9

Lending Relationships and Investor Activism

9.1 Introduction

Passive monitoring is in a sense backward looking: speculative monitors assess the value of assets in place in order to best arbitrage the mispricing of securities. Active monitoring, in contrast, is forward looking: large monitors such as a firm's main bank (Hausbank), a venture capitalist, or a large blockholder intervene so as to increase the value of assets in place through investor-friendly decision making. This chapter reviews the costs and benefits of active monitoring and analyzes the private incentives to become an active monitor.

There are several reasons to be interested in active monitoring.[1] First, as we discussed in Chapters 1 and 8, the topic is central to debate on equity- versus debt-based corporate governance. Countries such as Japan, Germany, France, and more generally continental Europe, have traditionally relied on banks, and to a lesser extent large shareholders, to discipline management.[2] The legal and regulatory environment in the United States has been less well disposed toward concentrated ownership, and interference in management has put relatively more weight on takeover and proxy fights. Management has also been more likely to be incentivized through stock-based compensation than in Europe and Japan. Although these differences in governance have been vanishing lately, they are still worth noting.

Second, one would like to know when blockholdings (or, by an abuse of terminology, main bank positions) are likely to trade at a premium or at a discount. For example, Barclay and Holderness (1989) analyze block trades and show that large blocks of shares trade at a premium relative to the market price. In this respect this chapter and the next will focus on four determinants:

Monitoring cost. First, monitoring is costly. That cost by itself suggests that blockholdings should trade at a discount. Section 9.2 investigates the validity of this intuition.

Learning by lending. A large investor, through his monitoring of management, acquires private information that puts him in a superior position against competitive investors in future financing rounds.[3] Section 9.4 studies whether such "learning by lending" makes investors willing to pay a premium for large blockholdings.

Block illiquidity. Conversely, a large investor may want to disengage himself from a firm because he needs cash to meet liquidity needs. But large blockholdings may be illiquid for two reasons (moral hazard and adverse selection). First, large blocks may be subject to a standstill agreement that limits transactions or a vesting provision meant to incentivize the large investors to monitor the firms; the logic of such restrictions is that long-term investors have more incentives to oversee and interfere in the firm than investors of passage. Second, even if no such restriction is in place, potential buyers of large blocks are usually wary that their owners might be cashing out, not because of a liquidity need, but because they have learned bad news about the firm's future. Section 9.5 studies when liquidity needs of large investors generate a price discount.

Benefits from control. Lastly, large blockholdings may confer benefits from control on their owner.

1. We focus on monitoring by a financial intermediary or a large shareholder. Several strands of the literature have studied other monitors, most notably peer monitoring (see the supplementary section in Chapter 4) and trade credit (see, for example, Biais and Gollier 1997; Burkart and Ellingsen 2004; Jain 2001).

2. For a survey of relationship banking, see Boot (2000).

3. Such incumbency rents figure prominently in the work of Sharpe (1990), Rajan (1992), and Greenbaum et al. (1989), among others.

This is obvious for blockholdings with a control majority, but less so for large minority shareholders. Chapter 10 will examine when benefits from control and associated price premia are likely to exist.

Section 9.2 develops a basic model of investor activism. A monitor is given a sufficient stake in the firm to have an incentive to sink resources into overseeing managerial behavior, thereby curbing moral hazard. The enlisting of a monitor involves two basic costs: first, at the very least, the monitor must be compensated for the monitoring cost that he incurs; second, monitoring capital may be scarce and so monitors may enjoy a rent relative to other investors.

The cost of enlisting a monitor implies that firms with strong balance sheets, which have enough pledgeable income to attract financing in the absence of monitoring, prefer to borrow more cheaply from financial markets, while firms with weaker balance sheets, which must assuage the investors' concerns, have little choice but to resort to costlier intermediated finance. (By contrast, the representation of monitors as advisors who help management to formulate efficient strategies instead of preventing management from wasting corporate resources leads to the prediction that firms with strong balance sheets are those that can afford advisers.)

Section 9.2 then analyzes two other costs associated with monitoring: scope for overmonitoring and collusion. On the collusion front, monitors may adopt a lenient attitude toward management, who can reciprocate by tunneling corporate resources so as to benefit the monitors' own ventures, by offering counterfavors in kind (including friendship), and so forth. The institutional response to the threat of collusion may consist in raising the monitor's financial stake in the firm or in reducing potential conflicts of interest.

Section 9.3 asks whether large blocks are likely to emerge spontaneously in financial markets rather than through a private deal. To the extent that blockholders supply a "public good" (the monitoring of managerial behavior), the acquisition of a large stake gives rise to free riding: each shareholder would like to hold on to his share while other shareholders sell their share to a larger buyer, who would then have a sufficient stake to monitor. We investigate when blockholdings may nonetheless emerge in financial markets.

Section 9.4 studies the implications of learning by lending. It first shows that incumbent blockholders enjoy an informational rent relative to other investors. Large investors are therefore willing to pay a premium for their blockholding that reflects the future supranormal profit. Put differently, they are willing to lose money in the short run in order to acquire an informational edge over other investors, that they will be able to exploit in the future. Section 9.4 then demonstrates a cost of relationship lending: the monopoly power associated with the incumbent monitor's informational advantage gives rise to a form of holdup on managerial investment in future profitability enhancements, and therefore discourages such investment.

Section 9.5 finally analyzes another cost of monitoring: the illiquidity of the monitor's stake. The analysis here parallels that of Section 4.4 for the entrepreneur. After all, the monitor, being subject to moral hazard himself, can be viewed as an insider. His ability to exit early—before the full consequences of his monitoring performance are realized—is a disincentive to efficient monitoring. On the other hand, monitors like to plan an exit strategy because they may need funds to reinvest in other ventures or face their own liquidity shocks. The optimal contract for the monitor is more likely to be liquid (allow an early exit) if reinvestment opportunities are likely and valuable, if early performance measures (perhaps associated with an IPO) are available, and if monitoring capital is not too scarce.

9.2 Basics of Investor Activism

9.2.1 Benefit of Activism

To model the collection of prospective information, we start from the fixed-investment model of Section 3.2 and add a monitor who can intervene in order to reduce the scope for moral hazard. A risk-neutral entrepreneur with wealth A has a project costing $I > A$ and must therefore borrow $I - A$ from investors. The project yields R when it succeeds and 0 when it fails. The probability of success is p_H if the entrepreneur works and $p_L = p_H - \Delta p$ if she shirks.

Table 9.1

	good project	bad project	Bad project
Pr(success)	p_H	p_L	p_L
Private benefit	0	b	B

9.2.1.1 No Monitoring

In the absence of monitoring, shirking provides private benefit B. Letting R_b denote the entrepreneur's reward in the case of success (she receives nothing in the case of failure as she is protected by limited liability), incentive compatibility requires that

$$(\Delta p)R_b \geqslant B. \tag{9.1}$$

Funding requires that the pledgeable income exceed the investors' investment:

$$p_H\left(R - \frac{B}{\Delta p}\right) \geqslant I - A. \tag{9.2}$$

If this condition is satisfied, and given that the investors break even, the entrepreneur's utility is equal to the project's NPV:

$$U_b = p_H R - I. \tag{9.3}$$

9.2.1.2 Monitoring (With Fixed Intensity)

Let us now formalize the idea that monitoring reduces the extent of moral hazard. A straightforward way of doing so[4] is to assume that a monitor can reduce the private benefit that can be enjoyed by the entrepreneur by shirking from B to $b < B$. The monitor must, however, bear an unobservable private monitoring cost $c > 0$ in order to achieve this reduction in private benefit.

An interpretation of this monitoring structure is as described in Table 9.1. The manager will have to choose among a number of *ex ante* identical projects. The manager privately learns the payoffs attached to each project. There are three relevant projects: (1) the "good project," which yields no private benefit and has probability of success p_H; (2) the low-private-benefit "bad project," which yields private benefit b and has probability of success p_L; and (3) the high-private-benefit "Bad project," which yields private benefit B and has probability of success p_L.

The monitor moves first. If he incurs effort cost c, he is able to identify the high-private-benefit Bad project and thus to prevent the entrepreneur from selecting it. But he still cannot tell the other two projects apart, and so the entrepreneur, who can condition her choice of project on the existence or absence of monitoring,[5] can still choose the low-private-benefit bad project if she wishes to. The monitor learns nothing when he does not incur the monitoring cost c; then, because the projects are still indistinguishable by the investors, the entrepreneur can choose any of the three projects, as in the absence of monitoring (of course, the low-private-benefit bad project is then less attractive for the entrepreneur than the Bad project and is therefore irrelevant).

Let us assume that the entrepreneur "hires" a monitor and that the monitor's incentives induce him to monitor. The entrepreneur's private benefit from shirking is then equal to b, and so, if R_b denotes the entrepreneur's reward in the case of success, the entrepreneur works if and only if

$$(\Delta p)R_b \geqslant b. \tag{9.4}$$

We can further assume that $(\Delta p)R_b < B$; for, if $R_b \geqslant B/\Delta p$, the entrepreneur is induced to work even in the absence of monitoring. Monitoring is then useless.

The monitor too must be provided with an incentive scheme.[6] We maintain the assumption of

4. Drawn from Holmström and Tirole (1997). The monitoring role of financial intermediaries has been studied in the theoretical literature on delegated monitoring (e.g., Besanko and Kanatas 1993; Diamond 1984, 1991; Hellwig 1991). In Admati and Pfleiderer (1994), monitoring serves to control managerial investment decisions, and in Berglöf (1994) it affects managerial replacement. Shleifer and Vishny (1986) study the incentives of potential raiders to monitor firms.

5. This sequential timing of monitoring simplifies the analysis (a similar assumption is made in Winton (1993)).

An alternative formulation consists in assuming that there are only two projects, as in Section 3.2, and that the entrepreneur chooses a project whose nature (p_H or p_L) is unknown to all, including the monitor. The monitor can then investigate at cost c, and possibly take remedial action. This class of monitoring models in general leads to equilibria in mixed strategies (see Exercise 9.5).

6. Like the borrower, the monitor is treated as a unitary actor. Put differently, the structure of incentives within the monitoring entity is left aside. Berger et al. (2005) provide empirical evidence that small banks are more willing to lend on the basis of soft information than larger ones.

universal risk neutrality, and so there is no loss of generality in assuming that the monitor receives a reward R_m in the case of success and 0 in the case of failure (because of limited liability). When not incurring cost c, the monitor is unable to prevent the entrepreneur from shirking, and so the incentive for monitoring is provided by an R_m satisfying[7]

$$(\Delta p)R_m \geqslant c. \tag{9.5}$$

Abundance of monitoring capital assumption. Let us first assume that monitoring capital is "abundant" or "not scarce." This means that there is a large supply of monitors who are willing to invest their capital in the monitoring activity as long as they are as well-off by doing so as with any other investment.[8] They are thus willing to contribute to the firm's investment at level I_m such that

$$p_H R_m - c = I_m. \tag{9.6}$$

The monitor then obtains no rent, and receives net payment $(p_H R_m - I_m)$ equal to his monitoring cost c. (In general, monitoring capital is scarce and therefore may demand a rate of return exceeding the market rate of return: see below.)

Nonmonitoring or uninformed investors are willing to fund the project if and only if

$$p_H(R - R_b - R_m) \geqslant I - A - I_m. \tag{9.7}$$

And so, using (9.4)–(9.6), the necessary and sufficient condition for the project to be funded is

$$p_H\left(R - \frac{b}{\Delta p}\right) \geqslant I - A + c. \tag{9.8}$$

That is, monitoring reduces the agency cost from $p_H B/\Delta p$ to $p_H b/\Delta p$, but adds monitoring cost c. Using (9.5) and (9.6), the monitor's stake R_m can be chosen equal to $c/(\Delta p)$ and the monitor's investment contribution equal to

$$I_m = \frac{p_L c}{\Delta p}.$$

To obtain some potential role for monitoring, let us assume that the monitoring cost is small enough that monitoring increases the pledgeable income:

$$p_H \frac{b}{\Delta p} + c < p_H \frac{B}{\Delta p}. \tag{9.9}$$

When does the entrepreneur benefit from having a monitor? Because all investors, including the monitor, obtain no rent from their relationship with the firm, the entrepreneur's utility is equal to the project's NPV under monitoring:

$$U_b = p_H R - I - c. \tag{9.10}$$

We assume that the NPV is positive even in the presence of monitoring:

$$p_H R > I + c.$$

Monitoring, as we could have expected, reduces the entrepreneur's utility by the monitoring cost, and so the entrepreneur forgoes monitoring if she can obtain funding in its absence, that is, if condition (9.2) is satisfied. On the other hand, if (9.2) is violated, the firm has no choice but to either resort to being monitored (if $c < p_H R - I$), or forgo the project. Figure 9.1

7. Note that the monitor's certification role is jeopardized if the monitor contracts with a "protection seller" (a third-party insurer) in a credit derivative market. Under risk neutrality, the monitor and the protection seller do not obtain gains from a trade when the monitor passes the default risk on to the protection seller. When the monitor is risk averse (and $p_H < 1$), in contrast, the monitor is tempted to offload the credit risk on to a third party, which reduces the incentive to monitor. To avoid this, the monitor's incentive constraint (9.5) must be slack and the monitor must not be "risk averse" (in order to limit the insurance gains relative to the efficiency loss in the side contract between the monitor and the protection seller). In the absence of other considerations, the monitor is better off committing never to use a credit derivative market. For more details, see Morrison (2002) (who, citing a 2000 study of the British Bankers Association, notes that the market for such credit derivatives reached $893 billion in 2000).

8. Regardless of the monitors' net wealth, we assume that there is a well-defined amount of this wealth. This is, of course, a simplifying assumption.

In practice, investors at any point in time have a variety of (uncertain) assets, some existing but somewhat illiquid (say, real estate) and some to be derived from future earnings. Before the institutions of limited liability became widespread, it was typical for shareholders to have unlimited liability for the company's debts in case of default. This unlimited liability (which still exists in some partnerships, such as Lloyd's of London in the insurance business) is really an uncertain liability, whose cost depends not only on the firm's unpaid debts, but also on the evolution of the values of the shareholder's and other shareholders' assets, as well as on the ability of debtholders to put their hands on these wealths in case of default.

Winton (1993) builds models that depict the various costs associated with unlimited liability: the liable shareholder may have to dispose of his assets at a discount; and there may be adverse selection, in that unlimited liability shares are more attractive to investors whose assets are overappreciated, or who can more easily transfer these assets to someone else or abroad (as Winton notes, the concern about adverse selection was particularly evident in the common rule that shares could not be resold without approval of other shareholders, or else their owner has to keep residual liability after the sale). We refer to Winton's paper for the discussion of these interesting topics, and simplify our analysis by assuming that monitors' assets are known.

Figure 9.1 $\underline{A} = I + c - p_{\rm H}(R - b/\Delta p)$,
$\bar{A} = I - p_{\rm H}(R - B/\Delta p)$.

describes the financing pattern as a function of the entrepreneur's equity A.

That is, entrepreneurs with strong balance sheets (e.g., with $A \geqslant \bar{A}$; see Section 3.3.2 for a discussion of various notions of balance-sheet strength) borrow cheaply because they can do without monitoring, while borrowers with weaker balance sheets ($\underline{A} \leqslant A < \bar{A}$) borrow more expensively. Returning to the observations of Chapter 2, recall that strong firms (which are also often the large firms) can borrow cheaply in markets (that is, under low-intensity monitoring) and that other firms either cannot get funding or borrow at high rates from banks and other intermediaries (that is, under high-intensity monitoring). The active monitoring theory developed here suggests a reason why this may be so. James (1987) and Lummer and McConnell (1989) are among the early empirical papers demonstrating the role of banks in the reduction of agency costs. Cantillo and Wright (2000) confirm empirically that high-quality borrowers make intensive use of bond markets, while lower-quality ones resort to intermediated finance.

Link to the law-and-finance literature. Recall from Chapter 1 that La Porta et al. (1998) find that legal systems which protect investors poorly also exhibit very concentrated ownership structures. One possible interpretation for this finding is that legal systems with poor investor protection create substantial opportunities for insiders to take private benefits or tunnel corporate resources to other entities that they own. In the context of the model, the values of B and therefore of $\bar{A}$ are large. Because, under poor investor protection, the theory predicts that an increase in the extent of moral hazard in the absence of high-intensity monitoring leads to more monitoring, and because monitoring is facilitated by concentrated ownership, the theory can thus be viewed as consistent with La Porta et al.'s empirical finding. The reader may object that a poor legal infrastructure may also make it easier for the managers and the large investor to collude against other investors; the scope for collusion on the other hand calls for even more concentrated ownership, as will be demonstrated in Section 9.2.4.

Concentrated ownership versus other forms of monitoring. Concentrated ownership by a monitor with a sufficient stake improves the control of management. It, however, has costs: the cost of mere monitoring as well as other costs that will be described shortly. Thus, the governance structure must trade off the costs and benefits of concentrated ownership. Alternative ways of making managers accountable, besides direct monetary incentives, include market monitoring (Chapter 8) and takeovers (Chapter 11). Bolton and von Thadden's (1998) model predicts a more dispersed (less concentrated) ownership structure in countries (such as the United States) in which there is more active trading of shares in secondary markets and regulation facilitates takeovers. That is, in their model, monitoring through concentrated ownership and other forms of monitoring are substitutes.[9]

9.2.2 The Potential for Overmonitoring

Monitoring is useful because it reduces the scope for diversion and thereby makes borrowers more accountable to investors. Interestingly, though, monitoring can be excessive. In specific instances, a monitor may have too strong an incentive to oversee the borrower. There are three basic reasons for this.

9.2.2.1 Noninternalization of the Entrepreneur's Rent

As Pagano and Roell (1998) argue, the large monitor exerts two types of externality when deciding whether to increase the intensity of his monitoring. First, he exerts a *positive* externality on other investors. By monitoring more he makes their claims as well as his own claim more valuable; this externality is particularly strong when the monitor holds only a small fraction of the investors' total stake since he then receives only a small fraction of the value enhancements he brings about. In contrast, there is no such externality if the monitor holds all

9. This is not always the case (see Section 9.5).

the outside shares in the firm. Second, he exerts a *negative* externality on the entrepreneur, by restricting the latter's choice set in our framework. When the monitor holds all outside shares, this negative externality generates overmonitoring. It is then appropriate to reduce the monitor's incentives. The fixed-monitoring-intensity variant developed above cannot generate overmonitoring since the monitoring intensity takes only two values. If the optimal amount of monitoring is 0, then no monitor is hired and there is no overmonitoring. We therefore consider a variant with more than two intensities of monitoring:

The variable-monitoring-intensity model. To formalize the notions of undermonitoring and overmonitoring in a simple way, let us extend the monitoring model of Section 9.2.1 by introducing uncertainty about the outcome of monitoring. Namely, the monitor discovers the identity of the Bad project (the one yielding private benefit B) with probability x, and learns nothing with probability $1 - x$. The probability x of effective monitoring depends on the unverifiable effort cost or disutility of effort $c(x)$ incurred by the large monitor. We assume that this disutility of effort is increasing ($c' > 0$) and convex ($c'' > 0$), and that $c'(0) = 0$ and $c'(1) = \infty$ (so as to guarantee an interior solution when the monitor has a positive stake in the firm's success).

Let us assume without loss of generality that the borrower's reward, R_b, in the case of success is smaller than $B/\Delta p$ (otherwise, the incentive problem has been solved and monitoring is useless), and larger than $b/\Delta p$ (and thus effective monitoring prevents shirking). Assuming that monitoring capital is abundant, the project's NPV for a monitoring intensity x and the borrower's utility are identical and equal to

$$U_b = x p_H R + (1 - x)(p_L R + B) - I - c(x). \quad (9.11)$$

The level x^* of monitoring that maximizes the NPV is then given by

$$(\Delta p)R - B = c'(x^*). \quad (9.12)$$

Let us assume that at this level of monitoring, there is enough pledgeable income to pay back the investors, large and small:

$$[x^* p_H + (1 - x^*) p_L]\left[R - \frac{b}{\Delta p}\right] \geqslant I - A + c(x^*),$$

while condition (9.2) is still violated so unmonitored borrowing is infeasible.

Let us now determine the large monitor's optimal stake. Letting R_m denote the monitor's payoff in the case of success, as earlier, the monitor chooses his monitoring intensity so as to maximize

$$[x p_H + (1 - x) p_L]R_m - c(x);$$

and so

$$(\Delta p)R_m = c'(x). \quad (9.13)$$

Comparing (9.12) and (9.13) yields

$$R_m = R - \frac{B}{\Delta p}. \quad (9.14)$$

Because the entrepreneur is unable to borrow in the absence of monitoring, R_b is strictly smaller than $B/\Delta p$, and so

$$R_m < R - R_b. \quad (9.15)$$

In words, the monitor should not hold all external shares in the firm. As we explained, were the monitor to hold all external shares, a unit increase in the monitoring intensity x would exert no positive externality on other outside investors (there would be none) and would impose a negative externality—namely, the loss of $B - (\Delta p)R_b > 0$—on the entrepreneur.[10]

9.2.2.2 Killing Initiative

Alternatively, and as developed in more detail in Section 10.3, a high monitoring intensity may discourage the entrepreneur from coming up with new ideas, as argued by Burkart et al. (1997) (see also Crémer 1995; Aghion and Tirole 1997). For one thing, the monitor may make up for the entrepreneur's lack of ideas, with an obvious detrimental impact on the entrepreneur's incentive to generate ideas. But even if the monitor does not generate the

10. The potential for overmonitoring also arises in a somewhat different context in Hermalin and Weisbach (1998). In their model, the monitor is a board that tries to assess the CEO's ability (rather than to curb moral hazard as in the Pagano–Roell model) and decides whether to fire the CEO. Hermalin and Weisbach's model is a multiperiod one in which the composition of the board both reacts to past performance and affects future monitoring. To the extent that less independent boards monitor less, a decrease in the independence of the board alleviates the overmonitoring problem; relatedly, Hermalin and Weisbach's model predicts that CEO turnover is more sensitive to performance when the board is more independent. Finally, the model implies that independent directors are likely to be added to the board following poor firm performance.

ideas himself and only assesses whether the entrepreneur's proposals enhance the value for investors, overmonitoring may still occur. It may be the case that the entrepreneur no longer has incentives to come up with new projects or new courses of action if she anticipates that her proposal will be systematically modified to enhance investor value and be expunged from any private benefit for the entrepreneur. There is a tradeoff between asserting whether the entrepreneur's proposed course of action enhances investor value and rewarding the entrepreneur for her initiative.

9.2.2.3 Careful Monitoring May Aggravate the Soft-Budget-Constraint Problem

We observed in Chapter 5 that, in some situations, committing to closing the firm when performance is unsatisfactory even in circumstances in which the firm's continuation generates positive net pledgeable income may strengthen managerial discipline and force the entrepreneur to exert more effort. This tough stance may, however, not be credible, since the investors may gain more *ex post* by renegotiating and refinancing the entrepreneur. As we observed there, the dispersion of the investors may help prevent renegotiation. The absence of large monitor may contribute to make renegotiation difficult as well if the lack of information about the continuation value makes investors wary and induces them not to refinance. A lack of information may thus act as a commitment device.

9.2.3 Scarce Monitoring Capital

In general, the supply of players with *both* the expertise to monitor the entrepreneur and their own capital to invest in the firm is limited. This implies that monitoring an entrepreneur has an opportunity cost over and above the mere disutility of effort.

Absence of monitoring capital. Let us first consider the opposite polar case in which potential monitors have no capital. The selected monitor then cannot contribute to the initial investment. The monitor's stake, however, must still satisfy condition (9.5); and since $I_{\mathrm{m}} = 0$, the monitor enjoys rent

$$p_{\mathrm{H}}R_{\mathrm{m}} - c = p_{\mathrm{H}}\left(\frac{c}{\Delta p}\right) - c = \left(\frac{p_{\mathrm{L}}}{\Delta p}\right)c.$$

In comparison with the case of abundant monitoring capital, this rent decreases both the borrower's utility and the amount of income that can be pledged to the uninformed investors. On the first point, note that there is now a wedge between the borrower's utility,

$$U_{\mathrm{b}} = p_{\mathrm{H}}R - I - \left[c + \frac{p_{\mathrm{L}}}{\Delta p}c\right],$$

and the project's NPV ($p_{\mathrm{H}}R - I - c$). This wedge is, of course, equal to the monitor's rent. Similarly, the condition that the pledgeable income exceed the uninformed investor's initial outlay becomes

$$p_{\mathrm{H}}\left[R - \frac{b+c}{\Delta p}\right] \geqslant I - A.$$

The implications are the same as in the case of abundant monitoring capital. The no-monitoring region in Figure 9.1 is unaffected, while the monitoring region shrinks as $\underline{A}$ is raised by the amount, $p_{\mathrm{L}}c/(\Delta p)$, of the monitor's rent. Put differently, the entrepreneur must make up through her own cash on hand for the monitor's rent if she wants to attract uninformed investors.

General case. More generally, one may assume that monitoring capital has a shadow cost. (This shadow cost can only be determined in a general equilibrium framework (see Chapter 13).) That is, the monetary return χ on the monitor's investment contribution, defined by

$$\chi \equiv \frac{p_{\mathrm{H}}R_{\mathrm{m}}}{I_{\mathrm{m}}},$$

is intermediate between its value, $p_{\mathrm{H}}/p_{\mathrm{L}}$, when monitoring capital is abundant and the infinite level that obtains when monitors have no capital.

The monitor enjoys rent M given by

$$M \equiv p_{\mathrm{H}}R_{\mathrm{m}} - I_{\mathrm{m}} - c = \left[p_{\mathrm{L}} - \frac{p_{\mathrm{H}}}{\chi}\right]\frac{c}{\Delta p}.$$

(This "rent" is relative to what he would obtain, namely, 0, if he had no alternative use of this capital. By definition, his rent exactly reflects the opportunity cost χ of alternative investment opportunities.)

The borrower's utility is again lower than the NPV (as long as $\chi > p_{\mathrm{H}}/p_{\mathrm{L}}$) and is equal to

$$U_{\mathrm{b}} = p_{\mathrm{H}}R - I - c - M.$$

Similarly, the financing condition becomes

$$p_{\mathrm{H}}\left(R - \frac{b}{\Delta p}\right) - c - M \geqslant I - A.$$

Unsurprisingly, the project is harder to finance, the scarcer the monitoring capital (i.e., the higher χ is).

9.2.4 Other Costs Associated with Monitoring

Until now the cost of monitoring has been equal to the monitor's cost. This cost should be understood broadly, and in general exceeds the mere disutility of effort $c(x)$. Besides the scarcity of monitoring capital, there are several reasons for this.

Lack of diversification. We have assumed that the monitor is risk neutral. Suppose in contrast that the monitor is himself an entrepreneur and furthermore is risk averse, as in Admati et al. (1994). Then, providing the monitor with incentives is costly since the wedge between the rewards of the monitor in the cases of success and failure required by the provision of incentives to monitor creates a risk and destroys the monitor's insurance.[11]

Illiquidity. The monitoring activity may also have a cost in terms of liquidity. To have incentives to monitor, the monitor should not be allowed to reduce his stake in the firm's success below its initial level $c/\Delta p$ before the final outcome is revealed. For, suppose that the monitor were allowed to reduce his stake in the firm's success to $R_m' < R_m$, and that this privilege were not thought to impair the initial incentive to monitor. The monitor would then receive $p_H(R_m - R_m')$ for the liquid shares regardless of whether he has worked or shirked (which is not observable). Assuming that these liquid shares are sold to new investors without recourse (that is, the proceeds of the sale are not put into escrow as collateral in case the project fails; in other words, the shares are really sold), then the monitor's benefit from monitoring is reduced to $(\Delta p)R_m' < c$. And so the belief that the shares' liquidity does not impair incentives to monitor is unwarranted.

On the other hand, the monitor may encounter new and profitable investment opportunities before the outcome on this particular investment is realized. At this stage, the monitor would like to undo his position in the firm in order to reorient his investment toward these new opportunities. For example, venture capitalists typically design exit options that allow them to undo their position in order to be able to invest in new start-ups. But we observed that such liquidity or exit options may jeopardize monitoring. We come back to this topical subject at greater length in Section 9.5.

Collusion. The investor activism paradigm is that of the "three-tier hierarchy": (1) agent (entrepreneur), (2) supervisor (large monitor), (3) principal (other investors). The role of the monitor is, as for any other supervisor, to reduce the asymmetry of information between the principal and the agent. This role is endangered by the possibility of collusion. Indeed, the asymmetry of information between the principal on the one hand and the supervisor and the agent on the other is the very essence of collusion. The supervisor and the agent may take advantage of their shared privy information in order to collude against the principal; the agent may trade a more lenient supervisory activity against some favor to the supervisor.

There are three standard responses to the threat of collusion.[12] The first is to reduce the dependency of the agent's welfare on the supervisory activity in order to reduce the agent's incentives to "bribe" the supervisor. This generally results in low-powered incentives for the agent. The second is, conversely, to increase the supervisor's stake so as to make it more costly for him to collude with the agent. The third response consists in limiting the scope for "bribes." Such bribes may take various forms: tunneling, monetary transfers, counterfavor in kind, friendship, and so forth.

11. This is the standard "agency cost" (see, for example, Holmström (1979), or the textbooks by Bolton and Dewatripont (2004), Laffont and Martimort (2002), and Salanié (2005)). For example, suppose that the monitor's limited liability constraint is not relevant, and so we can make a comparison with the case of abundant monitoring capital studied above; for a concave utility function $u(Y-c)$ (in case of monitoring) and $u(Y)$ (in the absence of monitoring) for income Y, and for given payments $\{R_m^S, R_m^F\}$ for the monitor in the cases of success and failure, the incentive constraint is

$$p_H u(R_m^S - c) + (1-p_H)u(R_m^F - c) \geqslant p_L u(R_m^S) + (1-p_L)u(R_m^F),$$

and so $R_m^S > R_m^F$. Therefore the certainty equivalent of the left-hand side of the incentive constraint is smaller than $p_H R_m^S + (1-p_H)R_m^F - c$. The monitor's participation constraint implies that the monitor's expected utility exceeds $u(0)$. The income pledgeable to the other investors (still assuming that the entrepreneur is risk neutral) is

$$p_H\left(R - \frac{b}{\Delta p}\right) - [p_H R_m^S + (1-p_H)R_m^F] < p_H\left(R - \frac{b}{\Delta p}\right) - c.$$

12. See Tirole (1986) and the surveys of Tirole (1992) and Laffont and Rochet (1997).

Collusion may occur "*ex post*" or "*ex ante*." *Ex post* collusion occurs when the monitor acquires information and then makes an offer to the entrepreneur to be "cooperative," i.e., in the model of this chapter, let the entrepreneur freely choose the project rather than constraining her feasible set by ruling out the Bad project. The entrepreneur, in exchange, does a favor to the monitor. *Ex ante* collusion refers to an agreement between the two parties drawn *before* the monitor decides to acquire information. *Ex ante* collusion is more powerful in that an *ex ante* agreement allows the parties to economize on the monitoring cost c and therefore to share a bigger gain from collusion, but it may be harder to set up.[13]

Let us apply some of the general principles to the situation at hand in the context of *ex post* collusion. Dessi (2005) studies both *ex ante* and *ex post* collusion and finds that the implications discussed below apply to both situations. Because $B > (\Delta p)R_b$, the entrepreneur is better off when the monitor does not rule out the Bad project. The entrepreneur's benefit from colluding with the monitor when the latter is informed is then $B - (R_b/\Delta p)$. The monitor can collude with the entrepreneur by not ruling out the Bad project.[14] But this is costly to the supervisor who then loses $(\Delta p)R_m$ in expectation. Somehow, there must be a *quid pro quo*. As discussed above, this quid pro quo may take several forms in practice. The entrepreneur may pay a monetary bribe to the monitor. However, we have assumed that the entrepreneur has invested all her wealth in the firm; so, unless the entrepreneur has hidden wealth, it is unlikely that the bribe will take the form of a direct monetary transfer from the entrepreneur to the monitor. Friendship may motivate collusion especially if c, and therefore R_m, is small. This case is particularly relevant for boards, composed of directors who may be friendly with management and have low-powered incentives, and who may therefore be too complacent.

Lastly, and perhaps most interestingly, the entrepreneur may use corporate resources to bribe the monitor. For instance, the entrepreneur may spend time otherwise devoted to the firm to help the monitor in another activity, or else spend corporate money to benefit one of the monitor's affiliated entities. For example, a firm may select a large shareholder's subsidiary as supplier even though another supplier would have reduced cost; similarly, a firm monitored by a bank may buy from a supplier who is in distress and turns out to borrow from the same bank. A last example is supplied by consulting contracts given to the firm's auditor's consultancy division.

In the context of our model, such diversions of corporate resources can be modeled as creating a gain $G > 0$ to the monitor and reducing the probability of success uniformly by an amount $\tau > 0$. That is, the favor done to the monitor reduces the probability of success from p_H to $p_H - \tau$ if the entrepreneur works, and from p_L to $p_L - \tau$ if she shirks. The convenience afforded by the uniform reduction in the probability of success is, as already noted in this book, that it does not alter the entrepreneur's incentive constraint since $(p_H - \tau) - (p_L - \tau) = \Delta p$. That this diversion is wasteful can be expressed by $G < \tau R$.[15] We assume that any direct monetary transfer between the entrepreneur and the monitor, in contrast, can be detected by uninformed investors, and so the only means of side-payment is this tunneling of corporate resources to the monitor.

Assuming, as earlier, that $B > (\Delta p)R_b \geqslant b$, the monitor, when informed, reduces the probability of success from p_H to $p_L - \tau$ by colluding with the entrepreneur and accepting the diversion of corporate resources. Collusion therefore occurs if the monitor gains from it,

$$G \geqslant (\Delta p + \tau)R_m, \tag{9.16}$$

and if the entrepreneur gains as well,

$$B \geqslant (\Delta p + \tau)R_b. \tag{9.17}$$

13. First, the *ex ante* agreement may be compromised by asymmetric information: the entrepreneur may not know whether the monitor has the ability or time to figure out the nature of projects or whether he holds information that facilitates his discovery of payoffs (technically, the monitoring cost may be either c, or a large number and the entrepreneur does not know which prevails). The entrepreneur may then wait and see whether the monitor comes up with information that may constrain her policy. Second, the quid pro quo may be hard to synchronize: the monitor may want an immediate favor rather than a promise, which exposes the entrepreneur to future reneging by the entrepreneur.

14. For example, he can rule out the bad or the good projects instead.

15. In Dessi's (2005) richer model, the monitor is useful even if he colludes with management and the diversion is not wasteful.

Two straightforward implications follow from inequality (9.16). First, as one would expect, it is preferable to choose monitors who do not have potential conflicts of interest. In this case, a monitor to whom it is hard to transfer funds through the diversion of corporate resources (a monitor who has a low G or a high τ) is unlikely to collude with the entrepreneur.

It may, however, be hard to find such monitors who have expertise, capital, and no conflict of interest. This brings us to the second implication: preventing collusion requires raising the monitor's stake from $c/\Delta p$ to $G/(\Delta p+\tau)$ if the latter is higher (which is the case if the monitoring cost is small). The possibility of collusion may then raise the cost of monitoring (e.g., because of the scarcity of monitoring capital or because of risk aversion).

9.2.5 A Different Form of Monitoring: Advising

Venture capitalists, boards of directors, and other monitors often do not content themselves with monitoring the proposals and decisions of managers. They may also bring some expertise and advice to help the managerial team. For example, venture capitalists help recruit the managerial team, shape the strategy and business model, and set up accounting and employee compensation (Lerner 1995).

In the tradition of Holmström's (1982) formulation of moral hazard in teams, a string of contributions, including Bottazzi et al. (2005), Casamatta (2003), Hellmann (1998), Kaplan et al. (2003), Lerner and Schoar (2005), Repullo and Suarez (2000, 2004), and Schmidt (2003), have investigated such environments. The monitor's advisory activity in those models is akin to that of the entrepreneur (it raises the probability that the project is successful), and accordingly this variety of monitoring models are sometimes called "double-sided moral-hazard models."

While the monitoring model of Section 9.2.1 and the advisory models are similar in structure, they differ in a couple of (related) insights. Namely, advisory monitoring models predict the following:

- The advisor increases the NPV and so may be brought on board even in the absence of financial constraint. By contrast, a "pure monitor" in the sense of Section 9.2.1 is brought on board solely to release financial constraints, since he does not bring any value beyond ensuring that a sufficient fraction of the pie is turned back to investors.
- An entrepreneur with a *stronger* balance sheet is more likely to bring a "pure advisor" on board. An advisor is the corporate equivalent of a personal coach; access to an advisor is therefore reserved to borrowers who have the means to pay for his presence, i.e., to firms with strong balance sheets. By contrast, we saw that only firms with weak balance sheets enlist pure monitors.

We formalize the advisory role in the fixed-investment model in the context of a pure advisor (it is then straightforward to combine the advisory and monitoring functions for the monitor within the same model). An investment of size I must be financed from the entrepreneur's net worth $A < I$ and other funds. As usual, the project yields R in the case of success and 0 in the case of failure. The probability of success is $p + q$, where

- $p \in \{p_H, p_L\}$ is determined by the entrepreneur, who receives private benefit B when misbehaving (choosing probability p_L) and 0 when behaving (choosing probability p_H),
- $q \in \{q_H, q_L = 0\}$ is chosen by the monitor/advisor, if any (if there is none, then $q = q_L = 0$); the monitor incurs a nonverifiable cost $c > 0$ in order to give useful advice and thereby raise the probability of success by q_H.

The separable form postulated for the probability of success will enable us to consider the two agents' incentive constraints separately, as we will see.

Let $\Delta p \equiv p_H - p_L$ and $\Delta q \equiv q_H - q_L$. We naturally assume that the advisory activity is socially desirable:

$$(\Delta q)R \geqslant c.$$

Despite the symmetrical description of contributions to the probability of success, the entrepreneur and the monitor differ in at least one key respect: the entrepreneur owns the idea, and therefore decides whether to enlist a monitor.[16]

16. By contrast, in Holmström's (1982) original model of moral hazard in teams, the principal (here the investors) hires the two agents (here, the entrepreneur and the advisor).

9.2.5.1 No Advisor

In the absence of an advisor ($q = q_L = 0$), the treatment is the standard one. The entrepreneur's utility (when obtaining financing) is the NPV,

$$U_b^{nm} = p_H R - I,$$

and funding can be secured if and only if the pledgeable income exceeds the investors' outlay:

$$p_H\left(R - \frac{B}{\Delta p}\right) \geqslant I - A$$

or

$$A \geqslant \bar{A} = I - p_H\left(R - \frac{B}{\Delta p}\right).$$

9.2.5.2 Advisor

As in Section 9.2.1, assume that monitoring capital is plentiful, and so monitors' rent can be captured by asking them to contribute sufficiently to the investment (Exercise 9.4 verifies the robustness of the insights to monitoring capital scarcity).

In the case of success, the entrepreneur receives R_b, the monitor R_m, and the other investors $R - R_b - R_m$. All receive 0 in the case of failure.

The entrepreneur's and the monitor's incentive constraints are, respectively,[17]

$$(\Delta p)R_b \geqslant B$$

and

$$(\Delta q)R_m \geqslant c.$$

Let

$$R_m = \frac{c}{\Delta q}.$$

The contribution I_m to initial investment that is demanded from the monitor fully extracts his rent:

$$I_m = (p_H + q_H)\left(\frac{c}{\Delta q}\right) - c.$$

The entrepreneur again receives the full NPV, since neither the monitor nor the uninformed investors receive a rent:

$$U_b^m = (p_H + q_H)R_b - A = (p_H + q_H)R - I - c.$$

Note that when monitoring takes the form of advising, there can never be overmonitoring (Cestone 2004). Indeed, if monitoring capital is not scarce, and so the monitor contributes to the initial investment at the level of his future quasi-rent, it is optimal to allocate all shares not held by the entrepreneur to the monitor.[18]

9.2.5.3 Comparison

Because $(\Delta q)R > c$,

$$U_b^m > U_b^{nm}.$$

The entrepreneur prefers to avail herself of the advisory services as long as she can afford them. The key issue is whether advisory services boost or decrease pledgeable income. The pledgeable income under monitoring is

$$(p_H + q_H)\left(R - \frac{B}{\Delta p} - \frac{c}{\Delta q}\right)$$

(accounting for the fact that the monitor receives $(p_H + q_H)(c/\Delta q)$), and so financing is possible if and only if

$$(p_H + q_H)\left(R - \frac{B}{\Delta p} - \frac{c}{\Delta q}\right) \geqslant I - A - I_m$$

or

$$(p_H + q_H)\left(R - \frac{B}{\Delta p}\right) - c \geqslant I - A.$$

This last condition, taken as an equality, defines the threshold level of cash on hand, $\hat{A}$, such that the investors will let the entrepreneur hire an advisor. Thus, the pledgeable income (net of the monitor's investment contribution) increases ($\hat{A} < \bar{A}$) if and only if

$$q_H\left(R - \frac{B}{\Delta p}\right) > c.$$

This condition is not implied by that guaranteeing that monitoring increases the NPV ($q_H R > c$). We are thus led to consider two cases, depicted in Figure 9.2.

In case 2, the possibility of being monitored increases the pledgeable income, and *a fortiori* the NPV. It enhances the NPV, as well as enlarging the set of net worths for which funding is secured.

In case 1, in contrast, monitoring increases the NPV but lowers the pledgeable income. Hence, only firms with strong balance sheets (a high A) can resort to an advisor. The use of an advisor is a bit similar to an upgrading of—or extra investment in—this project; because the entrepreneur benefits from

17. Note that the two constraints are independent. For example, the monitor's constraint, $(p + q_H)R_m - c \geqslant pR_m$, does not depend on the realization of p.

18. It is weakly optimal here as long as $(\Delta q)R_m \geqslant c$. It would be strictly optimal if the monitoring intensity were continuous.

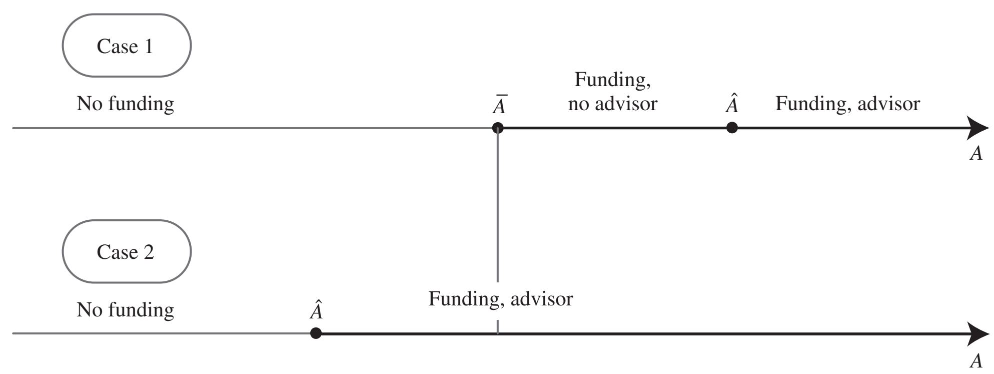

Figure 9.2 Case 1: $q_H(R - B/\Delta p) < c$. Case 2: $q_H(R - B/\Delta p) > c$.

this upgrade in the form of a higher rent, investors may not be able to put their hands on the increase in social value. This situation is reminiscent of the variable-investment model, in which an increase in the size of investment both increased the NPV and reduced the investors' profitability. Conversely, not taking on board an advisor is akin to a concession made to investors.

9.3 The Emergence of Share Concentration

As we discussed in Chapter 1, there is currently an important corporate governance debate as to whether the fiscal, legal, and regulatory environment sufficiently facilitates the emergence of large monitors. We abstract from this debate by assuming away any public restriction on or disincentive to the concentration of shares. Rather, we ask whether a large monitor will endogenously arise in an unregulated private economy. Share concentration may emerge in three ways: (a) private deal or private placement, (b) primary or seasoned offering, and (c) purchases on the secondary market.

The analysis of Section 9.2 has implicitly considered the case of a *private deal*: the entrepreneur chose a monitor (to be interpreted as a venture capitalist, an LBO specialist, a large shareholder, a bank, etc.) and then issued claims to nonmonitoring investors (junior partners, minority shareholders, other lenders, etc.). This section investigates whether a large monitor may arise endogenously through the purchase of a block of claims in a primary offering or in the secondary market. We begin with the latter possibility.

9.3.1 Tender Offer

Suppose that external shares are initially held by dispersed owners. A potential large monitor arrives and makes an unconditional and unrestricted tender offer at price P per share; that is, the large monitor stands ready to buy at price P any external share, regardless of the number of other shares tendered.

This situation gives rise to the well-known *free-rider problem* identified in Grossman and Hart (1980). Each initial owner of an outside share wishes that the other shareholders would tender their shares, since he would then benefit from the highest possible value enhancement. In general, though, individual investors are insufficiently motivated to supply the public good[19] created by share concentration. The second observation is that the large monitor in equilibrium does not acquire any share, since he must pay the *ex post* value for these shares and bears the cost of monitoring. Hence, no monitoring happens in equilibrium.

More formally, consider the *variable-monitoring-intensity* extension of Section 9.2.2.1. Let α denote the fraction of shares tendered to the large monitor. The fraction α cannot exceed the fraction $\bar{\alpha} \equiv [1 - (R_b/R)]$ of outside shares, where the entrepreneur's stake, R_b, is insufficient to generate good behavior in the absence of monitoring: $R_b < B/\Delta p$ (the case $R_b \geqslant B/\Delta p$ is, as we have seen, uninteresting, since monitoring is then irrelevant). These

19. The notion of "public good" is relative to the set of investors. As we have seen, the entrepreneur *ex post* loses from increased monitoring. Thus, share concentration may result in overmonitoring.

shares create a stake αR and an intensity of monitoring $x^*(\alpha)$ given by

$$\max_x \{[xp_H + (1-x)p_L]\alpha R - c(x)\}$$

or

$$c'(x^*(\alpha)) = (\Delta p)\alpha R.$$

The intensity of monitoring is an increasing function of the fraction of shares held by the large monitor. Let

$$V(\alpha) \equiv [x^*(\alpha)p_H + [1 - x^*(\alpha)]p_L]R$$

denote the expected payoff of a share when the large monitor holds a fraction α of shares. $V(\alpha)$ is an increasing function of α in the interval $[0, \bar{\alpha}]$, with

$$V(0) = p_L R$$

and

$$V(\bar{\alpha}) = [x^*(\bar{\alpha})p_H + [1 - x^*(\bar{\alpha})]p_L]R.$$

Consider a tender offer P in the relevant range $[V(0), V(\bar{\alpha})]$. The number of shares tendered is $\alpha = \alpha(P)$, where

$$V(\alpha(P)) = P.$$

If the number of shares tendered were smaller than $\alpha(P)$, then the value of a share would be smaller than the tender offer and all investors would want to tender, a contradiction. Conversely, if the number of shares tendered exceeded $\alpha(P)$, the value of shares would exceed the offered price and no one would actually want to tender. Note that the fraction of shares tendered is an upward-sloping function of the price, and that the supply curve is not perfectly elastic despite the fact that investors are risk neutral.

The large monitor's profit is then

$$\alpha(P)V(\alpha(P)) - c(x^*(\alpha(P))) - \alpha(P)P = -c(x^*(\alpha(P))),$$

and is therefore negative unless $\alpha(P) = 0$, i.e., $P = V(0)$. We therefore conclude that the large investor purchases no shares.

Remark (less extreme forms of free riding). The result that the large monitor acquires no shares is, of course, extreme and only serves to illustrate the free-rider and undermonitoring phenomena. In practice, large monitors, instead of purchasing shares through a tender offer, can try to acquire shares more discretely through anonymous orders and disguise these acquisitions behind liquidity trading (see Chapter 8); in many countries large investors can indeed do so until their shareholdings reach some threshold (e.g., 5% of the shares) at which point they must publicly disclose their position. The essential difference with the previous analysis of the free-rider problem is that liquidity traders (as in Chapter 8) lose money in expectation and thereby enable the large monitor to profitably acquire some shares. In contrast, the risk-neutral (and implicitly patient) investors of our analysis fully capture any value enhancement associated with the acquisition of shares by the monitor.

Similarly, the large monitor in Admati et al. (1994) (who, as in this section, makes a tender offer) acquires some shares despite free riding by small investors, because the latter have limited risk tolerance. The monitor supplies insurance to the small investors by purchasing shares. This creates gains from trade when the monitor buys shares, and in equilibrium the monitor indeed buys some shares, albeit an insufficient amount from the point of view of investors.

9.3.2 IPO: Winner's Curse in the Absence of Asymmetric Information

(This section contains advanced material.[20])

Suppose now that the entrepreneur offers the $\bar{\alpha}$ external shares in an IPO. For expository purposes only,[21] the auction is a discriminatory auction (the generalization of the first-price auction): bidders announce a price and a maximum quantity they are willing to buy at that price; the shares are then allocated to the highest bidders by order of their bids, and the bidders pay the price they bid for the shares they acquire.

As in the previous section, there are a large number of risk-neutral small investors, who in this primary market can be called market makers or arbitrageurs.[22] These arbitrageurs stand ready to buy any amount of shares as long as the rate of return

20. The analysis in this section transposes those of Burkart et al. (1998) and Joskow and Tirole (2000) to the IPO context.

21. In the United States, IPOs often do not use discriminatory auctions.

22. The auction we consider is in no way an optimal one. We consider it only to illustrate the main point. For some results on "mecha-

they expect on these shares (which is conditional on acquiring them: see below) is nonnegative. There is also a potential monitor who is risk neutral as well. The monitoring technology is again the uncertain monitoring technology of Section 9.2.2.1.

The first point to note is that *the equilibrium bids of this IPO cannot be deterministic*. Suppose, first, that the monitor bids $P = V(0)$, that is, the value of shares when he acquires none. Either he indeed acquires no share, and so no other investor makes a (money losing) bid above $V(0)$. The monitor can then acquire all shares at a price slightly above $V(0)$ and make a profit approximately equal to $\bar{\alpha}[V(\bar{\alpha}) - V(0)] - c(x^*(\bar{\alpha})) > 0$. Or else he acquires a fraction $\alpha > 0$ at bid $P = V(0)$, but then any investor can make a positive profit by placing a bid for a single share at a price in the interval $(V(0), V(\alpha))$. Suppose, second, that the monitor bids $P = V(\hat{\alpha})$ for some $\hat{\alpha} > 0$ and acquires α shares. Either $\alpha > \hat{\alpha}$, and by the previous reasoning, any investor could increase his profit by placing a bid for one share at a price in the interval $(V(\hat{\alpha}), V(\alpha))$. Or $\alpha \leqslant \hat{\alpha}$, and then the monitor's profit is

$$\alpha[V(\alpha) - V(\hat{\alpha})] - c(x^*(\alpha)) \leqslant 0.$$

As in the case of a tender offer, free riding prevents the monitor from making a deterministic offer at a price above $V(0)$.

Let us now describe the equilibrium. *The monitor randomizes over his bid P in some interval* $[V(0), \bar{P}]$, where $\bar{P} < V(\bar{\alpha})$, according to cumulative distribution $H(P)$ with continuous density $h(P)$ (so $H(V(0)) = 0$ and $H(\bar{P}) = 1$). The monitor stands ready to buy an arbitrary number of shares at the price he bids (he does not specify a maximum quantity).

The arbitrageurs' aggregate demand for shares is downward sloping rather than perfectly elastic. Namely, the fraction of shares demanded by arbitrageurs is equal to $\bar{\alpha} - \alpha(P)$, where $\alpha(P)$, the fraction of shares acquired by the monitor in the IPO when bidding P, is an increasing function of P with $\alpha(V(0)) = 0$ and $\alpha(\bar{P}) = \bar{\alpha}$. Because of competition (free entry) and risk neutrality, each bid by an arbitrageur must have an expected payoff equal to 0.

Let us compute this expected payoff *conditional on the arbitrageur receiving the corresponding share*. For bid P by the arbitrageur to be a winning bid, it must be the case that the monitor has bid some $\tilde{P} < P$. The conditional density of the monitor's bid knowing that it is lower than P is equal to $h(\tilde{P})/H(P)$ on $(V(0), P)$. The zero-expected-profit condition can therefore be written as

$$\int_{V(0)}^{P} [V(\alpha(\tilde{P})) - P] \frac{h(\tilde{P})}{H(P)} \, \mathrm{d}\tilde{P} = 0.$$

Since this condition must be satisfied for any P on $[V(0), \bar{P}]$, the derivative of its left-hand side with respect to P is also equal to 0, or

$$\frac{h(P)}{H(P)} = \frac{1}{V(\alpha(P)) - P}. \tag{9.18}$$

Condition (9.18), the investors' zero-profit condition, defines the mixed strategy $H(P)$ played by the monitor. The interesting point is the existence of a *winner's curse*. The acquisition of a share by an arbitrageur is bad news as to its value; the arbitrageur acquires the share for which he bids precisely when the monitor bids low, that is, when the monitor acquires few shares and performs little monitoring.

The monitor must be indifferent among all bids in the support of his mixed strategy. Note that $V(0)$ is in the support of H, because otherwise, the arbitrageurs would not bid prices between $V(0)$ and the greatest lower bound $\underline{P}$ of the support of H, and consequently the monitor would gain by bidding $V(0)$ instead of $\underline{P}$. Because he cannot make a profit by offering $P = V(0)$ (if he acquired some shares at this price, then arbitrageurs could make a profit by bidding just above $V(0)$), his profit must be equal to 0 for any bid on $[V(0), \bar{P}]$, or

$$\alpha(P)[V(\alpha(P)) - P] = c(x^*(\alpha(P))). \tag{9.19}$$

Equation (9.19) implies that the monitor buys shares at a discount ($V(\alpha(P)) > P$) that is just sufficient to compensate him for his monitoring cost. The upper bound on bids, $\bar{P}$, is given by

$$\bar{\alpha}[V(\bar{\alpha}) - \bar{P}] = c(x^*(\bar{\alpha})).$$

Lastly, we have posited that the monitor wants to purchase all available shares at his bid P. This follows from the fact that his profit function is convex in the number of acquired shares for a given price

nism design with externalities," we refer to, e.g., Jéhiel and Moldovanu (2000, 2001).

per share:[23] marginal value enhancements are more profitable for the monitor, the higher his number of shares.

We conclude that the IPO, although it leaves rents neither to the monitor nor to the other investors, does not generate an optimal monitoring structure. It lies in between the tender offer and the private deal in terms of free riding.

9.4 Learning by Lending

Through their monitoring activity, large blockholders or relationship lenders curb managerial moral hazard, but they also learn private information about the firm's prospects. This section analyzes the impact of learning by lending on the pricing of large investor stakes and on managerial incentives. The informational advantage acquired by current monitoring generates future informational rents. These future rents in turn tend to be competed away (i.e., dissipated) *ex ante* through a premium paid for the "right to monitor." Crucially, this section shows that the asymmetry of information between incumbent lenders and other potential lenders enables the former to partly hold up the manager for her investments in future productivity increases, and thereby identifies a cost of relationship lending.

Let us now add a dynamic dimension to the (abundant monitoring capital) model of Section 9.2.1.[24] There are two periods, $t = 1, 2$. The discount factor between the two periods is denoted by β. For simplicity, we rule out any savings between the two dates.[25]

Date 1. Consider an entrepreneur without cash ($A = 0$), but with a project requiring investment I at date 1. This initial project is successful (yields R) with probability p, and fails (yields 0) with the complementary probability. The probability of success is p_H if the entrepreneur behaves and $p_L = p_H - \Delta p$ if she misbehaves. The private benefit of misbehaving in the absence of monitoring, B, is large enough that there is not enough pledgeable income to reimburse the initial investors. That is, an arm's-length relationship is not an option. In contrast, monitoring (which costs c to the monitor) brings down the private benefit from misbehavior to $b < B$, and generates enough pledgeable income to pay back the investment and the monitoring costs. There is no scarcity of active monitors and so, in a static context, the extra cost of enlisting an active monitor is equal to c. Let us thus assume that

$$p_H\left(R - \frac{b}{\Delta p}\right) \geqslant I + c.$$

As shown in Section 9.2.1, this condition implies that the pledgeable income exceeds the total payment to investors (given that $A = 0$) and so the project can be financed even if there is no continuation project.[26]

Date 2. Regardless of the first-period profit, the entrepreneur is endowed with a new idea. This second project, which can be thought of as a continuation of the first, is identical to the first project, except for one thing: with probability α, the date-2 probability of success has increased uniformly by $\tau > 0$; that is, the probability of success of the second project is $p_H + \tau$ if the entrepreneur behaves in the second period, and $p_L + \tau$ if the entrepreneur misbehaves. Even with this improved profitability, an arm's-length relationship is still not an option at date 2; that is, the private benefit B is so large that a monitor is still needed. With probability $1 - \alpha$, these probabilities are still p_H and p_L; the second-period project is then a perfect image of the first-period one. The profit realizations (success, failure) are statistically independent across periods. We will refer to the realization

23. By the envelope theorem,

$$\frac{d}{d\alpha}[(p_L + x^*(\alpha)\Delta p)\alpha R - c(x^*(\alpha))] = [p_L + x^*(\alpha)\Delta p]R,$$

whose derivative is $(\Delta p)R[dx^*/d\alpha] > 0$.

24. A different model of relationship banking is developed in Scheepens (1996, Chapter 5). In Scheepens's model the borrower benefits from establishing a reputation with a bank as this increases the availability of financing later on. The initial loan may involve risky debt in order to provide the bank with an incentive to monitor.

25. Because we will assume in this section that there is enough pledgeable income and so funding is not an issue, it will not matter under symmetric information (Section 9.4.1) whether the consumer consumes or saves the compensation she earns in the case of date-1 success. The no-savings assumption, in contrast, matters (quantitatively, although presumably not qualitatively) when nonmonitoring investors are less well-informed than other parties. The level of savings by the entrepreneur and their use toward covering the date-2 investment may then, as in Chapter 6, act as signals of date-2 profitability. The no-saving assumption therefore considerably simplifies the analysis.

26. As shown in Sections 3.7, 4.8, and 5.5, in particular, making continuation contingent on performance allows managerial incentive contracts to preserve incentives while reducing current compensation, thereby increasing pledgeable income. Here, we rule out commitment to future policies, so contracting *ex ante* on contingent continuation is not a contacting option anyway.

of the probability of success as the "date-2 profitability" (since the other variables are public knowledge).

Quite importantly, we will assume that there is *no commitment* and so first-period investors' return comes from the first-period profit (if any), and the firm issues new claims in the second period. We consider three cases.

• Symmetric information: no one learns the date-2 profitability. The expected probability of success for the date-2 project is then $p_H + \alpha\tau$ or $p_L + \alpha\tau$, depending on the entrepreneur's behavior.

• Asymmetric information: the date-1 active monitor, and only the active monitor, learns the date-2 profitability.

• Endogenous profitability: the probability α of an increase in the date-2 profitability is the outcome of a date-1 investment by the entrepreneur. The entrepreneur's private cost of this investment is $D(\alpha)$. We will assume that only the active monitor observes the resulting date-2 profitability. That is, there is asymmetric information as in the previous case, but α is now endogenous.

9.4.1 Symmetric Information

Under symmetric information at date 2 (no one learns the realized date-2 profitability), the market for active monitors is competitive at dates 1 *and* 2. The entrepreneur's expected utility at date t is that period's NPV:

$$U_b(t) = p_H(t)R - (I + c),$$

where $p_H(1) = p_H$ and $p_H(2) = p_H + \alpha\tau$. And so the entrepreneur's overall utility is equal to the total NPV over the two periods, or

$$U_b = [p_H R - (I + c)] + \beta[(p_H + \alpha\tau)R - (I + c)].$$

In this symmetric-information environment, it does not matter whether the entrepreneur engages in a long-term relationship with a single active monitor, or sequentially issues a block share to an active monitor in each period. Symmetric information ensures that "Bertrand competition" among active investors operates and keeps the per-period borrowing cost $(I + c)$ at the minimum possible level.

9.4.2 Asymmetric Information

Let us now assume that only the date-1 active monitor (the "incumbent") learns the date-2 profitability (but the parameter α is still exogenous). At date 2, the incumbent and entrant monitors submit bids for the active monitoring position. In general, a "bid" is an offer by a monitor of (a) his investment contribution, and (b) his rewards in the cases of success and failure. Below, we will have the entrepreneur fix an incentive-compatible compensation scheme (part (b)), to be interpreted as the number of shares held by the large blockholder, and select the highest investment contribution offer (part (a)).

The description of the date-2 competition between the incumbent and the other potential active investors (the "entrants") is complex if we assume that the incumbent and the entrants make simultaneous offers to the entrepreneur for the active monitoring position. As observed in the literature (e.g., Rajan 1992), the equilibrium of this bidding game in general is in mixed strategies. To show this heuristically, suppose that the entrants' bid is deterministic and, if selected, yields zero profit for the monitor for probability of success[27] $q \in (p_H, p_H + \tau)$. The incumbent then overbids the entrants when the true probability is $p_H + \tau$ and underbids them (or does not bid) when the true probability is p_H. That is, an entrant is selected only if the profitability is low. This implies that the entrant loses money. This is the celebrated *winner's curse*. Next, assume that $q = p_H + \tau$. Because this bid is not matched by the incumbent when profitability is low, again the selected entrant loses money. Lastly, assume that $q = p_H$. Then it is optimal for the incumbent to bid an investment contribution corresponding to a probability of success slightly above p_H("$p_H + \varepsilon$") when the actual profitability is high. But this incumbent bidding behavior generates a profit opportunity for the entrants. By bidding a bit above the incumbent, they make a lot of money with probability α and lose a little with probability $1 - \alpha$. Hence, the equilibrium is necessarily in mixed strategies. A full treatment of this mixed-strategy equilibrium can be found in von Thadden (2004).

For the sake of simplicity, let us finesse this difficulty and assume the following sequential timing of offers by active monitors at date 2.

27. Technically, this means that (normalizing the active monitor's stake to be $R_m^2 = c/\Delta p$) the entrants bid the same investment contribution I_m^2 such that $q(c/\Delta p) = I_m^2 + c$.

(1) The entrepreneur defines the active monitor's stake $R_m^2 = c/\Delta p$ in the case of success (and 0 in the case of failure), and announces that the active monitor will be the bidder offering the highest investment contribution I_m^2. (There is actually no loss of generality in assuming that the stake, which must exceed $c/\Delta p$ for incentive compatibility, is exactly equal to this value.[28])

(2) New active monitors (the entrants) offer investment contributions.

(3) The incumbent active monitor then makes his offer. That is, he either matches the entrants' top offer[29] and then remains the firm's large shareholder, or he does not match it and is replaced.

(4) The residual date-2 investment, $I - I_m^2$, where I_m^2 is the highest bid, is then contributed by uninformed investors.[30]

In the bidding game, the entrants optimally bid as if the probability of success were always the lowest possible one (in this sense, our timing assumption takes the adverse-selection problem to its extreme and maximizes the incumbency rent):

$$I_m^2 = p_H R_m^2 - c = p_H \frac{c}{\Delta p} - c.$$

For, suppose that an entrant bids a level I_m^2 corresponding to a higher expected probability of success q ($I_m^2 = qR_m^2 - c$, where $q \in (p_H, p_H + \tau)$). The entrant knows that the incumbent will match if the profitability is high and will not if the profitability is low. The entrant suffers from the winner's curse and loses money.[31]

Because the entrepreneur has no independent wealth at date 2,[32] the uninformed investors contribute the investment shortfall:

$$I_u^2 = I - I_m^2.$$

How large a stake R_u^2 they receive on average does not depend on who is assumed to win in a low-profitability state (in which the incumbent is indifferent between matching and not matching the entrant).[33] Let us assume, for example, that the incumbent always wins (for example, the auction selects the incumbent at equal bids). The stake R_u^2 is such that uninformed investors break even:

$$(p_H + \alpha\tau)R_u^2 = I_u^2.$$

The entrepreneur's date-2 utility is then[34]

$$\begin{aligned} U_b^2 &= (p_H + \alpha\tau)(R - R_m^2 - R_u^2) \\ &= [(p_H + \alpha\tau)R - I - c] - \alpha\tau\left(\frac{c}{\Delta p}\right). \end{aligned}$$

That is, the entrepreneur's expected utility is equal to the expected NPV minus the incumbent monitor's expected rent,

$$\mathcal{R}_m^2 = \alpha\tau\left(\frac{c}{\Delta p}\right).$$

Let us now consider date-1 competition among potential large blockholders. At that date these potential active monitors are symmetrically informed and therefore perfect competitors for the block share $R_m^1 = c/\Delta p$. But the expectation of the future incumbency rent implies that they are willing to *make a generous introductory offer in order to obtain a profitable toehold*. Indeed, they are willing to contribute up to

$$I_m^1 = p_H\left(\frac{c}{\Delta p}\right) + \beta\mathcal{R}_m^2.$$

One can view the informational advantage of the incumbent active monitor as a switching cost that tends to lock the firm in with this monitor. As emphasized by the switching cost literature in industrial organization,[35] the anticipated *ex post* market power enjoyed by the incumbent provider of the service (here the monitoring service) is competed away at the *ex ante* stage through a (short-term)

28. She could set a higher stake (and, indirectly, ask for a higher investment contribution and thereby lead the large monitor to substitute for uninformed investors). But this would raise the incumbent monitor's informational rent.

29. Plus an arbitrarily small amount.

30. Following up on footnote 28, we could alternatively assume that the incumbent can bid for these as well and take a bigger stake in the firm. Note, though, that letting the incumbent do so extends the adverse-selection problem to "uninformed shares" and is not in the interest of the entrepreneur. We therefore assume that blockholdings are limited to stake $c/\Delta p$.

31. For a bid $I_m^2 = (p_H + \tau)R_m^2 - c$, whether the incumbent matches in the high-profitability state is irrelevant, and so the same conclusion holds.

32. Recall that, for the sake of simplicity, we assumed that there are no savings between dates 1 and 2.

33. Alternatively, we could have assumed that the uninformed investors bid before knowing who, between the incumbent and the entrant, wins. The equilibrium description would have been identical.

34. It is easily verified that the entrepreneur's stake exceeds $b/\Delta p$; and so the average probability of success is indeed $p_H + \alpha\tau$.

35. See Klemperer (1995) for a survey.

loss-making offer. The blockholding is initially acquired at a premium, and is later maintained at a discount.

One might conjecture that the winner's curse can be eliminated by preventing the incumbent (who after all has no comparative advantage in monitoring relative to his rivals) from competing for the block share at date 2. Note, though, that a commitment to exclude the incumbent active monitor from the second round of financing anyway is not time consistent. For, if entrants offered a contribution corresponding to probability of success $p_{\mathrm{H}} + \alpha\tau$, nothing would prevent the entrepreneur from accepting an offer corresponding to a slightly higher probability from the incumbent; and this renegotiation (which would occur only if the probability of success is $p_{\mathrm{H}} + \tau$) would recreate the winner's curse.

9.4.3 Holdup Cost of a Tight Relationship

Until now the "monopoly" power enjoyed by the incumbent monitor has had no inefficiency or redistributive impact. This property is special and one would in general expect *ex post* monopoly power to have some negative consequences. Let us here focus on a specific one: the ability of the active monitor to hold up (partly expropriate) the entrepreneur, who is then unable to fully benefit from the fruits of her investments. The holdup here takes a slightly unusual form. The incumbent active monitor does not formally have bargaining power vis-à-vis the entrepreneur as he is engaged in a bidding war with other prospective active monitors to keep his blockholding. But, because the latter are reluctant to bid against the incumbent, the incumbent is able to obtain supranormal date-2 profits.

Suppose therefore that the probability α of a profitability improvement is endogenous and determined at date 1 by the entrepreneur. Let $D(\alpha)$ denote the entrepreneur's date-1 (increasing and convex) private cost of generating a profitability improvement at date 2 with probability α.[36] Neither D nor α are observable by anyone but the entrepreneur.

36. We will assume $D(0) = 0$, $D'(0) = 0$, $D'(\alpha) > 0$ for $\alpha > 0$, $D''(\alpha) > 0$, and $D(1) = \infty$.

• When the profitability increase (that is, whether the probability of success has increased by τ) is publicly observable at date 2, the entrepreneur receives the full benefit from her investments, and α solves

$$\max_{\alpha}\{-D(\alpha) + \beta\alpha\tau R\}.$$

Let α^* denote this first-best value:

$$D'(\alpha^*) = \beta\tau R. \tag{9.20}$$

• When information is still symmetric among investors, but no one observes at date 2 whether there has been a profitability increase,[37] investors (active or not) assess the returns on the date-2 financial contracts on the premise that the value of α is the equilibrium value $\hat{\alpha}$. So

$$I_{\mathrm{m}}^2 = (p_{\mathrm{H}} + \hat{\alpha}\tau)\left(\frac{c}{\Delta p}\right) - c$$

and

$$I_{\mathrm{u}}^2 = I - I_{\mathrm{m}}^2 = (p_{\mathrm{H}} + \hat{\alpha}\tau)R_{\mathrm{u}}^2.$$

The entrepreneur's date-2 expected utility as a function of the equilibrium value $\hat{\alpha}$ and her actual choice α (the two must coincide in equilibrium) is

$$\begin{aligned} U_{\mathrm{b}}^2(\alpha, \hat{\alpha}) &= (p_{\mathrm{H}} + \alpha\tau)\left(R - \frac{c}{\Delta p} - R_{\mathrm{u}}^2\right) \\ &= (p_{\mathrm{H}} + \alpha\tau)\left(R - \frac{I + c}{p_{\mathrm{H}} + \hat{\alpha}\tau}\right). \end{aligned}$$

The entrepreneur selects α so as to maximize $-D(\alpha) + \beta U_{\mathrm{b}}^2(\alpha, \hat{\alpha})$; and so

$$D'(\hat{\alpha}) = \beta\tau\left(R - \frac{I + c}{p_{\mathrm{H}} + \hat{\alpha}\tau}\right) < \beta\tau R. \tag{9.21}$$

The entrepreneur underinvests in productivity improvement ($\hat{\alpha} < \alpha^*$) because she captures only the fraction of the benefits corresponding to her share in date-2 profits.

• Lastly, let us introduce *asymmetric* information and assume that the incumbent active monitor, but not the entrants, learns the realization of profitability.[38]

37. Of course, the entrepreneur, when choosing α different from the equilibrium $\hat{\alpha}$ does not have the same information as investors. The situation is similar to, but a bit different from, that considered in the model of privately-known-prospects of Section 6.2, since investors here believe that the probability of success is $p_{\mathrm{H}} + \hat{\alpha}\tau$ for certain. The entrepreneur does not have scope for signaling a high profitability when choosing an off-the-equilibrium path level $\alpha > \hat{\alpha}$, though.

38. We keep assuming that the entrepreneur organizes an auction between incumbent and entrants for the monitoring blockholding. We do not investigate more complex schemes.

From our previous analysis, and letting $\breve{\alpha}$ denote the new equilibrium probability,

$$I_{\rm m}^2 = p_{\rm H}\left(\frac{c}{\Delta p}\right) - c$$

and

$$I_{\rm u}^2 = I - I_{\rm m}^2 = (p_{\rm H} + \breve{\alpha}\tau)R_{\rm u}^2.$$

Simple computations show that

$$U_{\rm b}^2(\alpha, \breve{\alpha}) = (p_{\rm H} + \alpha\tau)\left(R - \frac{I + c + \breve{\alpha}\tau c/\Delta p}{p_{\rm H} + \breve{\alpha}\tau}\right)$$

and

$$D'(\breve{\alpha}) = \beta\tau\left(R - \frac{I + c + \breve{\alpha}\tau c/\Delta p}{p_{\rm H} + \breve{\alpha}\tau}\right). \qquad (9.22)$$

Thus,

$$\breve{\alpha} < \hat{\alpha} < \alpha^*.$$

The first-best level of investment in profitability is obtained when the realization of profitability is observed and the capital market is competitive. Nonobservability reduces the incentive to invest. Lastly, observability by the incumbent active monitor reduces the incentive even more as others are worried about bidding against a party who is better informed; low-bidding by uninformed monitors results in a lower stake in second-period profit for the entrepreneur, who therefore has less incentive to invest in date-2 value enhancements. The informational asymmetry now has an efficiency cost in terms of fewer incentives for entrepreneurial innovation.

This analysis points to a benefit in terms of entrepreneurial initiative of an arm's-length relationship with investors (when feasible—as we have seen and as embodied in the assumptions of the analysis, an arm's-length relationship may not be an option for the borrower): in a dynamic perspective, the firm in a sense has access to a more competitive capital market in the future if it is not linked to a powerful investor today.[39]

39. An alternative way of making the capital market more competitive *ex post* is information sharing among lenders, if it can be verified that incumbent lenders do not hide information about borrowers from their competitors. See Padilla and Pagano (1997) and Exercise 6.7 for the costs and benefits of information sharing. (There is some analogy between this solution to the holdup problem and the literature in industrial organization on licensing by a supplier to (i.e., the sharing of information with) competitors as a commitment not to abuse monopoly power on a customer in the future and to thereby encourage investments by this customer (see Farrell and Gallini 1988; Shepard 1987).)

If we introduced feasible date-1 "concessions," such as costly collateral pledges or a lower investment scale, the entrepreneur might want to make such concessions so as to enable an arm's-length relationship, even though the latter would be inefficient from the point of view of date 1. This arm's-length relationship would serve to commit the entrepreneur to higher investments in date-2 profitability.

9.4.4 Arm's-Length Relationships and Firms' Ability to Refinance

Arm's-length relationships on the other hand may also have drawbacks, assuming that they are feasible. Several studies (e.g., Hoshi et al. (1990a,b, 1991) for Japan) show that firms with close ties to financial institutions are less liquidity constrained than those without such ties.

To understand why this may be so, let us return, for simplicity, to the exogenously random profitability improvement version of the model. Instead of assuming that, under perfect knowledge by the investors of the date-2 profitability, the date-2 project is always financed, let us posit that it is financed only if the probability of success has increased. So, if I_2 denotes the second-period investment (because the first project is financed, the following condition requires that the second-period investment cost exceeds the first-period cost, keeping other parameters constant),

$$p_{\rm H}\left(R - \frac{b}{\Delta p}\right) < I_2 + c < (p_{\rm H} + \tau)\left(R - \frac{b}{\Delta p}\right);$$

let us also assume that I_2 is such that an arm's-length relationship is not feasible at date 2.

If, furthermore,

$$(p_{\rm H} + \alpha\tau)\left(R - \frac{b}{\Delta p}\right) < I_2 + c,$$

an arm's-length relationship at date 1 (assuming that it is feasible) makes it impossible in the absence of a long-term contract for the firm to obtain refinancing at date 2 even by resorting to a large monitor at that date. In contrast, a date-1 active monitor who learns by monitoring enables date-2 financing with probability α. Relatedly, a number of papers, starting with James (1987), have shown that the existence or renewal of a banking relationship is associated with a positive reaction in the stock price.

However, if refinancing is a sure thing when starting with an arm's-length relationship,

$$(p_{\rm H} + \alpha\tau)\left(R - \frac{b}{\Delta p}\right) > I_2 + c,$$

then the presence of an informed monitor at date 2 reduces the probability of refinancing. We thus conclude that we can rationalize the impact of arm's-length relationships on refinancing, but a richer theory is needed for crisper conclusions.[40]

9.4.5 Discussion

This treatment of holdup by a large monitor makes several strong assumptions. First, it assumes away any form of commitment. There are several issues with this lack of commitment. Coming back to the case in which date-2 financing is always optimal, the entrepreneur could better protect her investment through a long-term contract. For example, the entrepreneur could provide herself with incentives to sink $\alpha = \hat{\alpha}$ (given by (9.21)) by setting in advance the date-2 reward of the monitor (and committing to keep the incumbent monitor). The entrepreneur could further improve her incentives to invest by "backloading" her compensation and making it contingent on date-1 and date-2 successes.

A second criticism is that, in the case in which the incumbent monitor acquires private information about date-2 productivity, no use is made of the entrepreneur's own knowledge of her date-2 productivity. In particular, were the entrepreneur to observe the realization of the date-2 productivity and were she able to offer a date-2 contract to the incumbent monitor, she would be able to ask for conditions that reflect the actual productivity realization and the expropriation problem would disappear: $\alpha = \alpha^*$.[41] And, even if she did not observe this realization, she would still know what α she chose and use this to extract good terms from the incumbent monitor.[42]

Finally, we have focused on the impact of short-term contracting on managerial investments. Short-term contracting may also alter the borrower's ability to receive funds in the first place: suppose that the firm initially generates low cash flows relative to the investment cost but, provided that it receives initial financing, will later be very profitable. A monitor will be willing to lose money initially only if he is able to earn supranormal profits later on. These supranormal profits may be secured through a long-term stake, such as an equity stake, in the firm's profit.[43] In the presence of short-term contracting, though, the key to the monitor's ability to recoup his initial investment is to enjoy monopoly power in the loan market in the future (see Exercise 9.7). Interestingly, Petersen and Rajan (1994, 1995), analyzing small businesses' banking relationships in the United States around 1988–1989, show that more young firms were able to obtain external financing in concentrated local banking markets than in competitive local banking markets. The idea is that such firms have initially low cash flows and that banks, for regulatory reasons, took debt rather than equity claims; and so a concentrated local banking market offered more scope for banks to recoup initial losses in the future. Indeed, Petersen and Rajan offer evidence that banks smoothed interest rates intertemporally in concentrated markets.

9.5 Liquidity Needs of Large Investors and Short-Termism

9.5.1 The Issues

Recall that the Anglo-Saxon model of financial organization is often criticized for its lack of investor commitment (Coffee 1991; Bhide 1993: Roe 1990, 1994), and that, conversely, that prevailing in continental Europe and Japan is criticized for sacrificing investor liquidity. This section, which closely follows the lines of Section 4.4, shows that there is indeed a tradeoff between commitment and liquidity. In a

40. A further caveat is that this discussion does not allow for the long-term financing arrangements (long-term debt, equity or credit lines) considered in Chapter 5.

41. Situations with shared information make it easier to elicit the true state of the world (Maskin 1977). Here, the entrepreneur would more generally set at date 2 a *strike price* $I_{\rm m}^2$ at which the incumbent can keep its blockholding (in case the incumbent elects not to exercise his option, the blockholding is auctioned off to the highest bidder among new monitors).

As in Maskin and Moore (1999), renegotiation would reduce the power of such schemes. For example, the incumbent monitor could strategically refuse to exercise his option when the productivity is $p_{\rm H} + \tau$ and try to renegotiate with the entrepreneur.

42. Readers who are knowledgeable about contract design with correlated information will here see the link between this argument and the analysis of Crémer and McLean (1985).

43. Another way of obtaining a long-term profit is to secure a first right of refusal for future loans at predetermined high rates of interest.

nutshell, a large investor has a limited incentive to build long-term value if he can resell his stake before the impact of his monitoring is either realized or observed by the market (as in Chapter 8). In the absence of market certification of his value enhancement, this implies that the large investor must be a "long-term player." Or, using Hirschman's (1970) terminology, "exit" is inconsistent with "voice." There are, in practice, various ways of making it costly for a large investor to exit. The illiquidity of the shares (especially if shares are held privately, as in the case of letter stocks) is an obvious one. Vesting mechanisms (for example, granting extra shares or stock options if the initial shares are held beyond some prespecified length of time) are another.

Yet being a long-term player involves a substantial cost in terms of liquidity. A financial intermediary (or another firm playing the role of the monitor) may need cash to withstand its own liquidity shocks: a bank may have to honor an unusually high number of credit lines due to an industrial recession, or face an interest rate or exchange rate shock against which it is not completely hedged; it may also forgo profitable new investment opportunities if it is not able to free its assets in this firm. A parent company may similarly need to withstand its own liquidity shocks (as in Chapter 5). Venture capitalists usually insist on having an exit mechanism that enables them not to get stuck with their initial venture capital undertakings, and thereby allows them to undertake new investments.

An interim market validation or certification of the large investor's activity, on the other hand, provides a faster exit mechanism without necessarily jeopardizing monitoring. Suppose that, as in Chapter 8, some market participants collect retrospective information about the final outcome and therefore about the large investor's monitoring activity. The large investor, like the entrepreneur in Chapter 8, can then be assessed on the basis of the market's evaluation of his performance, or rather of the performance of the team composed of the large investor and the entrepreneur, and not only on the basis of the final outcome. *Passive monitoring thus provides an exit mechanism for the active monitor.*

Let us provide some illustrations of the use of speculative monitoring as an exit mechanism for the active monitor. Consider first the process of *certification.* A loan originator wants to dispose of some of its illiquid assets in order to withstand its liquidity shocks or undertake new investments. For example, by replacing risky assets by cash or cash equivalents, the financial institution relaxes its capital adequacy requirement and can thus invest in new assets. But the loan originator in general has private information about the quality of the assets to be disposed of. Typically, this loan originator—the active monitor—creates a special-purpose trust that purchases the loans and issues ("asset-backed") securities and then goes and searches for passive monitoring. There are several types of collectors of retrospective information, who often concurrently certify the quality of the loan portfolio that is being securitized: credit enhancers who provide a bank letter of credit or a cash collateral account, rating agencies,[44] independent auditors, and underwriters. At that point the asset-backed securities can be marketed to individual or institutional investors.

Another case in point is provided by venture capitalists, who may liquidate a substantial part of their holdings in a venture through an IPO or a sale to a large company. In the case of an IPO, the venture capitalist trades his shares against cash, shares in publicly traded companies, or short-term debt, which are all more liquid assets (this is called a "cash-out acquisition" (see Plummer 1987)). Alternatively, the start-up may be sold to a buyer, again providing the venture capitalist with liquidity. There is ample evidence that venture capitalists carefully plan their exit (see Black and Gilson 1998; Gompers and Lerner 1999; Lerner 1999; Sahlman 1990).

9.5.2 Modeling

Consider Figure 9.3, which describes the timing.[45] The situation is the same as in Section 9.2 except for

44. Often several agencies are involved. For example, in some cases the four main agencies, Standard & Poor's, Moody's, Fitch, and Duff and Phelps, all rate the issue.

45. The following treatment is inspired by that in Aghion et al. (2004). Kahn and Winton (1998) and Maug (1998) also emphasize the relationship between market liquidity and monitoring, but focus on small investors' liquidity demands rather than those of large blockholders/active monitors. Faure-Grimaud and Gromb (2004) and Fulghieri and Larkin (2001) are similar to Aghion et al.; they put less emphasis on mechanism design and the optimal degree of liquidity for the active monitor.

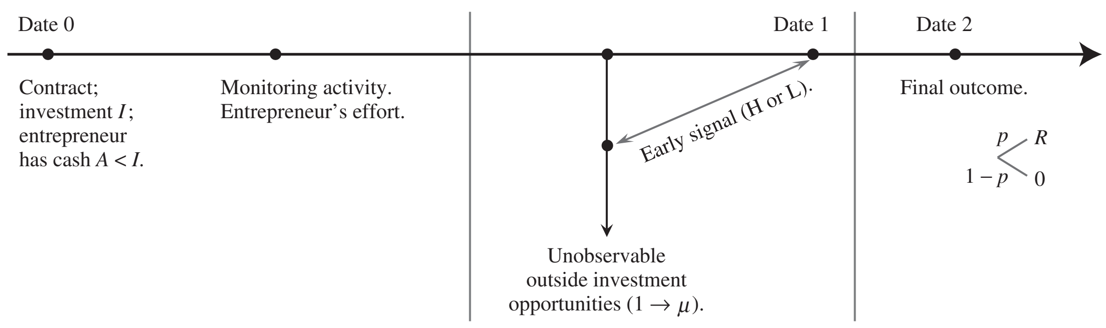

Figure 9.3

the possible presence of a liquidity shock at an intermediate stage, "date 1." As in Section 9.2, the entrepreneur, who must borrow $I - A$, needs to be monitored. Monitoring reduces the entrepreneur's private benefit of shirking from B to b, but involves private cost c for the monitor. The probability of eventual ("date 2") success is p_H if the entrepreneur works and p_L if she shirks.

At date 1, the monitor either does not face a liquidity shock, in which case he does not need money until date 2, or faces a liquidity shock. In the case of a liquidity shock, the monitor can transform an arbitrary amount of cash r_m (provided that it is available to him at date 1), into μr_m, where $\mu > 1$. The interpretation of the liquidity shock is therefore the accrual of attractive outside investment opportunities at the intermediate stage. We assume that the proceeds, μr_m, associated with the outside reinvestments, entirely go to the active monitor; that is, none of this return is pledgeable to those uninformed investors who have invested their money at date 0 in the firm (or to the entrepreneur for that matter). The probability of a liquidity shock is λ. The active monitor learns at date 1 whether he faces a liquidity shock. The other players never receive direct evidence on this shock.

To benefit from these attractive investment opportunities, the active monitor must be provided with liquidity at date 1. There are two issues with rewarding the monitor at date 1, though.

Imperfect performance measurement. The monitor receives (at least some of) the reward *before* the firm's final performance is realized. This limits the sanction inflicted on the monitor for poor firm performance.

We will assume that some early measure of performance is available, though (the signal accrues after the monitor learns whether he faces a liquidity shock). While this performance measure does not bring any information beyond that contained in the final payoff (the final payoff is a "sufficient statistic" to learn effort) and thus is not as good as the final performance, this "speculative information" will be used when the active monitor wants to realize his stake in the firm at date 1. More precisely, the date-1 signal is H ("high signal") or L ("low signal"). The probability of a high signal given a high (respectively, low) effort is q_H (respectively, q_L); comparing the likelihood ratios,

$$\mathcal{L}_q \equiv \frac{q_H - q_L}{q_H} < \mathcal{L}_p \equiv \frac{p_H - p_L}{p_H}.$$

In words, the final outcome is more informative about effort than the intermediate signal,[46] but the latter is nonetheless informative ($q_H > q_L$).

Strategic exit. Because the event of a liquidity shock is observable only by the monitor, the monitor can fail to monitor and claim to be facing a liquidity shock at date 1 even when he is not.

Monitoring capital is costly. In Section 9.2.3, we defined a required return χ on monitoring capital as the ratio of the active monitor's expected monetary payoff over his investment contribution. We can no longer define scarcity in those terms here, because the active monitor cares not only about how much he receives but also about *when* he receives it.

46. In Chapter 8, we assumed in contrast that the intermediate signal is a sufficient statistic and is *more* informative than the final outcome. Were we to assume this here, then providing the active monitor with a fully liquid contract (no vesting of rewards) would be optimal.

So, scarcity must be defined in terms of the active monitor's utility. In order not to confuse these two closely related concepts, we will denote by "κ" rather than "χ" the utility return on monitoring investment. Thus, if the active monitor receives gross surplus U_m from the contract, he is willing to contribute up to I_m, where

$$\kappa I_m = U_m.$$

Note that, necessarily,

$$\kappa \geqslant \lambda\mu + 1 - \lambda,$$

since the active monitor can always not sign a contract and enjoy return μ (with probability λ) or 1 (with probability $1-\lambda$) on the corresponding investment contribution.

Without loss of generality (see Aghion et al. 2004), the entrepreneur can offer either an "illiquid contract" in which the active monitor's stake is vested until date 2 so nothing can be withdrawn at date 1, or a "liquid contract" under which the active monitor has a choice between pulling out at date 1 and receiving r_m if the high signal accrues at that date (the monitor receiving nothing at date 2 if he asked to pull out at date 1), and waiting until date 2 to receive success-contingent reward R_m. Let us consider these two forms of contract sequentially.

Illiquid contract. Under the illiquid contract, the active monitor receives R_m in the case of success at date 2, 0 in the case of failure, and withdraws nothing at date 1.[47] Note that because the final payoff is a sufficient statistic, there is no point rewarding the active monitor at date 2 as a function of the date-1 signal.

To attract the active monitor, this contract must satisfy

$$p_H R_m - c = U_m = \kappa I_m. \tag{9.23}$$

The active monitor's stake R_m must be sufficient to induce him to monitor:

$$(\Delta p) R_m \geqslant c. \tag{9.24}$$

47. For simplicity, we assume that the illiquid contract is not renegotiated at date 1. Midstream renegotiation of agency contracts under moral hazard reduces the attractiveness of such contracts (e.g., Fudenberg and Tirole 1990), and here would imply that the optimal contract would deliver some degree of liquidity anyway.

Conditions (9.23) and (9.24) imply that the cost of enlisting the active monitor is then

$$C = C^{IL} = p_H R_m - I_m = \left[\frac{p_H - p_L/\kappa}{p_H - p_L}\right] c.$$

Because $\kappa > 1$, the cost of enlisting the monitor exceeds, as in Section 9.2.3, the monitoring cost c. The borrower's utility and the pledgeable income are then

$$U_b = p_H R - I - C$$

and

$$\mathcal{P} = p_H \left(R - \frac{b}{\Delta p}\right) - C,$$

respectively. The same expressions will hold in the liquid contract case as well (although, in general, the cost C of enlisting the monitor takes a different value).

Liquid contract. Suppose now that the active monitor has the choice between

- receiving r_m at date 1 in the case of a high signal and nothing at date 2, and
- receiving nothing at date 1 and R_m in the case of success at date 2.

This menu is designed so that he exercises the former option in the case of a liquidity shock and the latter option in the absence of such a shock.

Let us assume for simplicity that the probability of success when shirking, p_L, is small, so that if he does not monitor, the active monitor is better off receiving r_m than waiting for an unlikely reward R_m even if he has no attractive reinvestment opportunity. So his utility if he does not monitor is

$$\lambda\mu q_L r_m + (1-\lambda) q_L r_m.$$

Truthful revelation of the absence of a liquidity shock at date 1 requires that

$$p_H R_m \geqslant q_H r_m. \tag{9.25}$$

Similarly, in the case of a liquidity shock, the condition

$$\mu q_H r_m \geqslant p_H R_m \tag{9.26}$$

must be satisfied; but as we will see, inducing the active monitor to truthfully announce that he faces a liquidity shock is not constraining.

The active monitor's utility if he monitors is

$$U_m = \lambda\mu q_H r_m + (1-\lambda) p_H R_m - c. \tag{9.27}$$

Ex ante incentive compatibility requires that

$$U_m \geqslant (\lambda\mu + 1 - \lambda) q_L r_m. \qquad \text{(IC)}$$

It is easy to check that this constraint is binding.[48] And so

$$U_m = (\lambda\mu + 1 - \lambda) q_L r_m. \qquad (9.28)$$

The cost of hiring the active monitor is

$$C = \lambda q_H r_m + (1 - \lambda) p_H R_m - I_m,$$

so that, using $U_m = \kappa I_m$, (9.27), and (9.28),

$$C = \left[-\lambda(\mu - 1) q_H + \left(1 - \frac{1}{\kappa}\right)(\lambda\mu + 1 - \lambda) q_L \right] r_m + c$$
$$= \mathcal{C} r_m + c. \qquad (9.29)$$

Because $\kappa \geqslant \lambda\mu + 1 - \lambda$, the coefficient $\mathcal{C}$ of r_m in the expression of C is always positive when the intermediate signal is uninformative ($q_H = q_L$). But it becomes negative for q_H/q_L sufficiently large.

Assume for simplicity that $p_L = 0$, so that $C^{IL} = c$. (The case p_L positive, but small, is almost identical.)

If $\mathcal{C} > 0$, then the unconstrained optimum has $r_m = 0$. And so a *lower bound* on C is c. This implies that the optimal contract is illiquid. In contrast, if $\mathcal{C} < 0$, then r_m should be "as large as possible." Given (IC), it is then clear that (9.25) is binding (and that (9.26) is not). And so, from (9.27) and (9.28),

$$[\lambda\mu + 1 - \lambda][q_H - q_L] r_m = c. \qquad (9.30)$$

Hence, provided that

$$\lambda(\mu - 1) q_H > \left(1 - \frac{1}{\kappa}\right)(\lambda\mu + 1 - \lambda) q_L, \qquad (9.31)$$

which can be rewritten so as to highlight the signal's likelihood ratio,

$$\mathcal{L}_q \geqslant \frac{1}{\kappa - 1}\left[\frac{\kappa}{\lambda\mu + 1 - \lambda} - 1\right],$$

the optimal r_m is given by (9.30), and the cost of hiring the monitor by

$$C^L = c + \mathcal{C} r_m.$$

Given $p_L = 0$, (9.31) is a necessary and sufficient condition for

$$C^L < C^{IL},$$

and so the optimal policy is to offer liquidity to the active monitor.

Since (9.31) is the necessary and sufficient condition for the optimal contract to be liquid, we can finally derive the following comparative statics results:

The optimal contract for the active monitor is more likely to be liquid if

- *the frequency of attractive reinvestment opportunities (λ) or/and the value of these opportunities (μ) is/are high,*
- *the intermediate signal is informative ($\mathcal{L}_q$ high),*
- *monitoring capital is not too scarce (κ low).*

The first two implications are intuitive. The third is perhaps less so; to see why the active monitor's claim is more likely to be liquid when monitoring capital is not too scarce, recall that part of the monitor's benefit from liquidity is returned by him in the form of a contribution to the initial investment. But this effect plays a minor role if monitoring capital is scarce.

Speculative monitoring (the presence of an intermediate signal) is needed in order to provide the active monitor with an exit option. And the more precise the corresponding information, the better the case for liquidity. This result explains why monitors' exit strategies are often associated with an IPO or a sale to a large buyer. In either case, the floating or sale of securities creates an early performance measurement, i.e., a valuation of assets in place; the rationale for it is the same as in Chapter 8: speculative monitoring enables an assessment of performance before the actual profits accrue. Interestingly, venture capital contracts may include "drag-along" covenants that allow the general partner to force exit by limited partners and possibly the entrepreneur in the case where he finds a buyer; and often require that all convertible debt be converted prior to putting up the firm for sale or an IPO. These contractual features may be interpreted as ways of increasing the volume of equity put up for sale, thereby increasing the incentive of the buyer or of investors in an IPO to engage in careful speculative monitoring. Similar covenants can be found in shareholder agreements, which include joint ventures.[49]

48. If this were not the case, then $r_m = R_m = 0$ would be optimal, which obviously violates (IC).

49. See Chemla et al. (2004) for a theoretical analysis of these and other rights specified in shareholder agreements.

Finally, the demand for speculative monitoring leads to a violation of the pecking order (see Application 3 in Chapter 6): it is important to float high-information-intensity securities such as equity in order to stimulate information acquisition by the market.

9.6 Exercises

Exercise 9.1 (low-quality public debt versus bank debt). Consider the model of Section 9.2.1, except that the project has a positive NPV even if the entrepreneur misbehaves.

As usual, the entrepreneur is risk neutral and protected by limited liability. She has assets A and must finance an investment of fixed size $I > A$. The project yields R in the case of success and 0 in the case of failure. The probability of success is p_{H} if the entrepreneur behaves (no private benefit) and p_{L} if she misbehaves (private benefit B). Investors are risk neutral and demand a 0 rate of return.

Instead of assuming that the project has positive NPV only in the case of good behavior, suppose that

$$p_{\mathrm{H}}R > p_{\mathrm{L}}R + B > I.$$

Suppose further that there is a competitive supply of monitors and abundant monitoring capital. At private cost c, a monitor can reduce the entrepreneur's private benefit of misbehavior from B to b. Assume that

$$p_{\mathrm{H}}\frac{B-b}{\Delta p} > c > (\Delta p)R - p_{\mathrm{H}}\frac{b}{\Delta p}$$

and

$$(\Delta p)R > c + B.$$

Show that there exist thresholds $A_1 < A_2 < A_3$ such that

- if $A \geqslant A_3$, the firm issues high-quality public debt (public debt that has a high probability of being repaid);
- if $A_3 > A \geqslant A_2$, the firm borrows from a monitor (and from uninformed investors);
- if $A_2 > A \geqslant A_1$, the firm issues junk bonds (public debt that has a low probability of being repaid);
- if $A_1 > A$, the firm does not invest.

Exercise 9.2 (start-up and venture capitalist exit strategy). There are three periods, $t = 0, 1, 2$. The rate of interest in the economy is equal to 0, and everyone is risk neutral. A start-up entrepreneur with initial cash A and protected by limited liability wants to invest in a fixed-size project. The cost of investment, incurred at date 0, is $I > A$. The project yields, at date 2, $R > 0$ with probability p and 0 with probability $1 - p$. The probability of success is $p = p_{\mathrm{H}}$ if the entrepreneur works and $p = p_{\mathrm{L}} = p_{\mathrm{H}} - \Delta p$ ($\Delta p > 0$) if the entrepreneur shirks. The entrepreneur's effort decision is made at date 0. Left unmonitored, the entrepreneur obtains private benefit B if she shirks and 0 otherwise. If monitored (at date 0), the private benefit from shirking is reduced to $b < B$.

There is a competitive industry of venture capitalists (monitors). A venture capitalist (general partner) has no fund to invest at date 0 and incurs private cost $c_{\mathrm{A}} > 0$ when monitoring the start-up and 0 otherwise (the subscript "A" refers to "active monitoring"). The twist is that the venture capitalist wants his money back at date 1, before the final return, which is realized at date 2 (technically, the venture capitalist has preferences $c_0 + c_1$, while the entrepreneur and the uninformed investors have preferences $c_0 + c_1 + c_2$, where c_t is the date-t consumption). Assume that

$$I - p_{\mathrm{H}}\left(R - \frac{B}{\Delta p}\right) > A > I - p_{\mathrm{H}}\left(R - \frac{b + c_{\mathrm{A}}}{\Delta p}\right).$$

(i) Assume first that the financial market learns (for free) at date 1 whether the project will be successful or fail at date 2. Note that we are then in the standard two-period model, in which the outcome can be verified at date 1 (one can, for example, organize an IPO at date 1, at which the shares in the venture are sold at a price equal to their date-2 dividend).

Show that the entrepreneur cannot be financed without hiring a venture capitalist. Write the two incentive constraints in the presence of a venture capitalist and show that financing is feasible. Show that the entrepreneur's utility is $p_{\mathrm{H}}R - I - [p_{\mathrm{H}}c_{\mathrm{A}}/\Delta p]$.

(ii) Assume now that at date 1 a speculator (yet unknown at date 0) will be able to learn the (date-2) realization of the venture's profit by incurring private cost c_{P}, where the subscript "P" refers to "passive monitoring."

At date 0, the venture capitalist is given s shares. The date-0 contract with the venture capitalist specifies that these s shares will be put for sale at date 1 in a "nondiscriminatory auction" with reservation price P. That is, shares are sold to the highest bidder at a price equal to the highest of the unsuccessful bids, but no lower than P. If left unsold, the venture capitalist's shares are handed over for free to the date-0 uninformed investors (the limited partners) in the venture.

(a) Find conditions under which it is an equilibrium for the speculator (provided he has monitored and received good news) to bid R for shares, and for uninformed arbitrageurs to bid 0 (or less than P).

(b) Write the condition on (s, P) under which the speculator is indifferent between monitoring and not monitoring. Writing the venture capitalist's incentive constraint, show that P satisfies

$$\frac{R - P}{P} = \frac{c_{\rm P}}{c_{\rm A}} \frac{\Delta p}{p_{\rm H}}.$$

How should the venture capital contract be structured if these conditions are not satisfied?

Exercise 9.3 (diversification of intermediaries). Consider two identical entrepreneurs. Both are risk neutral, are protected by limited liability, have a project of fixed size I, and must borrow $I - A$ in order to finance their project. Each project, if undertaken, yields R with probability p and 0 with probability $1 - p$. The probability of success is $p_{\rm H}$ if the entrepreneur behaves (receives no private benefit) and $p_{\rm L}$ if she misbehaves (receives private benefit B). The two projects are statistically independent. The rate of interest in the economy is 0.

There is also a competitive supply of monitors, call them venture capitalists. Venture capitalists have no cash. Monitoring a firm involves a nonmonetary cost c for the venture capitalist. The entrepreneur's private benefit from misbehaving is then reduced from B to $b < B$. Assume that

$$I - A > \max\left\{p_{\rm H}\left(R - \frac{B}{\Delta p}\right), p_{\rm H}\left(R - \frac{b + c}{\Delta p}\right)\right\}.$$

(i) Show that the entrepreneurs cannot obtain financing without uniting forces (on a stand-alone basis, with or without monitoring).

(ii) Consider now the following structure: the two firms are monitored by the same venture capitalist. By analogy with Diamond's diversification reasoning (see Chapter 4), argue that the venture capitalist is paid a reward ($R_{\rm m}$) only if the two firms succeed. Show that if

$$p_{\rm H}\left(R - \frac{b + cp_{\rm H}/(p_{\rm H} + p_{\rm L})}{\Delta p}\right) > I - A,$$

then financing can be arranged.

Exercise 9.4 (the advising monitor model with capital scarcity). Work out the model of Section 9.2.5, but assume that monitors have no capital ($I_{\rm m} = 0$).

Find conditions under which the enlisting of a monitor facilitates financing, or conversely requires a stronger balance sheet.

Exercise 9.5 (random inspections). This exercise investigates a different way of formalizing monitoring. Rather than limiting the set of options available to the entrepreneur, the monitor *ex post* inspects, and, when finding evidence of misbehavior, takes a corrective action.

The timing is described in Figure 9.4.

The model is the standard one, with risk-neutral entrepreneur and investors. The entrepreneur is protected by limited liability and the investors demand a rate of return equal to 0.

At private cost c, the monitor can learn the choice of effort. If the entrepreneur has behaved, the firm is on the right track (as long as the entrepreneur stays on to finish the project), and there is no action to take. By contrast, if the entrepreneur misbehaves, the best policy is to kick her out, in which case she will enjoy neither her private benefit B nor any reward in the case of success. The remedial action (which includes firing the entrepreneur) raises the probability of success to $p_{\rm L} + \nu$, where $\nu > 0$ and $p_{\rm L} + \nu < p_{\rm H}$.

In questions (i) and (ii), *one will assume that the entrepreneur and the monitor are rewarded solely as a function of the final outcome* (they get $R_{\rm b}$ and $R_{\rm m}$ in the case of success, and 0 in the case of failure).

Assume that $\nu R_{\rm m} > c$ and $(\Delta p)R_{\rm b} < B$, and that the monitor has no cash (so $I_{\rm m} = 0$).

(i) Show that in equilibrium the entrepreneur and the monitor play mixed strategies: the entrepreneur misbehaves with probability $x \in (0, 1)$, and the monitor fails to monitor with probability $y \in (0, 1)$.

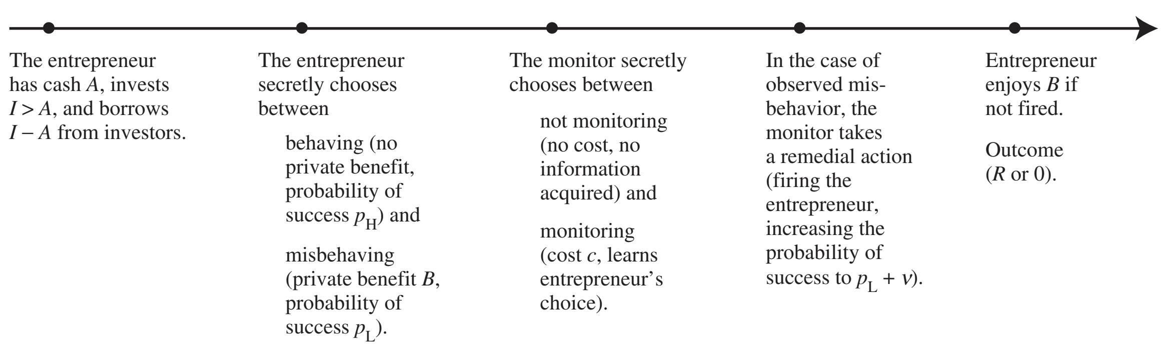

Figure 9.4

(ii) Write the entrepreneur's utility and the uninformed investors' income as functions of R_m and R_b. What is the optimal financing arrangement?

(iii) In view of Chapter 8, is the performance-based contract studied in (i) and (ii) optimal?

Exercise 9.6 (monitor's junior claim). A risk-neutral entrepreneur protected by limited liability has a fixed-size project that yields R^S in the case of success and $R^F \in (0, R^S)$ in the case of failure. Her cash on hand A is smaller than the investment cost I.

As in Section 9.2, there are three versions of the project: good (probability of success p_H, no private benefit), bad (probability of success p_L, private benefit b), Bad (probability of success p_L, private benefit B). A risk-neutral monitor can at private cost c rule out the Bad version. Monitoring capital is scarce; actually consider the polar case in which the monitor has no cash on hand (and is protected by limited liability).

As usual, uninformed investors are risk neutral and demand a rate of return equal to 0; one will also assume that funding can be secured only if the entrepreneur is monitored and is induced to choose the good version.

Compute R_m^S and R_m^F, the monitor's compensations in the cases of success and failure, respectively. Show that

$$R_m^F = 0.$$

Exercise 9.7 (intertemporal recoupment). An entrepreneur has a sequence of two projects to be undertaken at $t = 1, 2$, respectively. There is no discounting between the two periods. The only link between the two projects is that the second project can be undertaken only if the first has been. Each project is as described in Section 9.2, and has three versions: good (probability of success p_H, no private benefit), bad (probability of success p_L, private benefit b), Bad (probability of success p_L, private benefit B). A risk-neutral monitor can at private cost c rule out the Bad version.

There is no scarcity of monitoring capital, in the sense that a monitor is willing to participate as long as his rate of return (which includes his monitoring cost) exceeds 0. As usual, uninformed investors are risk neutral and demand a rate of return equal to 0; one will also assume that funding can be secured only if the entrepreneur is monitored and is induced to choose the good version.

A project yields R in the case of success and 0 in the case of failure.

Assume that the entrepreneur has no cash on hand ($A = 0$) and that the investment costs for the two projects, I_1 and I_2, satisfy

$$I_1 + c > p_H\left(R - \frac{b}{\Delta p}\right) > I_2 + c$$

(the second project can for example be viewed as a continuation project, involving a lower investment cost),

$$I_1 + I_2 + 2c < 2p_H\left(R - \frac{b}{\Delta p}\right),$$

and

$$p_H R - I_1 - c > 0.$$

Consider two situations depending on whether there is competition among potential monitors:

Concentrated lending market. There is a single potential monitor. This monitor furthermore has full bargaining power, i.e., makes a take-it-or-leave-it contract offer (or offers) to the borrower.

Competitive lending market. There are multiple potential monitors, who compete for the borrower's business.

(i) *Long-term contracts.* First, assume that a contract covers the two periods; characterize the outcome under concentrated and competitive lending, and show that in either case the borrower receives funding for both investments.

(ii) *Short-term contracts.* suppose now that the only contracts that a monitor can sign are one-period (spot) lending contracts, in which the monitor is compensated through a claim on the current profit only. Show that the borrower secures funding only in a concentrated market.

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