu}(1-\mu)^{n-\nu}}{1-(1-\lambda)^n(1-\mu)^n} \\
&= \frac{\sum_{\nu=1}^{\nu=n} \binom{n}{\nu} \frac{p\lambda^{\nu+1}(\lambda+(1-\lambda)\mu)^{\nu}(1-\lambda)^{n-\nu}(1-\mu)^{n-\nu}}{p\lambda^{\nu+1}+(1-p)(\lambda+(1-\lambda)\mu)^{\nu+1}(1-\mu)^{n-\nu}} R}{1-(1-\lambda)^n(1-\mu)^n} \\
&= \frac{\sum_{\nu=1}^{\nu=n} \binom{n}{\nu} \frac{p\lambda^{\nu+1}(\lambda+(1-\lambda)\mu)^{\nu}(1-\lambda)^{n-\nu}(1-\mu)^{n-\nu}}{p\lambda^{\nu+1}+(1-p)(\lambda+(1-\lambda)\mu)^{\nu+1}(1-\mu)^{n-\nu}} R}{1-(1-\lambda)^n(1-\mu)^n}
\end{aligned}
$$

whose comparative statics can be investigated by looking at the addenda in the summation, which can be rewritten as:

$$\frac{p\lambda^{\nu+1}\left(\lambda+(1-\lambda)\mu\right)^{\nu}}{p\lambda^{\nu+1}+(1-p)\left(\lambda+(1-\lambda)\mu\right)^{\nu+1}(1-\mu)^{n-\nu}}\frac{(1-\lambda)^{n-\nu}(1-\mu)^{n-\nu}}{1-(1-\lambda)^{n}(1-\mu)^{n}}R$$

Each of the addenda (and hence the summation) decreases in μ, which is easy to verify by inspection. The expected exit price initially increases and then decreases in n. To see why, notice that the summation's addenda decrease in n. Hence increasing n has a marginal and an infra-marginal effect: on the one hand, it adds an addendum and, on the other hand, it reduces all previous addenda. The infra-negative marginal effect becomes bigger as n rises and disappears as n approaches 0. □

Proof of Lemma 5

Proof. It is easy to see that $C_{\pi}(\mu)$ may exhibit discontinuities because μ affects the cutoff $\overline{v}$, which in turn takes discrete values. However, it is easy to see that $C_{\pi}(0)>0$ and hence $C_{\pi}(\mu)$ first crosses μ from above (if it does) and a value μ_{π} exists such that all investors with $c_i \leq \mu_{\pi}$ monitor because $c_i \leq C_{\pi}(\mu_{\pi})$.

Let us now examine the two components of $C_{\pi}(\mu)$ in turn. The first component

$$(1-p)(1-\Lambda)(1-\mu)^{n-1}L$$

is evidently decreasing in p, λ, μ and n. In particular, it goes to 0 as μ approaches

1. The second component is

$$(1-p)(1-\lambda)\mathrm{E}_{1\leq v\leq \overline{v}}[P(v) \mid q=0]$$

and is clearly less than the exit price in a corporation (Lemma 4). Therefore $C_\pi(\mu)$ does cross μ from above and a solution exists. □

Proof of Proposition 1

Proof. Using Lemma 4 an Lemma5, we have that if $\overline{v} > 1$, the monitoring level is larger in a corporation because $C_\pi(\mu) < C_\kappa(\mu)$, which is evident by comparing $C_\kappa(\mu)$ with the second line in $C_\pi(\mu)$. If instead $\overline{v} \leq 1$ and n is small, we could have $C_\pi(\mu) > C_\kappa(\mu)$. To see why, consider that if $n = 1$, the expression for $C_\pi(\mu)$ reduces to

$$(1-p)(1-\lambda)L$$

and we know by hypothesis that the liquidation value is greater than the exit price. Therefore, for small n the monitoring level could be lower in a partnership, but this is not necessarily the case because for $n = 1$ we could have $P(v=1) > L$ and hence $\overline{v} > 1$, so that the region in which $C_\pi(\mu) > C_\kappa(\mu)$ could be empty. For large n the monitoring level is larger in a corporation and this region will be reached for some large enough n, since $\overline{v}$ increases in n. □

Proof of Proposition 2

Proof. Note that if $n \downarrow 1$, we have $\Lambda = \lambda$, $M = \mu$, $(1-\mu)^{n-1} = 1$, and $\mu_\kappa \leq \mu_\pi$. Therefore:

$$\begin{aligned} \lim_{n\downarrow 1} V_\kappa &= (1-\lambda)\, pR + \lambda \frac{\sum_{\nu=1}^{\nu=n}(P(\nu)\Pr[\nu])}{\sum_{\nu=1}^{\nu=n}\Pr[\nu]} + \frac{\mu_\kappa^2}{2} \\ \lim_{n\downarrow 1} V_\pi &= (1-\lambda)\, pR + \lambda \frac{\sum_{\nu=1}^{\nu=n}(\max\{L,P(\nu)\}\Pr[\nu])}{\sum_{\nu=1}^{\nu=n}\Pr[\nu]} + \frac{\mu_\pi^2}{2} \end{aligned}$$

so that the value of shares is greater in a partnership than in a corporation. Note now that if $n \uparrow \infty$, we have $\Lambda = 1$, $M = 1$, $\lim_{n\to\infty}\sum_{\nu=1}^{\nu=n}(P(\nu)\Pr[\nu]) \to pR$, and $\mu_\kappa \geq \mu_\pi$.

$$\begin{aligned} \lim_{n\uparrow\infty} V_\kappa &= pR \\ \lim_{n\uparrow\infty} V_\pi &= 0 \end{aligned}$$

so that the value of shares is greater in a corporation than in a partnership. □