

A Theory of Corporate Personhood: Commitment of Capital, Liquidity, and the Separation between Ownership and Control

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Abstract

I develop a theory of corporate personhood starting from a fundamental question: Who should own firm assets, the collection of investors or a distinct legal entity, which is in turn owned by the investors? In a *partnership*, individual investors own firm assets as they have 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 and enhances the liquidity of the secondary market for shares. Hence, liquidity-strapped investors can sell their shares and the firm survives individual liquidity shocks. Dispersed ownership, however, comes at the cost of a more entrenched management and inefficient continuation decisions. While partnerships are at times inefficiently liquidated due to their vulnerability to liquidity shocks, corporations live inefficiently long. The amount of own capital needed to start a business is lower and share value at issuance is higher in a corporation if the number of investors is large, while the partnership might be preferred with few investors. The analysis sheds light on the choice between different business organizations, practices and rules that foster dispersed ownership, insider trading, and the separation between ownership and control in large corporations.

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

JEL codes: G30, K22.

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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 article 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 this 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 contract, 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 paper 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.¹ In contrast, in a corporation owners do not have a claim on assets

¹Section 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

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.

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 17th century. The Dutch East India Company was the first trading corporation endowed with permanent capital, decades before its competitors. In a previous coauthored paper I have shown that 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. 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 essential 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

upon withdrawal by one of the partners.

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 continuation 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 paper is organized as follows. The remaining of this introduction connects the present analysis with the extant literature. Section 2 presents the model. Sections 3 and 4 solve the model for the corporation and the partnership, respectively. Section 5 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 paper. Section 6 concludes with a set of empirical implications and further extensions. Technical proofs are in the Appendix.

1.1 Property-right theories: firms versus business organizations

The notion of property right has played a fundamental role in economic analysis for a long time, but the same label is often mapped onto different concepts. The political economy literature sees property rights as a constitutional protection of productive assets from expropriation by powerful elites (see, for instance, Acemoglu and Johnson, 2005), but this is not a concern here. Quite differently, the theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990) views property rights as characterized by residual control rights on assets. The problem that property rights solve is one of incomplete contracts. Indeed, if contracts were complete, rights on assets would be fully and explicitly allocated in the contract and the residual set would be empty. Firms, this theory emphasizes, are fundamentally "proprietary" constructions.

The theory of business organizations (Blair, 2003; Stout, 2005; Hansmann, Kraakman, and Squire, 2006; Ayotte and Hansmann, 2012; Baird and Casey, 2013) is also based on property rights. Yet, it rests on a different notion of property. Property regulates claims on firm assets, which are separated in various ways from the personal assets of owners and managers. At a very fundamental level, the legal notion of property is orthogonal to property in the theory of the firm (Armour and Whincop, 2007). 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 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. There are, however, a few 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 (2014) 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. 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. Limited liability is but one example of the importance of such a partitioning. These are proprietary arrangement in that they prevail over possibly incompatible contractual claims that parties may held. These claims run with the assets and are not conditional on the identity of owners and creditors Hansmann and Kraakman (2002).

Yet, the right to withdrawn one's capital can be viewed as a and, 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.

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 Dari-Mattiacci et al. (see 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 middlemen 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 a 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 return. Rolling over the capital to the next partnership was impractical and fraught with hold-out problems.

Both England and the Netherlands 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 uninformed investors of a centrally managed corporation with no voice for shareholders. 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.

1.3 Relation to the literature

Next to the connection to the theory of the firm and the theory of business organizations, this paper 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 may 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).

The trade-off presented here 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; Bhidé, 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.

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 paper analyzes can be framed in terms of the optimal allocation of control over continuation decisions when contracts are incomplete (Aghion and Bolton, 1992). The incomplete contracts literature has not touched upon the choice of organizational form, although it addresses the question of the

optimal maturity of corporate equity (Fluck, 1998) and the problem of efficient partnership dissolution (Cramton, Gibbons, and Klemperer, 1987).

2 Model

2.1 Description

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. This reflects negatively on share value at issuance and on loanable funds.

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. 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 generates the separation between ownership and control as a consequence of the lock-in of capital. Quite counter-intuitively, partners in a partnership have a right to withdraw their capital and find it advantageous to monitor the manager; in contrast, shareholders have their capital locked in the corporation and nevertheless find it advantageous not to monitor the manager (or to do so 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” information.

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. 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 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 $c_i \sim U(0, 1)$ Each investor i may monitor	Only the investor observes his monitoring cost
B	The project p_L yields a benefit b or $B > b$ to the manager depending on monitoring	Only the manager observes monitoring choices
Date 2 (Trade)		
A	Nature draws the liquidity shocks $l_i \sim B(1, \lambda)$ and the firm's profitability $q \sim B(1, p)$	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

Since 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.

	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 liquidation. 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.² 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.

2.3 Players

2.3.1 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.³ 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 $1 - \Gamma$ and will be a function of the investors' decisions going forward. In case of continuation, the project yields $Ap_H R$ to the manager.⁴ The manager will choose the good project if

$$(1 - \Gamma) Ap_H R \geq Mb + (1 - M) B \quad (1)$$

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. Note also that if $(1 - \Gamma) Ap_H R \geq B$ then the manager will always choose the good project, irrespective of the monitoring level, while if $(1 - \Gamma) Ap_H R < b$ the manager will always choose the bad project. In the intermediate cases, $b \leq (1 - \Gamma) Ap_H R < B$, the manager's choice depends on monitoring. The inequality in (1) can be rewritten as follows

$$M \geq \frac{B - (1 - \Gamma) Ap_H R}{B - b} \quad (2)$$

showing that the equilibrium probability of monitoring at date 1 has to be sufficiently high for the manager to have incentives to choose the good project at date 0.⁵

²Recall that, for simplicity, I assume that early liquidation never occurs in a corporation. See the discussion of this assumption in Section 2.1

³Given a positive loss-of-control cost k , our assumption is that $k = AL$.

⁴I 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.

⁵Note that, as discussed in the text, 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 $(1 - \Gamma) Ap_H R < b$ 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).

2.3.2 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 $U[0, 1]$. 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 (cf. 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.⁶

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 . 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, a liquidity shock determines the liquidity-type of each investor.⁷ An investor 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 consumption 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:

⁶Note that in Holmstrom and Tirole (1997) monitoring takes place before the project choice and has a preventive effect. In contrast here monitoring takes place after the manager chooses the project and hence has a deterrent effect if it is incentive compatible.

⁷More 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.

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 ($l_i = 1$) or later ($l_i = 0$) as in Diamond and Dybvig (1983).⁸ The probability that at least one of the n investors experiences a liquidity shock at date 2 is:

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

2.3.3 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.

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, which I will show decreases 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.

⁸To make the effect of liquidity shocks as sharp as possible, I am effectively assuming that they make the investor 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 decides to switch to it.

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 withdraw shares in good projects from sale. 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 for a given volume of outstanding shares (higher ν) or, conversely, a lower volume of outstanding shares for a given number of sellers on the market (lower n) makes the posterior go down in an intuitive way.

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. 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, ν , and becomes more informative as the monitoring probability μ increases. 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.

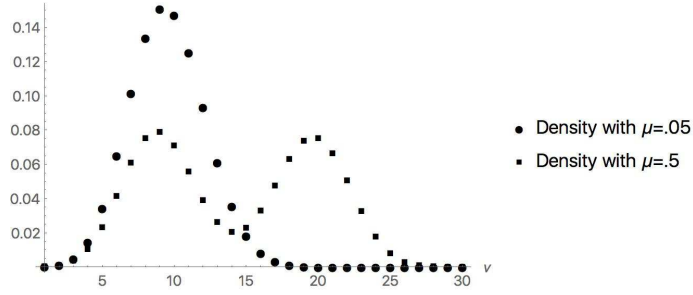


Figure 1: Density of the number of sellers ($p = .5$, $\lambda = .3$ and $n = 30$)

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.

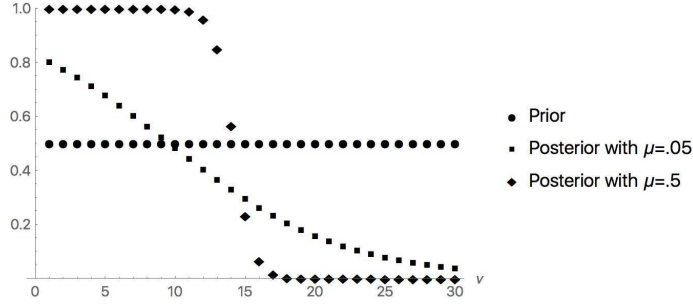


Figure 2: Posterior probability of success ($p = .5$, $\lambda = .3$ and $n = 30$)

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.

Proof. See Appendix. □

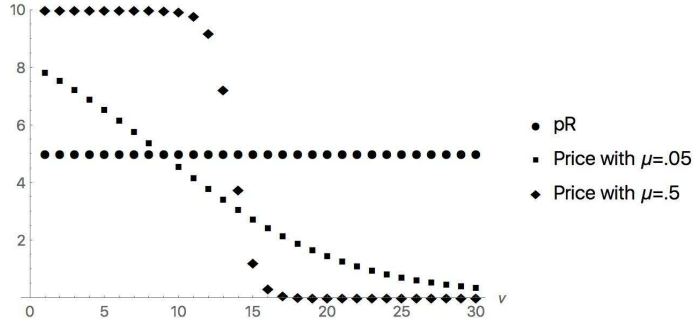


Figure 3: Price of shares ($p = .5$, $\lambda = .3$, $R = 10$ and $n = 30$)

The fraction $\frac{\lambda}{\lambda + (1-\lambda)\mu \Pr[q=0|\nu]}$ is the probability that an individual seller is a liquidity seller and hence that the project has average value $\Pr[q = 1 | \nu] R$ per share. The 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 $\Pr[q = 0 | \nu]$.

We are interested also in the date-2 price that can be expected at date 1, when that 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.⁹ In contrast, strategic sellers will only trade unprofitable projects. In turn, if a project is unprofitable, all strategic sellers sell and the price, due to the high volume of trade ν , will be relatively low. Hence the strategic sellers' expect a 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*

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

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

The expected price conditional on $q = 0$ is

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

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

⁹Recall that liquidity sellers attach a value zero to later returns, including from good projects. Hence their reservation price is 0 or, if they have the power to liquidate, L .

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. □

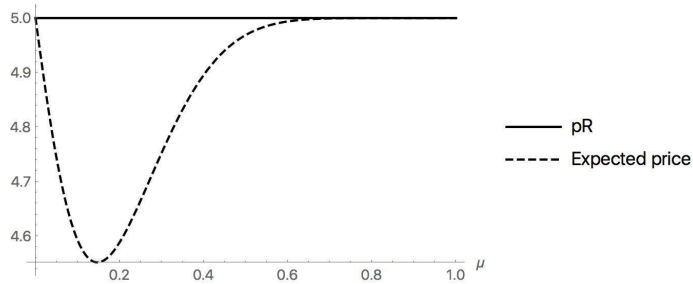


Figure 4: Expected price as a function of monitoring ($p = .5$, $\lambda = .3$, $R = 10$, and $n = 30$)

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.

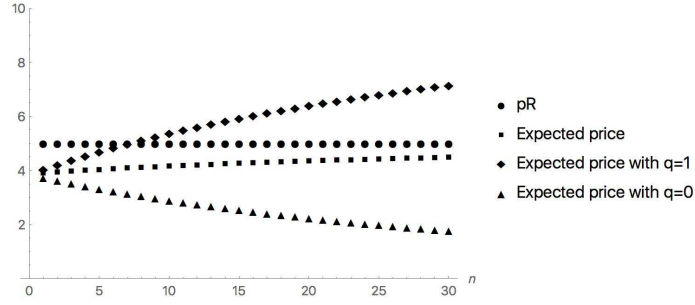


Figure 5: Expected price ($p = .5$, $\lambda = .3$, $\mu = .25$, and $R = 1$)

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 make two additional assumptions:

Assumption 1: $p_H R + (1 - p_H) L > 1$

Assumption 2: $p_H R > L$

The first assumption implies that the expected returns of the good project are greater than the initial investment, given an optimal continuation decision, so that it is optimal to invest in an optimally run project. The second assumption implies that it is not profitable to liquidate the project if the value of q is unknown. These two 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. 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, liquidation is the norm.

2.6 Organizational choice

Our goal is to determine whether the manager will choose to organize her business 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 raise 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. I will solve the extensive form-game described in Table 1 by first looking for the pure-strategy Nash Equilibrium of the subgame starting at date 1 and then solving backwards for the manager’s choice of project (a private decision) and organization form (a publicly-observed decision) and the investor’s choice of whether to invest at date 0.

3 Corporations

Let us start by assuming that the manager has selected the corporate form and investors have provided the necessary capital at date 0. In this case, 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. 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. In the equilibrium we will have that:

- The investors’ monitoring choice is the best response to the buyers’ reservation price $P(\nu)$, which in turn determines the expected market price of shares in unprofitable projects, P_0 . The investor monitors if his idiosyncratic cost of monitoring c_i is lower than its benefits, which in turn consist of the possibility to sell his shares for the expected price P_0 when the project is unprofitable. Given a cutoff level μ equal to the benefits of monitoring, investors with $c_i \leq \mu$ monitor the manager, while investors with $c_i > \mu$ do not. Since c_i is uniformly distributed, μ is also the equilibrium probability that an investor is a monitor.
- The buyers’ reservation price $P(\nu)$ is the best response to the investors’ monitoring strategy μ .

Accordingly, buyers’ update their posteriors about the probability that the project is profitable after observing the offer flow and set $P(\nu)$ to match the expected value of a share given μ as we have seen in Section 2.4. In turn, each investor i monitors if the expected payoff from monitoring is weakly greater than the expected payoff from not monitoring:

$$(1 - \lambda)(pR + (1 - p)P_0) + \lambda\bar{P} - c_i \geq (1 - \lambda)pR + \lambda\bar{P}$$

The value of going forward without selling, $(1 - \lambda)pR$, is unaffected by monitoring and appears on both sides of the inequality. Likewise for $\lambda\bar{P}$, 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.¹⁰ 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 $1 - \mu$).

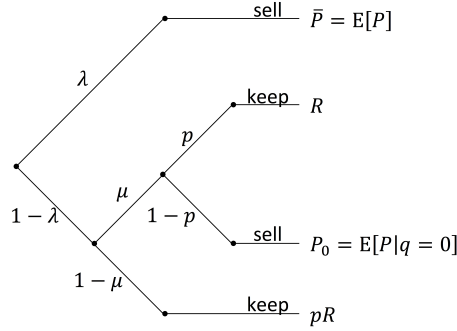


Figure 6: Liquidity shock, monitoring and share value

More concisely, an investor monitors if

$$c_i \leq (1 - \lambda)(1 - p)P_0 \equiv F_\kappa(\mu) \quad (3)$$

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

Proposition 1. *The equilibrium level of monitoring in a corporation solves*

$$\mu = F_\kappa(\mu)$$

The solution, μ_κ , is unique and decreases in n .

Proof. See Appendix. □

¹⁰Note 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.

Note that, quite intuitively, the individual monitoring probability decreases in the number of investors n owing to the fact that a larger n makes it easier for buyers to discriminate between profitable and unprofitable projects and hence reduces P_0 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.

4 Partnerships

If the manager selects the partnership form at date 0, investors retain the right to withdraw their capital and, hence, to force the liquidation of the company unilaterally. Liquidation gives investors L per share and hence it will occur only if the price $P(\nu)$ is below L .¹¹ 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. However, on the positive side, a breakdown of trade reduces the risk of inefficient continuation that plagues corporations, because it allows investors who do not monitor to benefit from information gathered by monitors, who force the liquidation of bad projects. These are efficient liquidations, and reduce the set of cases in which monitoring makes a difference. In turn, this creates a free-riding problem in monitoring and dampens the incentives to monitor.

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. The liquidation probability is equal to:

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

The first addendum captures the risk of inefficient liquidations that are trig-

¹¹ 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.

gered 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 liquidation, which are triggered by monitors upon learning that the project is unprofitable. Let

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

be the maximum volume of offers such that the share price is still weakly larger than the liquidation value (see Figure 7).

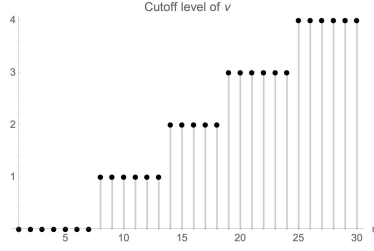


Figure 7: Cutoff $\bar{v}$ ($p = .1$, $\lambda = .1$, $L = .95$, and $R = 16$)

Given that the price of shares $P(v)$ decreases in the volume of sales v , we have $P(v) \geq L$ if $v \leq \bar{v}$ and $P(v) < L$ if $v > \bar{v}$. A high $\bar{v}$ makes liquidation less likely. A high $\bar{v}$ has a beneficial effect, because it reduces the risk of inefficient liquidations, but it also has a detrimental effect, because it prevents efficient liquidations. The balance between these two effects will be important in determining the effects of choosing the partnership at date 0.

Note that if $P(v) < L$, monitoring has public value, as monitors liquidate the company efficiently. If instead $P(v) \geq L$, monitors sell and hence capture the full benefit of monitoring privately as in a corporation. Following the same equilibrium concept as above, an investors monitors if:

$$c_i \leq (1-p)(1-\lambda) \sum_{v=0}^{\bar{v}} (\Pr[v \mid q=0] P(v)) + (1-p)(1-\Lambda)(1-\mu)^{n-1} \sum_{v=\bar{v}+1}^n \Pr[v \mid q=0] L \equiv F_{\pi}(\mu)$$

If the price is above the liquidation value (that is, if $v \leq \bar{v}$), monitoring produces a benefit if the firm is not profitable (with probability $1-p$) and the investor does not face a liquidity shock (with probability $1-\lambda$). In this case, the investor exits by selling and it is irrelevant to him whether there are other monitors; nevertheless, the presence of other monitors will depress the price. Instead, if the price is below the liquidation value (that is, if $v > \bar{v}$), monitoring produces a benefit if the firm is not profitable (with probability $1-p$) and no other investor forces liquidation, that is, if no investor faces a liquidity shock, including the monitoring investor (with probability $1-\Lambda$), and none of the other investors is a monitor (with probability $(1-\mu)^{n-1}$).

Note that if L were equal to zero, the monitoring probability would be the same as in a corporation because the second term disappears and $\bar{\nu}$ approaches n . If instead L is positive, there are two countervailing effects. On the one hand, investors in a partnership are induced to monitor more than their corporate counterparts because they can exit for $\max\{P(\nu), L\}$. On the other hand, they are induced to monitor less because liquidation could be efficiently triggered by another monitor or by a liquidity-strapped investor. The latter effect prevails.

Proposition 2. *The equilibrium level of monitoring in a partnership solves*

$$\mu = F_{\pi}(\mu)$$

The solution, μ_{π} , is not necessarily unique and decreases in n .

Proof. See Appendix. □

5 Comparison

Given that the equations in Proposition 1 and Proposition 2 do not have a straightforward closed-form solution, I illustrate how the corporate form compares to the partnership by means of a simulation. The simulation has been run in Mathematica with the following parameter values: $p = .1$, $\lambda = .1$, $L = .95$, and $R = 16$. I will compare the equilibrium monitoring levels at date 1 and then backup to date 0 to analyze the incentive-compatibility constraint for the manager to choose the good project and the investor's participation constraint.

5.1 Monitoring levels

Monitoring is larger in a partnership if $F_{\pi}(\mu) > F_{\kappa}(\mu)$ or if

$$\sum_{\nu=\bar{\nu}+1}^{\nu=n} \left(\Pr[\nu | q = 0] \left[(1 - \lambda)^{n-1} (1 - \mu)^{n-1} L - P(\nu) \right] \right) > 0$$

where $P(\nu) < L$. Note that the expression in square brackets decreases in n because the term $(1 - \lambda)^{n-1} (1 - \mu)^{n-1}$ decreases in n and $P(\nu)$ increases in n . So that $F_{\kappa}(\mu)$ and $F_{\pi}(\mu)$ cross only once and, in particular, the individual monitoring level is lower in a corporation ($\mu_{\kappa} < \mu_{\pi}$) for small n and in a partnership ($\mu_{\kappa} > \mu_{\pi}$) for large n . Figure 8 shows simulated monitoring levels confirming this pattern. As n grows monitoring decreases both in the partnership and in the corporation. Figure 9 shows the levels of aggregate monitoring and the aggregate liquidity risk. While in the corporation aggregate monitoring increases in n in spite of the reduction in individual monitoring levels, in the partnership free-riding in monitoring makes aggregate monitoring levels decrease in n . In addition, the aggregate liquidity risk rapidly increases in n , making the partnership form unstable. The aggregate liquidity risk is a concern in the corporation too, but only at the individual level. Since the price on the market is eroded by

a cost of trading due to asymmetric information, liquidity shocks are individually costly in a corporation, even if they do not create aggregate risk. However, the cost of liquidity shocks for individual investors decreases in n as the cost of trade is reduced.

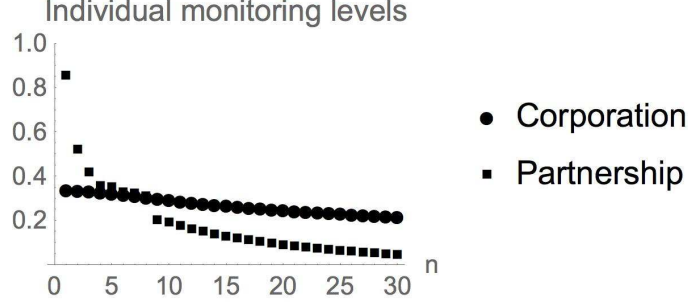


Figure 8: Individual monitoring levels ($p = .1$, $\lambda = .1$, $L = .95$, and $R = 16$)

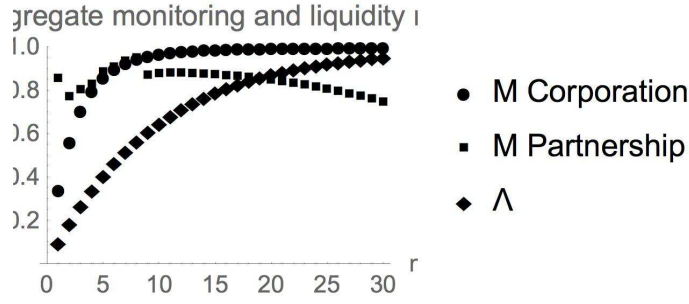


Figure 9: Aggregate monitoring and liquidity risk ($p = .1$, $\lambda = .1$, $L = .95$, and $R = 16$)

5.2 Choice of project and loanable funds

The expected returns from investment in project p_H for the manager is $Ap_H R$ in a corporation (because there is always continuation and hence $\Gamma = 1$) and only $A(1 - \Gamma)p_H R$ in a partnership because there is a positive chance of liquidation and the manager earns zero in that case. The entrepreneur chooses the project before monitoring takes place but anticipates the equilibrium level of monitoring motivated by speculative prospects. The entrepreneur will choose p_H if

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

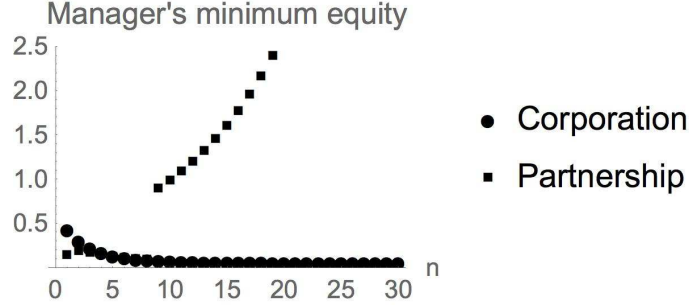


Figure 10: Manager's minimum equity stake ($p = .1$, $\lambda = .1$, $L = .95$, and $R = 16$)

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. Figure 10 illustrates this point, showing that the equity required from the manager is lower in a partnership ($A_\pi < A_\kappa$) for small n and in a corporation ($A_\pi > A_\kappa$) for large n .

5.3 Value of the investment

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

$$\begin{aligned} V_\kappa &= (1 - \lambda)(pR + (1 - p)\mu P_0) + \lambda\bar{P} - \frac{\mu^2}{2} \\ &= (1 - \lambda)pR + \lambda\bar{P}_\kappa + \frac{\mu_\kappa^2}{2} \end{aligned}$$

where the first terms 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, $\int_0^\mu cdc = \frac{\mu^2}{2}$. 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 $\bar{P}$ is high; $\bar{P}$ is the price that uninformed sellers obtain when selling shares of expected value equal to $pR > \bar{P}$, where the difference between the two is the cost of trade due to asymmetric information.¹² Similarly, investors benefit from lower monitoring costs.

¹²Note that in a liquid market P_0 is low. However, the benefits of a high $\bar{P}$ outweigh the disadvantages of a low P_0 .

The second line in the expression above is obtained by substituting the equilibrium level of monitoring μ_κ 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.

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.

$$V_\pi = \sum_{\nu=0}^{\nu=\overline{\nu}} ((1-\lambda)(pR\Pr[\nu | q=1] + (1-p)\mu P(\nu)\Pr[\nu | q=0]) + \lambda P(\nu)\Pr[\nu]) \\ + \sum_{\nu=\overline{\nu}+1}^{\nu=n} ((1-\Lambda)(pR\Pr[\nu | q=1] + (1-p)ML\Pr[\nu | q=0]) + \Lambda L\Pr[\nu]) - \frac{\mu^2}{2}$$

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.

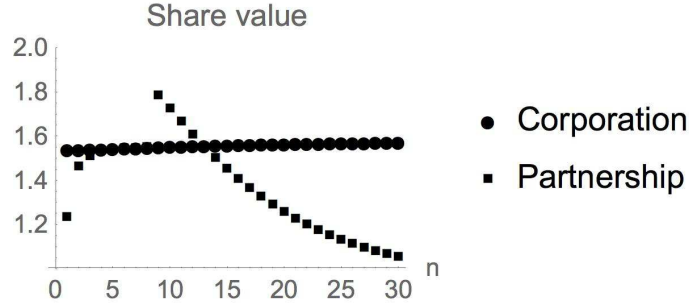


Figure 11: Share value at date 0 ($p = .1$, $\lambda = .1$, $L = .95$, and $R = 16$)

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. Figure 11 shows that the corporation induces higher share value for large n . While the performance of the corporation steadily improves in n due to the reduction in monitoring and the increased liquidity of the market, the partnership follows a more involved pattern. The partnership can only prevail for small n but there is a region of very small n where the partnership again underperforms due to the cost of high monitoring levels. This disadvantage, however, needs to be balanced against the lower capital requirements for the manager.

6 Conclusion

The analysis presented here has emphasized the role of capital lock-in in drawing a line between organizational forms with and without locked-in capital. 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 hence 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 paper 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 spit the cash flows into multiple securities, for instance, debt and equity, which appeal to uninformed and informed investors, respectively. To the contrary, 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 Gorton and Pennacchi (defined as in 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 benefit 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. Finally, I have assumed away an important difference in the tradability of shares. In partnerships, tradability is often explicitly limited or subjected to consent by the other partners. 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.

Further comparative statics. The analysis has focused on the number of investor. Interesting implications might result from expanding the analysis to consider the comparative static effects of other variables, such as the probability of success of the project, p , the expected returns, R , the liquidation value of the assets, L and the private benefits deriving from good and bad projects, b and B .

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Appendix

Proof of Lemma 1

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

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

$\Pr[\nu \mid q = 0]$ is the probability that liquidity sales ν_λ plus strategic sales ν_μ add up to ν , conditional on $q = 0$. Note that $(\nu_\mu \mid \nu_\lambda = i, q = 0) \sim B[n - i, \mu]$, because a strategic sale takes place only among those investors who are not subject to a liquidity shock, so that

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

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

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

Note that

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

which justifies line 5. Using the Binomial Theorem, we have

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

which justified line 6. $\Pr[\nu]$ is easily obtained by aggregating the preceding results over the probability distribution of q :

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

The comparative statics is straightforward. $\square$

Proof of Lemma 2

Proof. First note that:

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

Buyers know that each seller on the market is either a liquidity seller, with probability $\frac{\lambda}{\lambda + (1 - \lambda)\mu \Pr[q=0|\nu]}$, or a strategic seller, with probability $\frac{(1 - \lambda)\mu(1 - \Pr[q=1|\nu])}{\lambda + (1 - \lambda)\mu(1 - \Pr[q=1|\nu])}$. Liquidity sellers sell shares of value $\Pr[q = 1 | \nu] R$, while strategic sellers sell shares of zero value, because they adversely select whether to put up their shares for sale. Therefore, the price is:

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

Using $1 - \Pr[q = 1 | \nu] = \Pr[q = 0 | \nu]$ we have the expression in the Lemma. The comparative statics is straightforward. $\square$

Proof of Lemma 3

Proof. Omitted. $\square$

Proof of Proposition 1

Proof. From the expression for $\Pr[\nu | q = 0]$ in the proof of Lemma 1 it is easy to see that P_0 decreases in μ , $\lim_{\mu \downarrow 0} P_0 > 0$ and $\lim_{\mu \uparrow 1} P_0 = 0$. Therefore, there exist a unique μ_κ such that $\mu_\kappa = F_\kappa(\mu_\kappa)$. Further, note that μ_κ decreases in n iff $F_\kappa(\mu)$ decreases in n for every μ , which follows directly from Lemma 3. $\square$

Proof of Proposition 2

Proof. That μ_π is not necessarily unique can be easily seen from the functional form of F_π , which exhibits discontinuities; μ_π decreases in n for reasons similar to those explained in the previous proof. $\square$