Chapter 2

AGENCY, INFORMATION AND CORPORATE INVESTMENT

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Contents

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Abstract

This essay surveys the body of research that asks how the efficiency of corporate investment is influenced by problems of asymmetric information and agency. I organize the material around two basic questions. First, does the external capital market channel the right amount of money to each firm? That is, does the market get *across-firm* allocations right, so that the marginal return to investment in firm *i* is the same as the marginal return to investment in firm *j*? Second, do internal capital markets channel the right amount of money to individual projects within firms? That is, does the internal capital budgeting process get *within-firm* allocations right, so that the marginal return to investment in firm *i*'s division *A* is the same as the marginal return to investment in firm *i*'s division *B*? In addition to discussing the theoretical and empirical work that bears most directly on these questions, the essay also briefly sketches some of the implications of this work for broader issues in both macroeconomics and the theory of the firm.

Keywords

external capital markets, internal capital markets, underinvestment, overinvestment, moral hazard, agency problems, asymmetric information, adverse selection

JEL classification: G31, G32

1. Introduction

A fundamental question in corporate finance is this: to what extent does capital get allocated to the right investment projects? In a perfect world, with frictionless capital markets of the sort envisioned in Modigliani and Miller (1958), funds flow in such a way that the marginal product of capital is equated across every project in the economy. Of course, in the real world, there are a variety of distortionary forces that prevent things from working this well. Taxes and transactions costs are examples of such frictions. But perhaps the most pervasive and important factors influencing the efficiency of corporate investment are those that arise from informational asymmetries and agency problems.

This essay surveys research – both theoretical and empirical – that speaks to the influence of asymmetric information and agency on investment behavior. I organize the material by noting that the fundamental question posed above can be divided into two sub-questions. First, does the external capital market channel the right amount of money to each firm? In other words, does the market get *across-firm* allocations right, so that the marginal return to investment in firm i is the same as the marginal return to investment in firm j?

Second, do internal capital markets channel the right amount of money to individual projects within firms? In other words, does the internal capital budgeting process get *within-firm* allocations right, so that the marginal return to investment in, say, firm i's division A is the same as the marginal return to investment in firm i's division B?

Although these two questions are logically distinct – in the sense that the workings of the external capital market appear in many ways to be quite different from those of the internal capital market – an overarching goal of this essay is to emphasize the common elements of the capital-allocation problem across and within firms. For example, just as investors in the external capital market have to be wary of dealing with a CEO who is better informed about firm prospects than they, and whose incentives diverge from theirs, so must a CEO overseeing the internal capital budgeting process be wary of dealing with subordinates who are better informed about divisional prospects than she, and whose incentives diverge from hers. While the external capital market may ultimately resolve this problem through different means than the internal capital market – with different consequences for investment behavior – it is nevertheless important to appreciate that the underlying problem may well be the same one in both cases.

Both of the sub-questions have been the subject of extensive theoretical and empirical work. Still, it is fair to say that research on the first sub-question – that having to do with the efficiency of across-firm capital allocation – is currently at a more mature stage. On the notion that life is more exciting near the frontier, I will thus devote a somewhat disproportionate share of my attention to surveying work on the second sub-question, that of within-firm capital allocation. On the first, and especially when it comes to empirical work, I will defer more to existing survey papers [e.g., Hubbard (1998)].

1.1. Scope of the essay: what's covered and what's left out

As much as possible, I am going to focus on research that speaks directly to the impact of information and agency problems on *investment behavior*. To oversimplify, but not by much, most of the empirical papers that I will touch on have some measure of investment as the left-hand-side variable. Of course, the concepts of asymmetric information and agency are central to virtually every major topic in corporate finance, including corporate governance, capital structure, the design of incentive contracts, financial intermediation, etc. Indeed, one can think of governance, capital structure, incentive contracts and intermediation as a variety of curative mechanisms that arise endogenously to mitigate the effects of information and agency problems on investment outcomes. Thus, at some level, it is difficult to satisfactorily address the subject of investment without taking on these other topics as well.

Nevertheless, although this will no doubt lead to some awkwardness and many omissions, I will for the most part leave these curative mechanisms lurking in the background[1]. This can be thought of as a partial equilibrium approach, where it is implicitly assumed that certain types of information and agency distortions are not fully resolved by the curative mechanisms, and thus – for reasons that are exogenous to the model – remain relevant in equilibrium. This partial equilibrium approach is the only way I can think of to keep the scope of this essay manageable.

Moreover, in much of what follows, I will give primary emphasis to those types of investment distortions that are the most pervasive and stubborn, in the sense that they are likely to exist even when agency and information problems are relatively "mild" – that is, even when the legal, auditing, and contracting environment is highly evolved. (Think of the USA environment, for example). I will have less to say about more extreme distortions that arise in economies and situations where investors are poorly protected, and where managers are left with significant scope for looting their firms[2].

Finally, although I will discuss the general consequences of high leverage for investment, I will not address the details of how financially distressed companies restructure their assets, either inside or outside of formal bankruptcy. So perhaps the best way to interpret much of what I am doing is to think of a financially healthy firm operating in an environment where governance and other curative mechanisms are about as good as they can be, and to ask: what can still go wrong?

[1] Fortunately, there are already several surveys on these topics. In addition to the essays in this volume, see, e.g., Shleifer and Vishny (1997) on governance, and Harris and Raviv (1991) on capital structure.

[2] See Johnson, LaPorta, Lopez-de-Silanes and Shleifer (2000) for several examples of such looting behavior. Of course, even in economies such as the USA where it is not often observed in equilibrium, the out-of-equilibrium threat of such very bad behavior may do a lot to explain various features of governance, law, disclosure policies, etc.

1.2. Organization

The remainder of this essay is divided into two main parts. Part A deals with investment at the firm level, and contains three sections. I begin in Section 2 by reviewing the various major classes of theories that are relevant for understanding investment at the firm level. In Section 3, I discuss the empirical evidence that speaks to these theories. In Section 4, I touch briefly on the macroeconomic implications of this research.

Part B of the essay deals with investment inside firms. Section 5 covers the theoretical work, and Section 6 the associated empirical work.

Finally, in Section 7, I conclude by offering some tentative thoughts on how the central ideas in the essay can be used to think about the boundaries of the firm.

Part A. Investment at the firm level

2. Theoretical building blocks: investment at the firm level

There are many, many theoretical models that have implications for investment at the firm level, and there a variety of ways that one could go about grouping them. For the purposes of the discussion that follows, I will take an empirically-oriented approach to organizing the theories. That is, I will cluster together those models that have similar empirical implications, even if the underlying theoretical mechanisms are quite distinct. The converse and potentially awkward feature of this approach is that sometimes models that are quite close in terms of their underlying logic will get placed into different categories. To take a concrete example, the models of Myers (1977) and Hart and Moore (1995) are both built on the same foundation–the idea that a large debt burden can prevent a company from raising the funds to undertake new investment. But in the former paper, managers are benevolent towards outside shareholders, and there is always underinvestment in equilibrium; in contrast, in the latter, managers are self-interested and there can be either underinvestment or overinvestment, depending on the state of the world. Thus, although the formal structure of these models is quite similar, I will put them into different groupings.

2.1. Models of costly external finance

The first broad class of models to be considered are those that unambiguously predict underinvestment relative to a first-best benchmark. In these models, managers can for the most part be thought of as acting in the interests of current shareholders, at least in equilibrium[3]. Thus when managers have access to unlimited discretionary resources,

[3] Though in some cases [e.g., Townsend (1979), Gale and Hellwig (1985), Bolton and Scharfstein (1990), Hart and Moore (1998)], managers act on behalf of shareholders only because they are in equilibrium the *only* shareholders. In these entrepreneurial-firm models, agency problems are so severe as to rule out the use of outside equity finance.

investment converges to the efficient level. However, when managers are resource-constrained in some way or another, there will be too little investment, because there are frictions associated with raising finance externally.

2.1.1. Costs of equity finance

An important insight, due to Myers and Majluf (1984), Myers (1984) and Greenwald, Stiglitz and Weiss (1984), is that raising equity externally will generally be problematic due to an adverse-selection problem of the sort first identified by Akerlof (1970)[4]. To the extent that managers favor their current stockholders at the expense of potential future investors, they will wish to sell new shares at times when their private information suggests that these new shares are most overvalued. As a result, equity issues are rationally interpreted by the market as bad news [see Asquith and Mullins (1986), Masulis and Korwar (1986), Mikkelson and Partch (1986) for empirical evidence], which in turn can make managers of good firms (those with favorable realizations of their private information) reluctant to sell equity in the first place. The bottom line is that even firms that are badly in need of new equity – say because they have good investment opportunities but scarce internal resources – may be unable or unwilling to raise it.

2.1.2. Costs of debt finance

Of course, an inability to access new equity would not compromise investment if firms could frictionlessly raise unlimited amounts of debt financing. However, a variety of theories suggest that this is unlikely to be the case.

2.1.2.1. Adverse selection, moral hazard and credit rationing in the debt market. The same basic adverse selection argument that is used by Myers and Majluf (1984) for the equity market can be applied to the debt market, to the extent that the debt involved has some default risk: at any given interest rate, managers will be more likely to borrow if their private information suggests that they are relatively prone to default. Or, as a variation on the theme, there can be moral hazard, whereby those managers who borrow have an increased incentive to take the sort of risks that lead to default. As has been shown by Jaffee and Russell (1976), Stiglitz and Weiss (1981, 1983), and others, these sorts of considerations can lead to credit rationing, whereby firms are simply unable to obtain all the debt financing they would like at the prevailing market interest rate[5].

[4] The Myers–Majluf model has been extended and refined by many authors [e.g., Krasker (1986)]. See Harris and Raviv (1991) for a discussion and references. Dybvig and Zender (1991) have questioned the microfoundations of the assumption that managers act on behalf of existing shareholders, while Persons (1994) has offered a rationalization of this assumption.

[5] In spite of the similarities, Myers (1984) and Myers and Majluf (1984) argue that adverse selection problems are generally likely to be more severe in the equity market, because equity values are more sensitive than debt values to managers' private information.

2.1.2.2. Debt overhang. Myers (1977) is another paper that speaks to the limitations of debt finance. Here the problem is not so much in accessing the debt market ex ante, but rather in what happens after the money is borrowed. In particular, a large debt burden on a firm's balance sheet discourages further new investment, particularly if this new investment is financed by issuing claims that are junior to the existing debt. This is because if the existing debt is trading at less than face value, it acts as a tax on the proceeds of the new investment: part of any increase in value generated by the new investment goes to make the existing lenders whole, and is therefore is unavailable to repay those claimants who put up the new money[6].

Debt overhang models can be thought of as having two distinct sorts of empirical implications: ex post (once the debt burden is in place) they suggest that highly-leveraged firms, such as those that have recently undergone leveraged buyouts, will be particularly prone to underinvestment. Ex ante, they offer a reason why even more modestly-levered firms, particularly those with attractive future investment opportunities, may be reluctant to raise much debt in the first place, even if this means foregoing some current investment projects[7].

2.1.2.3. Optimal contracting models of debt: underinvestment in entrepreneurial firms. The above-discussed models of debt and equity finance take the existence of these types of financial claims as given, and then go on to derive implications for investment, capital structure, etc. Another branch of the literature seeks to endogenize the financial contract, typically by positing some specific agency problem (e.g., managers' penchant for diverting the firm's cashflow to themselves) and asking what sort of claim represents an optimal response to this agency problem.

In much of this work, the optimal contract that emerges resembles a standard debt contract, and there is no outside equity financing[8]. Thus, the firms in question should be interpreted as "entrepreneurial", in the sense that their only stockholders are their

[6] The basic debt overhang concept has proved to be enormously useful in addressing a wide range of questions having to do with: i) debt structure (seniority, security, etc.); as well as ii) the more specific details of how financial distress plays itself out and is resolved. For a few examples from a very large literature, see Stulz and Johnson (1985), Berkovitch and Kim (1990), Bergman and Callen (1991), Hart and Moore (1995) and Gertner and Scharfstein (1991). Again, see Harris and Raviv (1991) for more complete references.

[7] Fama and Miller (1972) and Jensen and Meckling (1976) offer another reason why firms might be unwilling to take on too much debt ex ante: the so-called "asset substitution" effect, whereby an excessive debt burden can create incentives for managers, acting on behalf of shareholders, to take on risky negative-NPV projects at the expense of lenders.

[8] Debt tends to be an attractive contract when verification of cashflows is costly or impossible, so that managers have broad scope for diverting these cashflows to themselves. However, Fluck (1998) and Myers (2000) show how outside equity financing can also be sustained in such a setting, provided there is an infinite horizon [see also Gomes (2000) for a related argument]. In other cases, when cashflows can be more readily verified, optimal financing schemes can involve a richer mix of claims. See, e.g., Dewatripont and Tirole (1994).

managers. Early examples include Townsend (1979) and Gale and Hellwig (1985), who assume that outside investors can only verify a firm's cashflows by paying some fixed auditing cost. As long as the manager turns over the stipulated debt payments, there is no audit, and the manager gets to keep the rest of the firm's cashflow. However, if the manager fails to make the debt payment, the lender audits, and keeps everything he finds; this can be interpreted as costly bankruptcy. The implications for investment follow from the auditing/bankruptcy cost. In particular, the less wealth the manager is able to put up, and hence the more he must borrow, the greater is the likelihood of the auditing cost being incurred. Thus, less managerial wealth translates into greater deadweight costs of external finance, and less investment.

More recently, following the work of Grossman and Hart (1986), Hart and Moore (1990), and Hart (1995) on incomplete contracting, the emphasis has shifted to thinking of financial contracts in terms of the allocation of control rights that they embody; Aghion and Bolton (1992) were among the first to take this point of view. In this context, debt is often seen as an incentive scheme that rewards management with continued control if it makes the required debt payments, and punishes it with loss of control otherwise. In a multi-period framework, this type of incentive scheme enables outside lenders to extract payments from managers even in the extreme case where cashflows are completely unverifiable. Well-known papers in this vein include Bolton and Scharfstein (1990) and Hart and Moore (1994, 1998).

Like the costly-state-verification models, these models also have the feature that there is underinvestment ex ante, with this problem being a decreasing function of managers' wealth. Moreover, given the multi-period nature of the models, one can also interpret some of them as implying a form of ex-post underinvestment as well, with assets sometimes being prematurely seized and liquidated by lenders when managers are unable to meet their debt payments[9].

2.1.3. Synthesis: a reduced-form model of costly external finance

In spite of the wide variety of modeling approaches, all the theories surveyed thus far have broadly similar empirical implications for investment. Indeed, the essence of what these theories have to say about investment can be captured in a very simple reduced-form model. Although the model may appear ad hoc, Froot, Scharfstein and Stein (1993) demonstrate that it can be mapped precisely into a variant of the Townsend (1979) and Gale–Hellwig (1985) costly-state-verification models. Also, Stein (1998) shows that an appropriately parameterized version of the Myers–Majluf (1984) adverse-selection model leads to essentially the same reduced form.

The setup is as follows. The firm invests I at time 1, which yields a gross return of $f(I)$ at time 2, where $f(\,)$ is an increasing, concave function. Of the investment I, an amount w is financed out of internal resources (managers' wealth, or the firm's retained

[9] See also Diamond (1991) for a model with excessive ex post liquidation by lenders.

earnings) and an amount e is raised externally, via new issues of debt, equity or some other claim. Thus, the budget constraint is $I = e + w$. In a first-best world, managers would seek to maximize:

$$\max f(I)/(1+r) - I, \tag{1}$$

where r is the risk-adjusted discount rate. This involves setting the marginal product of capital, f_I, equal to $(1+r)$.

One can loosely capture some of the financing frictions discussed above by assuming that there are deadweight costs associated with funds raised externally, and that these costs are given by $\theta C(e)$, where $C(\,)$ is an increasing convex function, and θ is a measure of the degree of the financing friction. Thus, the firm's problem becomes:

$$\max f(I)/(1+r) - I - \theta C(e). \tag{2}$$

Kaplan and Zingales (1997) show that the solution in this case has the following properties. First, I is always less than or equal to the first best. Also, $\mathrm{d}I/\mathrm{d}w \geqslant 0$ and $\mathrm{d}I/\mathrm{d}\theta \leqslant 0$: I is (weakly) increasing in the firm's internal resources w, and (weakly) decreasing in the degree of the financing friction θ. These features are exactly what one would expect. However, there is more subtlety in the behavior of some the higher-order derivatives of I. In particular, $\mathrm{d}^2I/\mathrm{d}w^2$ cannot be unambiguously signed. Thus while the local sensitivity of investment to internal cash, $\mathrm{d}I/\mathrm{d}w$, eventually converges to zero for w high enough, this convergence need not be monotonic. Similarly, one cannot in general sign $\mathrm{d}^2I/\mathrm{d}w\mathrm{d}\theta$. As Kaplan and Zingales (1997) emphasize, the important message for empirical work is that one has to be careful in using measures of $\mathrm{d}I/\mathrm{d}w$ as proxies for θ. That is, in comparing two firms, it is not necessarily true that the one with the higher empirically-measured sensitivity of investment to internal cash should be thought of as the one facing the more severe financing frictions. I will return to this caveat below.

2.2. The agency conflict between managers and outside stockholders

In the models discussed so far, there is in equilibrium no meaningful conflict between managers and stockholders. This is either because managers are simply assumed to act in the interests of stockholders [as in Myers and Majluf (1984) and Myers (1977)] or, at the other extreme, because the threat of managerial expropriation of outside stockholders is so great that equity financing is not viable in equilibrium, and the firm remains owner-managed. But a central theme in much of the corporate-finance literature – with a lineage going back to Berle and Means (1932), and including the influential work of Jensen and Meckling (1976) – is that the managers of publicly-traded firms pursue their own private objectives, which need not coincide with those of outside stockholders.

There are many possible manifestations of the manager–stockholder agency conflict. For example, managers may simply not exert as much effort as they would in a first-best

world [Holmström (1979)]. Given the focus of this essay, however, I restrict attention to those variants of the agency problem that have the most direct implications for investment.

2.2.1. Empire-building

2.2.1.1. Empire-building and overinvestment. One way in which managers' interests may diverge from those of stockholders is that managers may have an excessive taste for running large firms, as opposed to simply profitable ones. This "empire-building" tendency is emphasized by Baumol (1959), Marris (1964), Williamson (1964), Donaldson (1984) and Jensen (1986, 1993), among many others.

Jensen (1986, 1993) argues that empire-building preferences will cause managers to spend essentially all available funds on investment projects. This leads to the prediction that investment will be increasing in internal resources. It also implies that investment will decrease with leverage, because high current debt payments force cash out of the firm, thereby reducing managers' discretionary budgets. Note that these are the same basic predictions that emerge from the costly-external-finance genre of models described in Section 2.1 above, though of course the welfare implications are very different.

Jensen's ideas have been further developed and refined in formal models by Stulz (1990), Harris and Raviv (1990), Hart and Moore (1995) and Zwiebel (1996)[10]. These models typically incorporate empire-building preferences by using the modeling device of managerial private benefits of control [Grossman and Hart (1988)], and assuming that these private benefits are proportional to either the amount the firm invests [Hart and Moore (1995)], or the gross output from investment [Stulz (1990)][11]. One insight that comes from these models is that no matter how strong the underlying agency problem, it would be wrong to conclude that empire-building tendencies necessarily lead to an empirical prediction of *overinvestment on average.* Rather, the usual outcome in the models is an endogenously determined level of debt that attempts to balance ex post over- and underinvestment distortions. Thus, the models predict ex post overinvestment in some states of the world (when the level of free cashflow relative to investment opportunities is higher than expected), and ex post underinvestment in others.

As a very loose heuristic way of comparing the empirical content of empire-building models to those of costly external finance, one can modify Equation (2) above in the spirit of Stulz (1990) and Hart and Moore (1995) by adding a term equal to $\gamma f(I)$ to the objective function. This captures the idea that managers derive private benefits

[10] With respect to the general idea that debt can serve as a disciplinary device, an important precursor to these papers is Grossman and Hart (1982).

[11] The latter formulation – private benefits proportional to output – implies that managers overinvest, but that conditional on the level of investment, they rank projects in the right order, from high to low NPV. This seems to capture the behavior described by Donaldson (1984).

from gross investment output, as in Stulz (1990), with γ measuring the intensity of the agency conflict. Thus, Equation (2) becomes:

$$\max(1+\gamma)f(I)/(1+r) - I - \theta C(e). \tag{3}$$

As internal resources w go to infinity, the marginal product of capital now asymptotes at $(1+r)/(1+\gamma)$, rather than at $(1+r)$ – i.e., there is overinvestment. However, more generally, there can be either over- or underinvestment, depending on the realization of w relative to other parameter values[12]. And importantly, most of the other comparative statics of the model – having to do with $\mathrm{d}I/\mathrm{d}w$, $\mathrm{d}I/\mathrm{d}\theta$, $\mathrm{d}^2I/\mathrm{d}w^2$ and $\mathrm{d}^2I/\mathrm{d}w\mathrm{d}\theta$ – are the same as before. Again, this underscores the challenges associated with empirically distinguishing the two classes of theories[13].

2.2.1.2. Empire-preservation, entrenchment and diversification. If managers do in fact derive private benefits from being in charge of large corporate empires, this is likely to show up not just as an overall tendency toward overinvestment. Rather, some specific types of investments will seem especially attractive to managers. For example, Amihud and Lev (1981) argue that there will be a managerial preference for diversification, as this reduces the risk of the empire going out of business. And Shleifer and Vishny (1989) suggest that managers will be particularly keen to invest in projects that require their specific human capital, thereby strengthening their chances of keeping their jobs.

2.2.2. Reputational and career concerns

Another source of conflict between managers and shareholders is that managers may be concerned with how their actions affect their reputations, and ultimately their perceived value in the labor market[14]. This idea, elegantly modeled by Holmström (1999a), has a variety of specific applications to investment[15].

2.2.2.1. Short-termism. Narayanan (1985) observes that managers concerned with their labor-market reputations may have incentives to take actions that boost measures of short-term performance at the expense of long-run shareholder value. Stein (1989) makes a similar point about managers concerned not with their own reputations per se,

[12] The models discussed above suggest that w will be in part endogenously determined by the firm's choice of capital structure policy.

[13] Hadlock (1998) argues that empire-building models have the property that $\mathrm{d}I/\mathrm{d}w$ is decreasing in managerial incentives, while a costly-external-finance model of the Myers–Majluf (1984) type has the opposite property, and uses this insight to construct a differentiating test.

[14] Fama (1980) is one of the first to discuss how career concerns might affect agents' incentives. He stresses how career concerns can in some cases lead to better-behaved agents.

[15] See Dewatripont, Jewitt and Tirole (1999) for a recent extension of Holmström's model to more complex information structures.

but rather with their firms' stock prices over a near-term horizon[16]. In both cases, the key to the argument is that managers can do things that are unobservable to outside shareholders. For example, managers may be able to boost reported earnings by underinvesting in hard-to-measure assets, such as maintenance, customer loyalty, employee training, etc. From the perspective of outside investors, such myopic behavior cannot be disentangled from other, more positive shocks (e.g., increases in customer demand) that also lead to higher reported profits. Consequently underinvestment is rewarded with an increase in either the stock price, or in managers' personal reputations.

The model of Bebchuk and Stole (1993) also shares the general idea that a concern with near-term stock prices or reputation can lead to investment distortions. However, they point out that the nature of the investment distortion can be quite sensitive to the information structure. In particular, a desire to impress the stock market or the labor market in the short run can in some circumstances lead to overinvestment, rather than underinvestment. This will happen if, for example, the act of investment itself is observable and the asymmetry of information instead has to do with managers' ability to generate good investment opportunities. Now, managers seeking to boost their reputations will want to invest more, rather than less.

The most basic empirical implications of short-termism models flow from the comparative-static proposition that investment distortions will be greatest when the concern with impressing the market is most pronounced. Thus, Stein (1988, 1989) suggests that underinvestment will be particularly acute when firms are either subject to takeover pressure, or are preparing to issue new equity; in either case, the fact that shares will actually be sold at the current market price makes maximizing this price more of a pressing concern to managers. In a similar vein, Gompers (1996) and Baker (2000) argue that young venture capital firms – who do not yet have well-established track records, and who must boost their reputations if they are to attract more capital – are more likely than older venture firms to take distortionary actions to enhance their near-term performance.

2.2.2.2. Herding. Another manifestation of managers' career concerns is that they may exhibit an excessive tendency to "herd" in their investment decisions, with any given manager ignoring his own private information about payoffs, and blindly copying the decisions of previous movers. Scharfstein and Stein (1990) show how the herding incentive can arise in a reputation-based model. They assume that "smart" agents receive signals about future payoffs that are informative, but that contain a common

[16] In Stein (1989), managers maximize a weighted average of near-term stock prices and long-run value. Thus, although the modeling apparatus is taken from Holmström (1999a), the conflict of interest is not the classic agency conflict between managers and their principals, but rather one between short-term and long-term stockholders. Other models of underinvestment with a similar structure include Miller and Rock (1985) and Stein (1988). Bizjak, Brickley and Coles (1993) explore some of the implications of this framework for the design of optimal managment compensation schemes.

error component. In contrast, "dumb" agents receive signals that are uncorrelated noise. This information structure has the property that, holding fixed the absolute payoff to an agent's investment choice, the labor market should rationally infer that he is more likely to be smart if his choice was the same as that of other agents. This form of endogenous relative performance evaluation generates an incentive for all agents to mimic each other, regardless of their actual signals[17].

As with short-termism models, one way to generate empirical predictions from reputational herding models is to think about cross-sectional variation in managers' incentives to boost their reputations. For example, one might posit that younger managers with less of a track record have more to gain from trying to manipulate the labor market's assessment of their ability[18]. If so, it follows that there should be more herd-like behavior among young managers than among older managers.

2.2.2.3. Other distortions induced by career concerns. As the above discussion suggests, models of career concerns can deliver a wide range of outcomes, depending on the specific assumptions that are made about information structure, etc. Holmström and Ricart i Costa (1986) demonstrate that career concerns may induce a general reluctance on the part of managers to undertake new investment projects. This is because the performance of a new project will reveal information about managerial ability; in contrast, if no project is undertaken, no information is revealed. If managers are risk-averse, they will prefer to avoid the variation in wages that accompanies any labor-market updating about their ability. Hirshleifer and Thakor (1992) build a related model of excessive conservatism in which reputational considerations lead managers to favor safe projects over riskier ones.

Career concerns can also come into play when the decision at hand is not whether to initiate a new project, but rather, whether to kill an existing one. Boot (1992) and Baker (2000) both argue that managers may be reluctant to either liquidate or divest poorly-performing lines of business, for fear that such actions will be interpreted as an admission of failure on their part.

2.2.3. The quiet life

Although empire-building and career-concerns theories have probably received the most attention, there are other variations on the classic manager–shareholder agency conflict that also have implications for investment. A recent paper by Bertrand and Mullainathan (2003) considers an especially simple variant: managers prefer the "quiet

[17] Zwiebel (1995) builds a related model of reputational herding. Given his setup, herding requires managerial risk aversion, unlike in Scharfstein and Stein (1990). See also Trueman (1994) on herding among security analysts. By contrast, Banerjee (1992) and Bikhchandani, Hirshleifer and Welch (1992) generate herding without appealing to agency considerations.

[18] For a more detailed analysis of how herding incentives can vary over the course of an agent's career, see Prendergast and Stole (1996) and Avery and Chevalier (1999).

life", and thus are prone to excessive inertia when it comes to making tough decisions. On the one hand, this can lead to something that looks much like empire-building overinvestment, if the decision at hand is whether to shut down an existing, poorly-performing plant. On the other hand, it can also lead to underinvestment if the decision concerns whether to enter a new line of business[19].

2.2.4. Overconfidence

A final – and potentially very promising – agency theory of investment builds on the premise that managers are likely to be overly optimistic about the prospects of those assets that are under their control. That such overconfidence exists at the individual level has been repeatedly established in the psychology literature[20]. Moreover, unlike in the asset-pricing arena, one cannot easily appeal to arbitrage considerations to argue that the effects of individual-level overconfidence will not show up in aggregate corporate investment.

Roll (1986) is one of the first papers to explicitly introduce overconfidence into a corporate-finance context[21]. Roll argues that managerial "hubris" can explain a particular form of overinvestment, namely overpayment by acquiring firms in takeovers, but his general logic would seem to carry over to other forms of investment as well. Malmendier and Tate (2002a) provide evidence consistent with Roll's theory.

More recently, Heaton (2002) demonstrates that an overconfidence model can deliver not only a broad tendency towards overinvestment, but also many of the liquidity-constraints-type patterns associated with the costly-external finance models reviewed in Section 2.1. Heaton's insight is that when managers make overly optimistic assessments of their firms' prospects, they will be reluctant to issue new equity, as the stock price will often seem unfairly low to them. This leads to very much the same conclusions as in Myers–Majluf (1984) – there will be little external equity financing, and investment will increase with internal resources[22]. Thus, an assumption of overconfidence can be an alternative and relatively parsimonious way to generate a reduced form that looks very much like the unified empire-building/costly-external-finance model summarized in Equation (3). This idea is explored empirically by Malmendier and Tate (2002b).

One reason for taking overconfidence seriously in a corporate-finance setting is that, compared to other agency problems, it is likely to be relatively impervious to some of the obvious remedies. This is because overconfident managers will think that they

[19] Aggarwal and Samwick (1999) build a model in which underinvestment is a result of managerial laziness.

[20] See, e.g., Weinstein (1980).

[21] See also Cooper, Woo and Dunkelberg (1988) and Bernardo and Welch (2001) on the subject of entrepreneurial overconfidence.

[22] In contrast, one weakness of pure empire-building models is that they have a hard time explaining why managers – disregarding shareholders' preferences – don't simply issue large amounts of external equity so that they can grow their empires faster.

are acting benevolently on behalf of shareholders, even though from the perspective of objective outsiders their decisions may destroy value. As a result, the distortions associated with overconfidence cannot be easily resolved by, e.g., giving managers higher-powered incentive contracts.

2.3. Investment decisions when stock prices deviate from fundamentals

All of the theories discussed to this point share the common premise that financial markets are informationally efficient – i.e., that the prices of debt and equity accurately reflect fundamental values – even if individual managers are prone to making mistakes, as in Roll (1986) and Heaton (2002). However, a growing body of work in behavioral finance [surveyed in Shleifer (2000)] suggests that one might wish to view this market-efficiency premise with some skepticism. If so, the relevant question for our purposes is how the presence of non-fundamental noise in asset prices might influence the behavior of corporate investment, and thereby alter some of the conclusions offered above. Although this topic is beginning to generate some interest among finance researchers, the existing literature on it is quite small. So I will just briefly mention a few of the most prominent themes.

First, a market-inefficiency perspective can potentially shed light on the empirical relationship between stock prices and investment, which has been studied in a number of papers, including Fischer and Merton (1984), Barro (1990), Morck, Shleifer and Vishny (1990a) and Blanchard, Rhee and Summers (1993). According to traditional efficient-market theories, one should expect to see a strong association between Tobin's (1969) q and firm investment, since q is a summary statistic for the market's information about investment opportunities. Although there is certainly a significant positive relationship in the data, this relationship (after controlling for fundamentals like firm profitability) has been characterized by some as relatively limited in economic terms – e.g., Morck, Shleifer and Vishny argue that the stock market is something of a sideshow in terms of its influence on investment. Such a sideshow outcome can be easily rationalized in the context of an inefficient market, to the extent that managers are relatively rational and far-sighted, and therefore do not let investment respond to noise in stock prices.

Second, and perhaps more interestingly, market inefficiencies can interact with some of the other financing frictions discussed above to produce a variety of cross-sectional and time-series patterns in investment. For example, Stein (1996) hypothesizes that firms that are heavily dependent on external equity (i.e., those that are growing fast relative to their retained earnings, and that have little debt capacity) will have investment that is more sensitive to non-fundamental variations in stock prices than firms that have plenty of cash on hand. Intuitively, when stock prices are below fundamental values, rational managers of equity-dependent firms are very reluctant to invest, because for them investment requires the issuance of stock at a too-low price. This is effectively the same mechanism as in the Myers–Majluf (1984) model, but now it works with a vengeance. In contrast, when stock prices are above fundamental values,

the problems identified by Myers and Majluf go away, and equity-dependent firms find it more attractive to issue new shares and invest[23]. In this story, the stock market may well be a sideshow for some firms – those with ample cash or debt capacity – but it is a much more important determinant of investment for the subset of equity-dependent firms. Baker, Stein and Wurgler (2003) provide evidence supportive of this prediction.

Finally, Shleifer and Vishny (2003) argue that stock-market inefficiencies may explain a variety of facts about mergers and acquisitions, such as the tendency for aggregate M&A activity to be clustered in periods when market prices are high relative to observable fundamentals. Their idea is that at such times, the manager of an overvalued firm would like to issue large amounts of equity, but needs an excuse for doing so – simply issuing stock and parking the proceeds in T-bills won't work. Given the adjustment costs associated with physical investment, a stock-for-stock acquisition of another less-overvalued firm may be the best way to go.

3. Evidence on investment at the firm level

3.1. Financial slack and investment

3.1.1. What we know: firms with more cash and less debt invest more

According to the Modigliani–Miller (1958) paradigm, a firm's investment should depend only on the profitability of its investment opportunities as measured, e.g., by its value of Tobin's (1969) q. Nothing else should matter: not the firm's mix of debt and equity financing, nor its reserves of cash and securities, nor financial market "conditions", however defined. Perhaps the one clearest empirical finding emerging from research on investment over the last 15 or so years is that this theoretical proposition is false. In fact, controlling for investment opportunities, firms with more cash on hand invest more, as do firms with lower debt burdens.

The literature that establishes these results is by now very large, and includes important contributions by Meyer and Kuh (1957), Fazzari, Hubbard and Petersen (1988), Hoshi, Kashyap and Scharfstein (1991), Whited (1992), Schaller (1993), Bond and Meghir (1994), Calomiris and Hubbard (1995), Chirinko (1995), Gilchrist and Himmelberg (1995), Hubbard, Kashyap and Whited (1995) and Lang, Ofek and Stulz (1996). This work is surveyed in detail by Hubbard (1998), so I will confine myself to a few brief observations.

First, it is important to recognize that the evidence speaks to the effect of financial slack on a wide range of investments, not just expenditures on plant and equipment. These include investments in inventories [Carpenter, Fazzari and Petersen (1994),

[23] Many studies have documented that there is a strong positive link between stock prices and the propensity of firms to issue equity. See Baker and Wurgler (2002) for a recent treatment and further references.

Kashyap, Lamont and Stein (1994)], in R&D [Hall (1992), Himmelberg and Petersen (1994)], in pricing for market share [Chevalier (1995a,b), Chevalier and Scharfstein (1995, 1996), Phillips (1995)], and in labor hoarding during recessions [Sharpe (1994)].

Second, taken as a whole, the literature has convincingly dealt with a fundamental endogeneity problem, namely that a firm's cash position or its debt level may contain information about its investment opportunities. For example, firms will tend to accumulate cash when they are abnormally profitable, and high profitability may be an indicator that marginal q (which is hard to measure accurately) is high as well[24]. Or firms may take on debt precisely at those times when they plan to cut investment, so that it can be tricky to infer causality from, e.g., the finding that dramatic increases in leverage are associated with sharply reduced investment [Kaplan (1989)].

Different papers have addressed this endogeneity problem in different ways, and there has been some debate as to the merits of various approaches to identification. But at this point, even a skeptic would have to concede that the case has been made. Perhaps the cleanest evidence comes from a series of "natural experiments" which isolate shocks to firms' financial positions that appear obviously unrelated to (at least a subset of) their investment opportunities. For example, Blanchard, Lopez-de-Silanes and Shleifer (1994) show that firms' acquisition activity responds to large cash windfalls coming from legal settlements unrelated to their ongoing lines of business. Peek and Rosengren (1997) document that declines in the Japanese stock market lead to reductions in the USA-lending-market share of USA branches of Japanese banks, with these reductions being larger for banks with weaker balance sheets. Similarly, Froot and O'Connell (1997) find that reinsurance companies cut back on their supply of earthquake insurance after large hurricanes impair their capital positions[25].

A related natural-experiment approach to identification, pioneered by Lamont (1997), involves looking at how investment in one division of a firm responds to shocks originating in another, ostensibly unrelated division. As has been found by Lamont (1997), Lang, Ofek and Stulz (1996), Houston, James and Marcus (1997), Shin and Stulz (1998) among others, increases in cashflow or decreases in leverage attributable to one of a firm's divisions translate into significant increases in the investment of other divisions. As these papers ultimately speak more to the topic of the second part of this essay–within-firm investment allocation – I defer a more complete discussion of them until later. For the time being, suffice it to say that they represent one more nail in the coffin of the Modigliani–Miller null hypothesis that a firm's investment is unrelated to its liquidity position or its leverage ratio.

[24] See Erickson and Whited (2000) for a recent analysis of the biases arising from measurement errors in q.

[25] Other work that can arguably be thought of in this natural-experiment spirit includes Froot and Stein (1991) and Calomiris and Hubbard (1995).

3.1.2. What we don't know: why firms with more cash and less debt invest more

While it is becoming very hard to argue with the proposition that financial slack matters for investment, it is much less clear what the precise mechanism is that drives this relationship. Most of the empirical findings discussed above can be loosely understood in the context of Equation (3), which nests both the empire-building and costly-external-finance models, and which contains the latter as a special case (where $\gamma = 0$). Consequently, these findings do not for the most part allow one to sharply discriminate between the two[26].

Indeed, given that the models can be so naturally nested, it is not even clear that it is a sensible goal to try to universally reject one in favor of the other. The only way to do so would be to establish that $\gamma = 0$ always, i.e., that managers never seek to empire-build. As is discussed in more detail below, there is a variety of other evidence that appears to directly contradict this hypothesis. And if it is the case that $\gamma > 0$, then the unified empire-building/costly-external-finance model in Equation (3) admits either over- or underinvestment, and a more interesting question to ask is simply this: as an empirical matter, which distortion is more prevalent?

On this point, some helpful evidence is provided by McConnell and Muscarella (1985). They look at how the stock market responded to firms' announcements of new capital expenditures during the period 1975–81. In most cases, the market reaction was positive[27]. However, in the oil industry – in which, according to Jensen (1986), there was systematic overinvestment during the sample period – the market reaction to new investment was negative. A simple and appealing interpretation of these findings is that the unified model with both empire-building and financing constraints is the right one, and that in many, but not all cases, the parameters line up in such a way that the typical firm is in the underinvestment region, where the net present value (NPV) of the marginal investment is positive[28].

Unfortunately, the full story for why investment is related to financial slack is likely to be somewhat more complicated. Kaplan and Zingales (2000) point to the case of Microsoft, which over the period 1986–1997, had a very high sensitivity of investment to cashflow. On the one hand, given Microsoft's extraordinarily strong financial position – no debt and almost $9 billion in cash on hand in 1997 – this underscores Kaplan and Zingales' (1997) warning that one cannot assume that high values of dI/dw are necessarily indicative of tightly binding financing constraints[29].

[26] It should be noted that on this point, my reading of the literature differs from that of Hubbard (1998). Hubbard interprets the evidence almost entirely in terms of models of costly external finance, and concludes that: "the free cash flow (empire-building) story does not appear to explain the link between net worth and investment . . . " (p. 214).

[27] As discussed below, the stock market often seems more skeptical about another form of corporate investment – mergers and acquisitions.

[28] Alternatively, one could say the same thing about Heaton's (2002) overconfidence model, since, as argued above, it delivers a reduced form similar to that in Equation (3).

[29] See also Cleary (1999) and Almeida and Campello (2001) for more on this point.

But the puzzle goes deeper than this. In light of the high level of inside ownership (by Bill Gates and other top managers) it is also hard to believe that the high investment–cashflow correlation is telling us that Microsoft is a worst-case example of the traditional agency/empire-building effect. One is thus tempted to conclude that even if the unified model in Equation (3) describes a good part of what is going on, there must be something else at work in the data as well.

3.2. Direct evidence of agency-related overinvestment

While much of the evidence discussed above – on the correlation between investment and measures of financial slack – does not speak to the question of whether empire-building tendencies exert an important influence on investment, there are a variety of other studies that do. I now briefly review some of this work.

3.2.1. Acquisitions as a form of empire-building

There are a number of studies that suggest that acquiring firms often overpay when buying other companies. For example, in many deals, the acquiror's stock price falls upon announcement of the transaction [see Roll (1986) for references to this work]. Moreover, it appears that the tendency towards this particular form of overinvestment is linked to agency conflicts. Lewellen, Loderer and Rosenfeld (1985) document that negative announcement effects are most pronounced for those acquirors where management has a small equity stake. Similarly, Lang, Stulz and Walkling (1991) find that negative announcement effects are stronger when the acquiror has a low value of q and relatively high cashflows – precisely the configuration of excess cashflow relative to investment opportunities that, according to Jensen (1986), exacerbates empire-building overinvestment. And Morck, Shleifer and Vishny (1990b) find more negative announcement effects when acquirors are engaging in unrelated diversification. As noted above, unrelated diversification represents a type of merger for which there is a natural presumption of an agency motivation, with managers seeking to build not only larger, but more stable empires[30].

Blanchard, Lopez-de-Silanes and Shleifer (1994) look at how a small sample of firms respond to large cash windfalls coming from legal settlements. The firms in their sample have for the most part very poor investment opportunities as measured by low values of q. Yet rather than turning over the windfalls to their shareholders, they typically spend the cash on acquisitions, in many cases on deals that represent unrelated diversification. This is a clear-cut violation of the Modigliani–Miller theorem – exogenous cash shocks have a big impact on investment – and it also seems very consistent with an empire-building view of the world. But just to restate a point stressed above: while this sort of evidence goes a long way toward rejecting the hypothesis that

[30] See Section 6 below for more about empirical work on unrelated diversification.

$\gamma = 0$, it does not imply that, across the entire universe of firms, the dominant problem is one of overinvestment. It is quite possible that, were firms with high values of q and scarce internal resources to receive similar windfalls, they would spend them on value-creating investment in their own line of business, as suggested by models of costly external finance[31].

3.2.2. Is agency-related overinvestment always empire-building?

Although it has become commonplace in the literature to associate overinvestment with the specific mechanism of empire-building, there are, as noted above, other agency effects that can also give rise to overinvestment under some circumstances. Bertrand and Mullainathan (2003) argue that a managerial preference for the "quiet life" – effectively, a resistance to change – can lead to excessive continuation of existing negative-NPV projects. Consistent with this hypothesis, and in contrast to a naive empire-building story, they find that when discipline on managers (in the form of takeover pressure) decreases, firms are less likely to shut down old plants, but also less likely to build new ones. In a somewhat similar vein, Baker (2000) builds a model in which reputational concerns deter managers from discontinuing negative-NPV projects, as this would be an admission of failure. He then finds evidence which suggests that the youngest venture-capital firms – who are presumably the most concerned about reputation-building – are also the most reluctant to liquidate bad investments.

3.3. Evidence on reputational models of investment

3.3.1. Short-termism

Short-termism models such as that of Stein (1989) can be difficult to test directly. This is because their central prediction is that there will be underinvestment in *those types of activities that are not directly observable by the market.* For example, a firm may skimp on maintenance, advertising, worker training, etc., because the resulting cost savings are interpreted by investors not as reduced investment per se, but rather as increases in firm profitability. But to the extent that an econometrician's information set is no better than that of investors, this makes it difficult to actually document the underinvestment behavior explicitly.

Nevertheless, there is a good deal of circumstantial evidence consistent with the main comparative-static prediction of the theory, namely that underinvestment will be most pronounced in circumstances when managers are most concerned with hyping

[31] Indeed, Holtz-Eakin, Joulfaian and Rosen (1994) find evidence to just this effect: small businesses whose owners receive windfalls in the form of inheritances are more likely to survive, and to grow rapidly, than their peers.

their stock prices or labor-market reputations. Perhaps the best example comes from studies that examine the operating performance of firms around the time of equity offerings. A number of papers, including Hansen and Crutchley (1990), DeGeorge and Zeckhauser (1993) and Loughran and Ritter (1997) find that firms typically have abnormally strong operating performance relative to their peers in the year or two preceding an equity issue (either a seasoned issue or an IPO), and abnormally weak performance in the years after the issue. Although this is not definitive proof, it is exactly the pattern that one would expect to see if the desire to elevate the stock price at the time of the issue were leading managers to sacrifice long-run value for higher current profits[32].

Also noteworthy is the work of Gompers (1996). He observes that for venture-capital firms, having the startup companies in their portfolio go public is often one of the most visible and credible signs of strong performance. He then documents that younger venture firms take their startups public at an earlier stage of their life-cycle than do older, more established venture firms. If there is an optimal time for startups to go public, and going too soon is therefore costly, this would represent another form of distortionary short-run performance boosting.

3.3.2. Herding

A number of recent papers provide evidence supportive of reputational herding models. For the most part, this evidence comes not from garden-variety corporate investment decisions, but rather from either: i) the investment choices of institutional investors; or ii) the recommendations of security analysts. In some of the work [Lakonishok, Shleifer and Vishny (1992), Grinblatt, Titman and Wermers (1995), Falkenstein (1996), Nofsinger and Sias (1999), Wermers (1999), Welch (2000)], the aim is simply to determine whether certain groups of agents look like they are herding – e.g., whether all money managers try to buy the same stocks at the same time – without relating this herding behavior to career concerns. However, there are also several papers that tie actions directly to measures of agents' reputations, thereby providing sharper tests of the reputational herding mechanism. Notable work in this latter category includes Stickel (1990), Ehrbeck and Waldmann (1996), Graham (1999), Chevalier and Ellison (1999), Hong, Kubik and Solomon (2000) and Lamont (2002).

The Chevalier–Ellison (1999) and Hong–Kubik–Solomon (2000) papers are especially interesting from a career-concerns perspective in that they both: i) identify the implicit labor-market incentives that agents face; and ii) show how these implicit incentives color behavior. For example, in their study of mutual fund managers, Chevalier and Ellison find that young managers (with presumably less well-established reputations) are more likely to be fired if their portfolio choices differ from those of their peers, *even after controlling for the absolute performance of these portfolios.* The

[32] See also Teoh, Welch and Wong (1998a,b) for closely related evidence.

result that, controlling for absolute performance, an agent is punished for a decision that differs from the herd, is precisely what is predicted by the model of Scharfstein and Stein (1990). Chevalier and Ellison then go on to show that consistent with the incentives they face, younger money managers are indeed less likely to take positions that differ from benchmark weightings. In a similar vein, Hong, Kubik and Solomon demonstrate that inexperienced security analysts are more likely to be fired for earnings forecasts that deviate from the consensus, controlling for forecast accuracy. And, in the face of these incentives, inexperienced analysts tend to issue earnings forecasts that are in fact closer to the consensus.

4. Macroeconomic implications

Thus far, I have been taking a very microeconomic perspective on corporate investment, focusing on the extent to which information or agency problems can lead a single firm's investment to deviate from its first-best value. But the work surveyed thus far has important and far-reaching macroeconomic implications as well. Unfortunately, giving a complete and satisfactory treatment of these macro implications – which are fleshed out in a what has become a very large literature in its own right – would take me well outside the scope of this essay. So what follows is intended to be only an extremely cursory and selective review.

4.1. The financial accelerator

Over the years, many macroeconomists, including Fisher (1933), Bernanke (1983) and Eckstein and Sinai (1986), have argued that financial-market imperfections can play an important role in propagating and amplifying business-cycle fluctuations. More recently, researchers have begun explicitly embedding financing frictions of the sort discussed in Section 2 into formal macro models. One of the first and most significant papers in this genre is Bernanke and Gertler (1989). Using an adaptation of Townsend's (1979) costly-state-verification model, they show how economy-wide movements in firms' internal resources can be a source of output dynamics. In particular, an initial positive shock to the economy improves firms' profits and retained earnings; this in turn leads to increased investment and output, which amplifies the upturn, and so forth. A converse effect plays out during recessions.

Kiyotaki and Moore (1997) add a substantial kick to the Bernanke–Gertler story by noting that movements in asset values – as opposed to just cashflows – can also exert a strong influence on firms' ability to fund their investments. In the language of the heuristic model sketched above, Kiyotaki and Moore would say that a firm's internal resources w can be a function of asset prices, if, for example, the firm owns substantial amounts of land. In such a scenario, an initial positive shock is further amplified by an increase in land prices, which then feeds back into more investment and output, further increases in land prices, and so on. There is also now an added intertemporal

ingredient, as land prices respond not only to current movements in output, but also to expectations of future movements.

The large body of work in this "financial-accelerator" genre is surveyed by, among others, Bernanke, Gertler and Gilchrist (1996, 1999). One point worth noting is that in most cases, the financing imperfections considered in the macro literature are ones that fit in the costly-external finance genre – i.e., that have reduced forms similar to that given in Equation (2) – while empire-building tendencies have been given less attention. Nevertheless, it is unlikely that adding empire building into the macro models would dramatically change their most basic *positive* implications. After all, whether or not one allows for $\gamma > 0$, the link between investment and financial slack – which is the mechanism at the heart of the macro models – is much the same.

What would probably change with the addition of empire-building preferences, however, are the *welfare* implications of the macro models. For example, one might imagine that there could be a silver-lining aspect to recessions, to the extent that they lead certain firms to curtail wasteful overinvestment[33].

4.2. When banks face financing frictions

The same external-financing frictions which make life difficult for non-financial firms are also likely to affect banks. This observation underlies recent research in two related areas: on the effects of "capital crunches" in banking; and on the so-called "bank lending channel" of monetary-policy transmission.

4.2.1. Capital crunches in banking

Suppose that banks in a particular region are heavily exposed to local real estate, and that land prices crash, leading to large loan losses and depleted equity capital for the banks. What happens to their subsequent ability to make new loans? Clearly, it depends on the extent to which they are able to promptly rebuild their capital bases with new equity issues. If, for example, banks face the sort of adverse-selection problems in the equity market described by Myers and Majluf (1984), it may take a while to repair their balance sheets, and in the meantime, their lending may be sharply reduced, with attendant effects on their borrowers' investment, the regional economy, etc. This would be a classic example of a bank capital crunch.

This mechanism is at the heart of Bernanke's (1983) account of the Great Depression. More recently, research interest in bank capital crunches surged in the early 1990s, in the wake of widespread capital-adequacy problems in the USA banking industry, and has continued to draw motivation from episodes like the Asian financial crises of the late 1990s. Among the many empirical papers on the topic are Bernanke

[33] Loosely speaking, such a silver lining can arise if, in a recession, firms' cashflows decline *relative* to the rate at which their positive-NPV investment opportunities dry up.

and Lown (1991) and Peek and Rosengren (1995, 1997). Holmström and Tirole (1997) build a formal theoretical model of a capital crunch.

4.2.2. The bank lending channel of monetary policy transmission

As developed by Bernanke and Blinder (1988) and Stein (1998), the idea behind the bank lending channel is that central bank open-market operations have independent consequences for the supply of loans by banks – and hence for the investment of bank-dependent firms – above and beyond any impact due to standard "money channel" increases in bond-market rates of interest. The logic goes as follows. When the central bank drains reserves from the banking system, this obviously compromises banks' ability to raise money with *reservable* sources of financing, such as insured deposits. In a Modigliani–Miller world, this shock to the liability side of banks' balance sheets would have no independent effect on lending, since a bank losing a dollar of insured deposits could simply offset this by raising a dollar of nonreservable uninsured debt finance, e.g., by issuing commercial paper, or medium-term notes.

However, if banks are subject to adverse-selection problems, they will have difficulty replacing insured deposits with these other forms of uninsured debt finance, since the latter expose investors to default risk. As a result, contractionary open-market operations which shrink banks' deposit bases ultimately translate into declines in bank lending, and in turn into reductions in the investment of those non-financial firms that depend on banks.

A wide variety of evidence consistent with these ideas is documented by, among others, Bernanke and Blinder (1992), Kashyap, Stein and Wilcox (1993), Kashyap and Stein (1995, 2000), Ludvigson (1998), Morgan (1998) and Kishan and Opiela (2000). More complete surveys include Kashyap and Stein (1994), Bernanke and Gertler (1995), Cecchetti (1995) and Hubbard (1995).

4.3. Cross-country differences in financial development, investment and growth

Implicit in many of the theories discussed in Section 2 above is the idea that the efficiency of corporate investment is ultimately a function of institutional factors such as: the quality of auditing and disclosure; and the degree to which the legal and regulatory system enforces contracts and otherwise protects outside investors from abuse by managers. For example, in the context of an adverse-selection model, one would predict that better accounting standards and more timely disclosure would reduce the information asymmetry between managers and outsiders, and thus free up the flow of external finance to positive-NPV projects.

Alternatively, note that models such as Bolton and Scharfstein (1990) and Hart and Moore (1998) – in which managers can simply steal all of a firm's operating cashflows because these cashflows cannot be verified in a court of law – correspond to an extremely weak auditing/contract-enforcement technology. Thus, taken literally, these models might be most appropriate for thinking about firms in economies where

the legal system offers investors very little in the way of protection from managerial misbehavior. Again, the obvious prediction that follows from this observation is that raising external finance for good projects ought to be easier when investors are better protected.

A natural way to test such propositions empirically is with cross-country comparisons. LaPorta et al. (1997, 1998) show that there is indeed substantial variation across countries in measures of legal protection and accounting standards. They also establish the key link between these institutional factors and "financial development", demonstrating that countries which score better on their legal and accounting criteria also have more extensively developed debt and equity markets.

Having established this link, the next important empirical question becomes: what are the consequences of such financial development for investment? The answer, which is beginning to emerge convincingly in a series of recent papers, is that financial development seems to be quite important for real activity[34]. In particular, King and Levine (1993) and Levine and Zervos (1998) find that the predetermined component of a country's financial development is a strong predictor of its future growth, capital accumulation and productivity improvements.

More detail on the mechanisms by which financial development exerts these beneficial effects is provided by Rajan and Zingales (1998), Demirguc-Kunt and Maksimovic (1998) and Wurgler (2000). The first two papers show that countries with more developed financial systems do a better job of channeling funds to, and promoting the growth of, externally-dependent industries and firms – i.e., those with strong investment opportunities but scarce internal resources. In a similar vein, Wurgler (2000) finds that in countries with more developed financial markets, investment is more sensitive to measures of the quality of investment opportunities, such as value-added. Thus overall, financial development seems to help growth in just the way that the theory would lead one to expect: by relaxing external financing constraints, and thereby allowing capital to flow to the best investment projects.

Part B. Investment inside firms

5. Theoretical work on internal capital allocation

I now turn to the topic of within-firm capital allocation, beginning with the theoretical work in this area. To organize the discussion, I first give an overview of the primitive differences between internal and external capital markets, focusing heavily on the control rights held by the provider of finance in either case. I then go on to examine

[34] See Levine (1997) for a more complete survey. Earlier work hypothesizing a causal relationship between financial development and growth includes Schumpeter (1911), Goldsmith (1969), McKinnon (1973) and Shaw (1973).

in more detail the specific implications of these differences for the efficiency of within-firm investment outcomes. Finally, I very briefly touch on a related literature, that which seeks to explain observed capital budgeting practices by appealing to information and agency problems inside firms.

5.1. Fundamental differences between internal and external capital markets

Consider a particular line of business, denoted by $B1$, which has both assets in place, as well as future investment opportunities. $B1$ is run by manager $M1$, who, in the spirit of much of the work surveyed in Section 2, may both have empire-building tendencies (i.e., may derive private benefits from the assets under his control), as well as private information about the value of either the assets in place or the future investment opportunities. $B1$ can be financed as a stand-alone entity in the external capital market – in which case it goes to, e.g., a bank, a venture capitalist, or the public debt or equity market – or it can be financed in an internal capital market. In the internal market, $M1$ always approaches the CEO of the parent firm for funding.

5.1.1. Simplest case: a benevolent CEO overseeing just one division

Let us begin with the simplest possible case, in which the CEO acts benevolently on behalf of her ultimate shareholders (so that the only agency problem is that between $M1$ and the CEO) and in which $B1$ is the only division reporting to the CEO. How do the workings of the internal capital market differ in this case from those of the external capital market?

A first observation is that when $M1$ deals with the CEO, he is dealing with a single centralized provider of finance, as opposed to a (possibly) large group of investors, such as in the public debt or equity market. Standard free-riding arguments therefore suggest that the CEO might be expected to devote more effort to monitoring, i.e., to uncovering information about either $B1$'s current performance or future prospects. This would be a benefit of internal capital allocation. On the other hand, as has been pointed out by Dewatripont and Maskin (1995), Bolton and Scharfstein (1996) and others, there is also a potential downside to centralized finance and the accompanying lack of free-riding. In particular, the CEO's inability to precommit not to renegotiate with $M1$ can lead to a "soft budget constraint" whereby projects are not liquidated even following poor managerial performance; this in turn weakens ex ante incentives for $M1$.

While the centralized-finance aspect of an internal capital market is important, it is at best only a part of the story. After all, if one focuses only on the degree of centralization, there is no distinction between $M1$ approaching the CEO of his firm and, say, a single bank lender, or a single venture capitalist. Motivated by this observation, Gertner, Scharfstein and Stein (1994) argue that what distinguishes the CEO from these other centralized providers of finance is that the CEO has total and unconditional control rights in the sense of GHM [short for Grossman and Hart (1986), Hart and

Moore (1990) and Hart (1995)]. That is, the CEO can unilaterally decide what to do with *B1*'s physical assets, while the same is not true of a banker if the firm is not currently in default.

Gertner, Scharfstein and Stein (1994) argue that these strong control rights have two consequences. First, the CEO will have greater monitoring incentives than even other centralized providers of finance; that is, control and monitoring are complements. This is because when the monitor (i.e., the CEO) also has control rights, she can ensure that any value-enhancing ideas that occur to her in the course of monitoring are implemented, something which a financier without control rights cannot do. For example, suppose that the CEO decides that some of $B1$'s assets should be reconfigured, or put to different uses. With full control rights over these assets, she can implement such a restructuring directly. In contrast, a bank lender making the same judgement cannot (outside of default) do anything with $B1$'s assets; the bank is limited to just making suggestions that $M1$ may or may not want to take up. As a result, the bank has less incentive to invest in learning about the business in the first place. This formalizes an old line of argument, due to Alchian (1969) and Williamson (1975), that the internal capital market brings a higher quality of information to bear on decisions than the external market.

Second, however, a direct application of the GHM logic suggests that there will also be an offsetting cost of the CEO's strong control rights. The presence of the CEO on top of him in the chain of command is likely to blunt $M1$'s entrepreneurial incentives, i.e., to discourage him from taking a variety of costly but non-contractible actions that raise the overall value of the business. This point is also made by Aghion and Tirole (1997)[35].

5.1.2. More interesting case: a benevolent CEO overseeing multiple divisions

The case in which the CEO oversees only one division is a helpful starting point in thinking about the fundamental differences in control rights between the internal and external markets. But this case obviously does not leave much room for thinking about within-firm capital reallocations per se. So the next step is to consider a situation in which the CEO oversees multiple lines of business, each with their own managers.

Stein (1997) argues that, in this case, the key distinction between the CEO and a banker is that the CEO has greater scope to redistribute resources across the lines of business. To be concrete, suppose that there are now two businesses, $B1$ and $B2$, each of which has adequate collateral/pledgeable income to raise one unit of financing on its own. A CEO who controls both businesses can, if she wants, raise two units of

[35] Aghion and Tirole (1997) further explain why a manager reporting to a CEO is more likely to be discouraged than one reporting directly to outside shareholders. Although diffuse shareholders also have complete control rights in a formal (i.e., legal) sense, their de facto control is likely to be much weaker than a CEO's, since they are less well-informed. See also Burkart, Gromb and Panunzi (1997) for a similar argument.

financing against the combined collateral, and give both units to $B1$. In other words, the CEO can engage in a strong form of winner-picking[36]. Note that if the two businesses were separate entities borrowing from a bank, the bank could not impose the same outcome – if it tried to hold $B2$ to a zero allocation, $M2$ would be free to go to another bank and seek a better offer. In contrast, the CEO's control rights enable it to keep $M2$ from seeking competing financing offers. After all, the CEO "owns" the assets of $B2$ and can thus forbid $M2$ to use these assets as collateral in a transaction that the CEO does not approve of. This idea builds on Hart and Moore's (1990, p. 1121) observation that "... the sole right possessed by an owner of an asset is his ability to exclude others from the use of that asset".

Whether the CEO ultimately uses her reallocative authority to good or bad ends is of course the central question to be addressed here. There are arguments on either side, and I take these up momentarily. But first, note that the very existence of this authority can also have further incentive effects – either positive or negative – above and beyond any direct consequences for ex post investment efficiency. On the negative side, as emphasized by Milgrom (1988), Milgrom and Roberts (1988) and Meyer, Milgrom and Roberts (1992), division managers may engage in wasteful influence activities in an effort to convince the CEO to give them a larger share of the capital budget. Alternatively, Brusco and Panunzi (2000) argue that the potential threat of reallocation away from, say, $M2$ can weaken his incentives. For if he is not sure he will get to reinvest all of the profits generated by his line of business – because they might get steered to $B1$ instead – he will not want to work as hard to create such profits in the first place[37].

In contrast, Stein (2002) argues that the CEO's reallocative authority may also have positive ex ante effects. To the extent that their desire to convince the CEO to grant them a larger share of the firm's capital budget leads division managers to act as honest advocates, and to produce additional legitimate "hard" (i.e., verifiable) information about project prospects, overall efficiency can in some circumstances be enhanced[38].

5.1.3. The CEO is herself an agent

A final and very important aspect of internal capital allocation is that the party making the allocation decisions (the CEO) is herself an agent of outside shareholders, so

[36] A distinct point, due to Gertner, Scharfstein and Stein (1994), is that a CEO overseeing two related lines of business can, when $B1$ is in trouble, combine its assets with those of $B2$, and put $M2$ in charge of everything – a form of internal restructuring that cannot be as simply accomplished by a bank lending to two separate firms.

[37] See also Rotemberg and Saloner (1994) and Inderst and Laux (2000) for somewhat related analyses.

[38] But this advocacy mechanism is a delicate one: the private returns to division managers from producing hard information – and thereby possibly increasing their capital budgets – are potentially much greater than the social returns, so there is the danger that they waste too much time on this activity.

that one cannot simply assume that she will act benevolently on their behalf. Thus, a complete model of the within-firm allocation process should incorporate at least two layers of agency – one between the CEO and shareholders, and one between the division managers and the CEO.

This two-tiered agency feature is not unique to models of internal capital allocation; consider for example Diamond's (1984) well-known model of a bank, which explicitly recognizes the agency problem between the bank and its ultimate investors[39]. But, as will become clear below, the ultimate effect of the top-level agency problem between the principals and the "supervisor" (i.e., either the bank, or the CEO) can depend crucially on the structure of control rights in the lower-level agency relationship. For example, in Diamond's model – in which the bank does not have the authority to take all the money away from some of its clients in order to give it to others – diversification across multiple projects emerges as a device which is helpful in mitigating the top-level agency problem. In contrast, in an internal capital market, where the CEO has much broader reallocative authority, diversification can in some cases actually exacerbate top-level agency problems [Scharfstein and Stein (2000)].

5.2. Implications for the efficiency of capital allocation

The literature has identified several mechanisms by which the allocation of investment funds in an internal capital market can lead to either increases or reductions in efficiency, as compared to an external-capital-markets benchmark. I consider the bright and dark sides of internal capital markets in turn.

5.2.1. The bright side of internal capital markets

Absent any direct operating synergies, there are two basic financing-related ways that value can be created by bringing together multiple business under the roof of a single parent company. First, integration of this sort may allow *more* total external financing to be raised than could be raised by the individual businesses operating as stand-alones; this "more-money" effect is beneficial if there is an underinvestment problem on average. Second, an internal capital market may do a better job of allocating *a given amount* of funding across projects, which one might call a "smarter-money" effect.

With respect to the more-money effect, Lewellen (1971) argues that coinsurance across imperfectly correlated divisions increases the debt capacity of integrated firms[40]. However, Berger and Ofek (1995) and Comment and Jarrell (1995) cast doubt on the importance of this story by documenting that, empirically, integrated firms

[39] There are also other multi-tier agency models – Tirole (1986) is an early example – which do not focus on capital allocation issues.

[40] Inderst and Muller (2003) provide a modern treatment of this and related issues, showing how the existence of an internal capital market shapes the nature of the optimal financial contract between a firm and its outside investors.

borrow only a trivial amount more than their stand-alone counterparts. Alternatively, Hadlock, Ryngaert and Thomas (2001) build a model in which diversification – by pooling risks and therefore reducing the variance of managers' inside information – helps to alleviate adverse-selection problems of the Myers–Majluf (1984) type in the external equity market[41]. In support of this hypothesis, they find that equity issues by diversified firms have a smaller price impact than equity issues by comparable stand-alone firms. Again, though, there is little direct evidence as to whether this ultimately translates into more external finance being raised by diversified firms.

The smarter-money effect has a long tradition and has been discussed by a number of authors, including Alchian (1969), Weston (1970), Williamson (1975) and Donaldson (1984). It is based on two related premises: first, that the CEO in an internal capital market will become relatively well-informed about the prospects of the firm's divisions; and second, that the CEO will use her high-quality information as the basis for making value-enhancing reallocations across divisions – i.e., will engage in active winner-picking. As discussed above, more recent theoretical treatments [e.g., Gertner, Scharfstein and Stein (1994), Li and Li (1996), Stein (1997) and Matsusaka and Nanda (2002)] explicitly link the performance of one or both of these functions – monitoring and winner-picking – to the strong control rights held by the CEO in an internal capital market.

Stein (1997) goes on to suggest that the CEO will be more likely to do a good job of winner-picking when the firm operates in related lines of business. The logic is one of relative performance evaluation: if the task is to most efficiently distribute a fixed amount of capital, it is not important to know the *absolute* merits of the competing investment projects, all that matters is their *relative* merits. And assessing relative value may be easier when comparing projects in related lines of business.

The smarter-money effect arises naturally in a setting where the CEO acts in the interests of outside shareholders. But it can also come through even when the CEO is self-interested. This point is emphasized by Stein (1997), who notes that CEO's with certain kinds of empire-building preferences (such as private benefits that are proportional to gross output) may actually have very good intrinsic incentives for doing intra-firm resource allocation – though they may want to do more total investment than their principals would like, their desire to have large and profitable empires can lead them to rank projects in the right order from the principals' perspective. Although one can think of counterexamples [e.g., a CEO who only wants to invest in projects which make use of her specific human capital, as in Shleifer and Vishny (1989)], the general conclusion to be taken away is that CEO self-interest, *taken alone,* is not necessarily inimical to efficient capital allocation.

[41] As a counterpoint to this idea, practitioners often argue that diversified firms have a harder time raising equity, because their complexity makes them difficult for investors to value accurately. See Nanda and Narayanan (1999).

5.2.2. The dark side of internal capital markets

Parallel to the discussion of its potential benefits, there are two broad ways in which an internal capital market can reduce value. First, if one believes that there is a general tendency towards overinvestment, then the more-money effect – the potential for integrated firms to have larger capital budgets than their stand-alone peers – is seen as a bad thing. Second, holding fixed the overall level of investment, there is the concern that the internal capital market does a worse job of allocating funds to individual divisions or projects.

Recent theoretical research has focused almost exclusively on the latter possibility, which makes sense, given the paucity of direct evidence to support the more-money hypothesis. This work, which includes Rajan, Servaes and Zingales (2000), Scharfstein and Stein (2000) and Wulf (1999), goes a level further down into the organization and stresses the agency conflict between division managers (i.e., $M1$ and $M2$ in our earlier notation) and the CEO as being a central part of the problem. Following the papers on influence activities by Milgrom (1988), Milgrom and Roberts (1988) and Meyer, Milgrom and Roberts (1992), division managers in these models are portrayed as rent-seeking agents who try to actively sway the CEO to give them more in the way of compensation, power, or resources[42].

Although introducing rent-seeking at the division-manager level is a helpful step in building a model of inefficient within-firm capital allocations, it is by itself not sufficient. For example, in the model of Meyer, Milgrom and Roberts (1992), division managers try to influence the CEO to give them more capital by overstating their divisions' prospects, but the CEO rationally sees through the hype. The only inefficiency in the model is the fact that division managers waste their time and effort in the futile attempt to influence the CEO. Alternatively, think of models where division managers expend effort to increase their bargaining positions vis-a-vis the CEO, perhaps by building up their outside options, or by making it harder for a successor to take over their jobs [Shleifer and Vishny (1989), Edlin and Stiglitz (1995)]. Such models make it clear how rent-seeking division managers might be able to extract larger compensation packages from the CEO, but they do not say much about why the extra compensation comes in the form of increased capital allocations, as opposed to just cash.

Rajan, Servaes and Zingales (2000) address this why-distort-the-capital-budget question in a model in which the CEO acts on behalf of shareholders – i.e., where the only agency conflict is the lower-level one between the CEO and division managers. They argue that when divisions have different investment opportunities, the CEO will want to tilt the capital budget away from the efficient point, and towards a "socialist" outcome in which the weaker division gets relatively more than it would under the first-best. This is because in their setup, the technology is such that a more equal capital

[42] See also Bagwell and Zechner (1993) for an application of influence-cost ideas.

budget increases division managers' incentives to engage in cooperative, joint-surplus-maximizing behavior, as opposed to self-interested, rent-seeking forms of behavior.

Thus, loosely speaking, Rajan, Servaes and Zingales (2000) view the capital budget as a tool that the CEO, acting as a principal, uses in part to design a more effective incentive scheme to control division-manager rent-seeking. A similar observation can be made about Wulf (1999). Although her model works somewhat differently, it shares the feature that the CEO is a principal who uses capital allocation rules as part of an incentive scheme to make rent-seeking division managers behave better[43].

In contrast, the key assumption in Scharfstein and Stein (2000) is that there are two levels of agency, with the CEO acting in her own private interests, rather than those of shareholders. In their framework, managers of weak divisions spend more effort building up their outside options, which in turn forces the CEO to compensate them more highly in order to retain them. If the CEO were herself the principal, she would pay this added compensation in the form of cash, and capital would still be allocated efficiently. But as an agent, she may view it as less personally costly to tilt the capital budget in the direction of the weaker division; this allows her to save the firm's cash to use for other, more privately attractive purposes[44].

This model shares with Rajan, Servaes and Zingales (2000) the general implication of socialism in internal capital allocation, with weaker divisions being cross-subsidized by stronger ones. Moreover, both models also imply that problems will be most acute when the divisions in question have widely divergent investment opportunities (as measured, e.g., by industry q). The most obvious empirical distinction between the two is that Scharfstein and Stein (2000) predict that socialism will be most pronounced when the CEO has poorly aligned incentives, while Rajan, Servaes and Zingales (2000), who cast the CEO as a principal, make no such prediction.

5.2.3. Pulling it together: when are internal capital markets most likely to add value?

Rather than viewing the bright-side and dark-side models as competing directly with one another, a more fruitful way to synthesize the theoretical work in this area is to ask a cross-sectional question. Specifically: under what conditions is an internal capital market most (or least) likely to add value relative to an external capital markets benchmark?

First, an internal capital market should, all else equal, be more valuable in situations where the external capital market is underdeveloped, either because of weaknesses in the legal and contracting environment, inadequate accounting and disclosure practices,

[43] In this regard, these papers bear some similarity to Rotemberg (1993).

[44] This conclusion requires the assumption that the CEO has less ability to divert private benefits from the firm's capital budget than from spare cash. Alternatively, the CEO may prefer to compensate division managers with capital instead of higher salaries because, as in Stein (1989), this is a way of pumping up reported earnings and hence boosting either her bonus or the short-run value of her stock options.

etc. To see the logic most clearly, consider an extreme case where outside investors are so poorly protected that they are unwilling to put up any financing, and hence firms can only invest out of their retained earnings. In this case, an internal capital market represents the only way to move money from those lines of business that have surpluses relative to their investment needs to those in the opposite situation[45].

Second, the dark-side theories reviewed above suggest that the internal capital market is most likely to run into problems when the firm's divisions have sharply divergent investment prospects. Third, these problems may be exacerbated when divisional managers both: i) have a strong incentive to maximize their own division's capital allocation as opposed to profits; and ii) are powerful relative to the CEO – i.e., have valuable specific human capital (either expertise or internal political clout), and so can threaten to disrupt the firm's activities.

As an example of the latter point, consider this bit of folklore about General Electric, which is widely viewed to be one of the most successful diversified conglomerates. GE apparently follows a policy of rotating its senior managers across different divisions on a regular basis. According to the logic above, there are two distinct potential benefits of such a policy. First, managers' incentives to lobby for a lot of capital in any given division will be reduced if they think that they will be leaving the division soon anyway. Second, a job-rotation policy may prevent managers from accumulating a great deal of specific expertise and political capital in a given division, thereby reducing their bargaining power relative to that of the CEO.

This discussion suggests a fundamental tradeoff in organizational design and capital allocation: that between expertise and parochialism. One way to see this tradeoff is to think of a CEO who has to allocate a fixed capital budget across four competing projects. The CEO's first option is to do the whole job herself – i.e., to assess each project and then make a decision. Alternatively, she might hire two division managers, each of whom would be given the responsibility of evaluating two of the four projects in more detail. In this hierarchical case, the CEO would make a division-level allocation to each of the two managers, and these managers would then choose how much to give to the individual projects within their divisions. The latter option has the obvious advantage of more total information production. But it also has the potential disadvantage that each division manager may be preoccupied with landing his division a larger share of the overall capital budget, with the adverse consequences discussed above. In contrast, in the case where the CEO makes all the decisions, there may be less total information brought to bear, but there is also less parochialism, because the CEO has a broader span of control and thus does not have a vested interest as to which division gets more capital.

[45] Hubbard and Palia (1999) use this reasoning to argue that the conglomerate mergers of the 1960s and 1970s in the USA made sense at the time that they were done, even though later it became optimal to undo them – there was a change in the environment, in that external capital markets became more developed over time.

5.3. How information and agency problems shape firms' capital budgeting practices

While I have been emphasizing how information and agency problems shape *investment outcomes* inside firms, there is a closely related literature that seeks to rationalize observed *capital budgeting practices* based on the same primitive frictions. A broad set of anecdotal and field-based evidence suggests that firms often do not follow the textbook prescription of allocating capital to projects based on a simple net-present-value (NPV) criterion; instead, they often rely at least in part on other methods, such as rationing capital to individual division managers, imposing payback requirements, and so forth.

These alternative capital budgeting practices can in many cases be understood by reference to the canonical model laid out above – one in which lower-level managers (e.g., division managers) have better information about project prospects than their superiors, but also have empire-building preferences, and hence cannot be relied on to truthfully report their private information. In such a setting, capital budgeting procedures can be thought of as part of a mechanism to elicit truthful revelation of this private information[46]. Among the papers to take this point of view are Harris, Kriebel and Raviv (1982), Antle and Eppen (1985), Harris and Raviv (1996, 1998) and Bernardo, Cai and Luo (2001).

For example, internal capital rationing can emerge in the sense that even when the firm as a whole has plenty of cash, the allocation to a given division will increase relatively little as its reported prospects improve; this type of underinvestment in strong divisions is needed to preserve incentive compatibility. And as argued by Bernardo, Cai and Luo, if it is harder to get managers to be honest about the prospects of longer-horizon projects (because their forecasts cannot be contradicted by data in the short run), then firms may want to adopt payback-like criteria that effectively punish distant cashflows more heavily than does the NPV method[47].

6. Empirical work on internal capital allocation

6.1. The value consequences of diversification

There is a large empirical literature which, broadly speaking, asks the following question: what are the consequences of diversification for shareholder value? While this literature does not get directly at the efficiency of the internal capital market – diversification may impact value for a variety of other reasons unrelated to investment

[46] Often the optimal design also includes other features, such as auditing by headquarters [Harris and Raviv (1996, 1998)], or incentive compensation [Bernardo, Cai and Luo (2001)].

[47] See also Thakor (1990) and Berkovitch and Israel (1998) for alternative rationalizations of the payback criterion.

efficiency, such as operating or organizational synergies, etc. – it is nonetheless informative. And for the most part, the picture painted is one that is unfavorable to diversification, especially if one focuses on unrelated diversification and data after around, say, 1980. For example, the stock market seems to encourage and reward focus-increasing transactions, but to punish the stocks of acquirors in diversifying mergers[48].

One particular measure of the value effect of diversification that has received a great deal of attention in recent work is the so-called "diversification discount". As developed by Lang and Stulz (1994) and Berger and Ofek (1995), the diversification discount compares the stock price of a diversified firm to the imputed stand-alone values of its individual segments, where these imputed values are based on multiples (such as price-to-book, or price-to-sales) of comparable pure-play firms in the same industries as the diversified firm's segments. Using data from the USA, these authors find substantial mean discounts, on the order of 15%, which they interpret as evidence of value destruction by diversified firms. This work has been extended to a variety of other sample periods and countries by Servaes (1996), Lins and Servaes (1999, 2002), Fauver, Houston and Naranjo (1998) and Claessens et al. (1999) among others, and the results suggest that the diversification discount is a pervasive phenomenon[49].

However, a number of other papers have taken issue with the idea that the diversification discount reflects value destruction. Villalonga (1999), Burch, Nanda and Narayanan (2000), Campa and Kedia (2002), Graham, Lemmon and Wolf (2002) and Hyland and Diltz (2002) all argue in one way or another that the discount is tainted by endogeneity bias, because relatively weak firms are the ones that choose to diversify in the first place[50]. Lamont and Polk (2001) show that the discount also is partly driven by the fact that stocks of diversified firms have higher expected returns than their pure-play counterparts; this could be because the cashflows of diversified firms are inefficiently undervalued by the market. A balanced reading of these papers suggests that taking these caveats into account significantly reduces – though may not eliminate – that part of the discount which one can think of as reflecting a causal link from diversification to fundamental value. Such skepticism about the causal significance of the diversification

[48] See, e.g., Wernerfelt and Montgomery (1988), Bhagat, Shleifer and Vishny (1990), Morck, Shleifer and Vishny (1990b), Kaplan and Weisbach (1992), Liebeskind and Opler (1993), John and Ofek (1995), Comment and Jarrell (1995), Berger and Ofek (1996, 1999) and Denis, Denis and Sarin (1997). In contrast, Matsusaka (1993) finds positive event returns for diversifying acquirors in the 1960s.

[49] Some of these papers have also tried to test a hypothesis discussed above – that internal capital markets will be relatively more valuable when external capital markets are poorly developed – by regressing the diversification discount against various country-level measures of financial development. Taken together, the results from this effort thus far seem inconclusive.

[50] Fluck and Lynch (1999) offer a theoretical explanation for why weak firms might find it optimal to merge. It should be noted, however, that there is another less well-explored bias which cuts in the opposite direction. Even if it occurs more among weak firms, diversification will still only be chosen by those for whom it is most valuable. This implies that the observed discount could actually be *less* than would occur if random firms were forced to merge.

discount is also reinforced by the fact that although the stocks of acquirors tend to drop upon announcement of a diversifying transaction, studies looking at the *combined return* to acquirors and targets in such deals generally find it to be either close to zero or slightly positive [Chevalier (2000)].

While this methodological debate over the correct mean value of the diversification discount is interesting, it should be noted that, from the perspective of testing the theories discussed in Section 5 above, the mean value of the discount is not necessarily the most informative item. After all, taken as a whole, the theoretical work does not lead to a clear-cut prediction that diversification (and the associated creation of an internal capital market) is on average good or bad. Rather, the theory has more bite in the cross-section, pointing to the specific circumstances under which internal capital markets are most likely to destroy value. Thus, the diversification discount may indeed be a useful measure, but perhaps one should pay less attention to its mean value, and more to its cross-sectional variation[51]. As an example in this vein, Rajan, Servaes and Zingales (2000) and Lamont and Polk (2002) both find that the discount increases with measures of the diversity of a firm's investment opportunities. These results provide indirect support for one of the dark-side theories' main cross-sectional implications, namely that greater divergence in investment opportunities leads to less efficient internal capital allocation.

6.2. Evidence on investment at the divisional and plant level

6.2.1. Is there an active internal capital market?

I turn next to evidence which speaks directly to investment outcomes. The first question to ask is this: is it in fact true that – as both bright-side and dark-side theories presuppose – that the internal capital market actively reallocates funds across a firm's divisions? Operationally, this question can be rephrased as: holding fixed $B1$'s investment prospects and cashflow, is it the case that $B1$'s investment is influenced by $B2$'s cashflow?

The first paper to provide an answer to this question is Lamont (1997). He finds that when oil prices decline, integrated oil companies cut investment across the board in all of their divisions. These divisions include not only lines of business that appear totally unrelated to oil (such as Mobil's Montgomery Ward department-store business), but also petrochemical divisions. What is particularly interesting here is that the petrochemical industry is one which takes oil as an input, and hence whose investment prospects should *benefit* when oil prices fall. And indeed, the operating cashflows of oil companies' non-oil segments generally rise at such times. The fact that they

[51] Berger and Ofek (1996) find that firms with higher diversification discounts are more likely to be taken over and busted up. This suggests that even if there is an endogeneity bias in the mean value of the discount, there is useful information in its cross-section.

nonetheless see their investment reduced seems to be very clean evidence that the cashflow of one of a firms' divisions affects the investment of its other divisions.

Further work, including Houston, James and Marcus (1997) and Shin and Stulz (1998) has found that Lamont's (1997) results generalize to other industries. Chevalier (2000) raises a methodological caveat about some of this work, particularly insofar as the relatedness or unrelatedness of divisions is established using measures like standard industrial classification (SIC) codes. Chevalier's point is that if a single firm owns two divisions in apparently unrelated SIC codes, they may still be related because of a common factor at the firm level. The example she uses is of a firm based in Texas that owns both local restaurants and oilfields, which, though they belong to different SIC codes, are both influenced by the same regional economic conditions. In this case, it would be unsurprising if the restaurant division's investment is related to the oil division's cashflow, as the latter may contain information about the common component of investment opportunities.

Nevertheless, while this critique contains an important message about experiment design – that one should be careful not to measure relatedness too mechanically – it does not appear that it undermines the basic qualitative message of Lamont's (1997) original work[52]. The bottom line is that it seems very hard to argue with the simple statement that the internal capital market actively reallocates funds across divisions.

6.2.2. Is it efficient?

Of course, the harder question is whether these internal reallocations are value-increasing or value-reducing. That is, compared to the external capital market, does the internal market move money at the margin from less to more deserving divisions, or is it the other way around? Before turning to the evidence, note that this question can be framed a couple of different ways. First, one might ask an "on average" version of the question: across a large sample, does it look like the internal capital market of the typical firm is doing a good job? This version of the question is certainly interesting, but as with the mean value of the diversification discount, it is not one for which a synthesis of the theoretical work yields strong priors one way or another. Alternatively, one can ask various cross-sectional versions of the question. For example, under what circumstances does it look like the internal capital market makes the worst allocations? And are the investment outcomes in these bad scenarios sufficiently value-destroying that they can plausibly be the leading explanation for large diversification discounts, bustups, etc.?

6.2.2.1. On-average statements. Most papers that pose the on-average version of the question [Shin and Stulz (1998), Scharfstein (1998), Rajan, Servaes and Zingales

[52] Lamont in fact takes pains to hand-clean the data in such a way as to eliminate observations which appear to fit the Chevalier restaurants/oilfields characterization.

(2000), Billett and Mauer (2003)] come to the conclusion that the internal capital market in the typical diversified firm engages in "socialist" cross-subsidization, allocating too much to low-q divisions and too little to high-q divisions[53]. For example, Rajan, Servaes and Zingales (2000) find that the industry-adjusted investment of low-q divisions within conglomerates is higher than the industry-adjusted investment of high-q divisions. Similarly, Scharfstein (1998) shows that the sensitivity of investment to industry q is much lower for divisions of a conglomerate than it is for stand-alone firms.

However, as in the case of the diversification discount, this on-average conclusion of socialism has been challenged on methodological grounds. The concerns have to do with the endogeneity of the diversification decision, and the resulting possibility that conglomerate divisions are systematically different from their stand-alone counterparts in the same industry. To take one concrete example of the sorts of issues that come up, Whited (2001) and Chevalier (2000) argue that industry q's may be better measures of the investment opportunities of stand-alone firms than those of conglomerate divisions. If this is so, it could explain Scharfstein's (1998) findings.

Chevalier (2000) investigates the importance of these effects by looking at the investment behavior of conglomerate divisions in the years before they merged. In this pre-merger phase – when the divisions were still stand-alone firms and by definition there could have been no reallocation – she finds some of the same patterns as Rajan, Servaes and Zingales (2000) and Scharfstein (1998), albeit in a weaker form. This suggests that correcting for various econometric biases weakens, though does not necessarily overturn, the evidence of on-average socialism in these papers.

Thus overall, someone with relatively neutral priors might say that the weight of the current evidence favors the view that there is on average some degree of socialist cross-subsidization in diversified firms, at least at the divisional level[54]. At the same time, a skeptic could reasonably remain skeptical at this point. But again, it is important to recognize that if one is interested in testing the distinctive predictions of the dark-side theories, then trying to definitively nail down the average degree of socialism may not be the best way to go. Instead, it can be more helpful to look at the cross-section.

6.2.2.2. The cross-section.

6.2.2.2.1. Diversity of investment opportunities. In addition to simply computing an average measure of cross-subsidization, Rajan, Servaes and Zingales (2000) also

[53] A more positive view of the internal capital market emerges in Maksimovic and Phillips (2002). Using plant-level data from manufacturing firms, they find that when a division that has high productivity relative to its industry experiences a positive demand shock, this reduces the growth of the other divisions in the same firm. Thus, the internal capital market seems to take money away from other divisions to feed the strong ones when they most need it.

[54] It is of course quite possible that the internal capital market does a poor job of allocating funds at the divisional level, but at the same time, is quite efficient with respect to within-division allocations – e.g., across manufacturing plants in the same line of business.

investigate how this measure is correlated with other variables. Two key findings stand out. First, socialist cross-subsidization (roughly defined as the industry-adjusted investment of low-q divisions minus the industry-adjusted investment of high-q divisions) is more pronounced when there is a greater diversity of investment opportunities within the firm, i.e., when there is a greater spread in the industry q's of the divisions. This pattern is, as noted above, precisely what is predicted by the theoretical models. It is also particularly noteworthy in light of the methodological critiques of Whited (2001) and Chevalier (2000). For even if one takes these critiques seriously and worries that there is a bias in the average estimate of cross-subsidization, there is no clear reason to expect a positive bias in the correlation between the cross-subsidization measure and the diversity measure.

The second important fact is that the cross-subsidization measure is significantly correlated with the diversification discount. That is, firms whose investment behavior looks more socialistic suffer greater discounts. Again, even if one is skeptical about putting too much inferential weight on the average values of either the diversification discount or the cross-subsidization measure, this suggests that there is valuable information in their cross-sectional variation. And at a minimum, it appears that one can say that in those cases where socialist tendencies are the strongest, this has a negative effect on firm value.

6.2.2.2.2. CEO incentives. Using his somewhat different measure of cross-subsidization, Scharfstein (1998) finds that socialism is more pronounced in those diversified firms in which top management has a small equity stake. Palia (1999) comes to a similar conclusion, and also shows that there is more socialism when firms have large (and, he presumes, less effective) boards of directors. These governance-related patterns are consistent with the two-tier agency model of Scharfstein and Stein (2000), though not with the CEO-as-principal models of Rajan, Servaes and Zingales (2000) or Wulf (1999). And once again, these kinds of cross-sectional tests help to address the econometric issues raised by Whited (2001) and Chevalier (2000): even if one believes that Scharfstein's measure of socialism is biased upwards, it is hard to see why it would be spuriously correlated with top-management ownership.

6.2.2.2.3. Division-manager incentives. In a similar vein, Palia (1999) also finds that there is more socialist cross-subsidization when division managers' compensation is less closely linked to overall firm performance, either through stock ownership or options. To the extent that one is willing to take division-manager compensation as exogenous, this fits with a central prediction of all the dark-side theories, since all of them are predicated in part on an agency problem at the division-manager level.

Of course, it is more natural to think of division-manager compensation as endogenous. Though this suggests that one needs to interpret results like Palia's very cautiously, it may actually make them all the more striking, since the most obvious endogeneity story is one that would lead to a bias that works in the opposite direction to these results. In particular, the theory suggests that a principal would want to offer more high-powered incentive compensation (based on overall firm performance) to those division managers who have the greatest ability to rent-seek, or to otherwise engage in

distortionary influence activities designed to increase their share of the capital budget. And indeed, Wulf (2002) presents a variety of empirical evidence consistent with the hypothesis that division managers' compensation contracts are designed to reduce rent-seeking incentives.

6.2.2.2.4. Spinoff firms. Another way to address the methodological critiques of Whited (2001) and Chevalier (2000) is to look at the investment behavior of a division before and after it is spun out of a conglomerate firm. Recall that the heart of the critique is that conglomerate divisions are somehow endogenously different than stand-alone firms, and that as a result, one cannot use the investment behavior of the latter as a benchmark for the former. But by focusing on spinoffs, one isolates a pure change in the degree of integration, while holding fixed the division in question. This approach is taken by Gertner, Powers and Scharfstein (2002). They find that once a division is spun off from its parent, its investment becomes markedly more sensitive to industry q. Most of the effect is driven by the behavior of divisions in low-q industries, which sharply cut investment after a spinoff. Moreover, the change in investment behavior is most pronounced for those spinoffs to which the stock market reacts favorably. Overall, this would seem to be quite convincing evidence that there is inefficient overinvestment in the weak divisions prior to spinoff[55].

However, an important caveat with this research design is that those divisions that are spun off from their parents are far from a random sample; spinoffs are likely to occur precisely in those situations where it becomes clear that integration is destroying value. Thus, the results of Gertner, Powers and Scharfstein (2002) do not really speak to the question of whether there is socialism on average. Rather they make a somewhat different point: in those particular cases where integration appears to be a bad idea, the problems are at least in part attributable to socialist-type inefficiencies in the internal capital market[56].

6.2.2.2.5. Relatedness. In an interesting counterpoint to much of the recent work in this area – which has tended to look at instances of unrelated diversification (i.e., conglomerates) and has come to largely negative conclusions about the efficiency of the internal capital market – Khanna and Tice (2001) focus on firms that operate in multiple divisions within the same broad industry, retailing. An example of an integrated firm in this context would be Dayton Hudson, which operates both a discount department store chain (Target) and a more exclusive chain (Hudson). Khanna and Tice find that such integrated retailers react quite efficiently when they experience a negative shock to their discount business, in the form of Wal-Mart entering their markets. In particular, they document that the subsequent investment decisions of the integrated firms are *more responsive* to division profitability than those of the

[55] For related analyses of spinoffs, see also McNeil and Moore (2000) and Burch and Nanda (2003).

[56] On a somewhat related note, Peyer and Shivdasani (2001) find that one of the costs of high leverage is that it also can lead to distortions in the internal capital market – after leveraged recapitalizations, firms allocate more resources to low-growth, high-cashflow segments.

specialized firms that operate only discount businesses. These results thus have the opposite flavor of the empirical "socialism" findings of Scharfstein (1998) and Rajan, Servaes and Zingales (2000). Khanna and Tice interpret them as being consistent with a comparative static of Stein's (1997) model, namely that the positive, winner-picking function of the internal capital market will work best if the firm in question operates in related lines of business.

6.2.3. Where things stand

Empirical work on investment inside firms is at a very early stage, and many of the most interesting and important questions remain incompletely resolved. Nevertheless, a few conclusions can be ventured with some confidence. First, it is clear that the internal capital market can generate economically significant reallocations of resources across a firm's operating segments – i.e., divisions that are part of a larger firm can have markedly different investment patterns than they would as stand-alones. Second, in those cases where there is a large value loss associated with integration, this value loss is often due in part to inefficiencies in the internal capital allocation process. Third, when such inefficiencies do occur, they tend to be socialist in nature, with weak divisions receiving too much capital, and strong divisions too little. (There is little evidence to date of the reverse kind of inefficiency, excessive Darwinism, whereby strong divisions get too much capital, and weak ones too little). Finally, and most tentatively, socialism appears to be more of a problem when a firm's divisions are in unrelated lines of business, and have widely divergent investment prospects.

Looking to the future, it would seem that one particularly promising line of research is that which pushes beyond the divisional level, and looks at investment patterns *within* operating segments, e.g., at the plant level. Such work is just getting started, in papers by Maksimovic and Phillips (2002) and Schoar (2002). Among the many kinds of questions that one might hope to answer with it are the following: are there cases in which capital is allocated relatively inefficiently across divisions, but relatively efficiently within divisions? If so, what aspects of organizational structure appear to be driving the outcome? For example, in a heuristic extension of the dark-side models discussed above, one might conjecture that this sort of pattern would result if division-level managers are very powerful in the capital budgeting process, while lower-level managers (e.g., plant managers) have less influence.

7. Conclusions: implications for the boundaries of the firm

The process of allocating capital to investment projects is made difficult by the existence of information asymmetries and agency conflicts. Put most simply, the fundamental problem is that the manager closest to a project is likely to know more about its prospects, but at the same time may have incentives to misrepresent this information – e.g., to say that the outlook is better than it really is. This fundamental

problem arises both when capital is allocated across firms via external debt and equity markets, and when capital is allocated within firms via the internal capital market. Internal and external markets differ in how they address the problem, but it is important to recognize that they are both trying to accomplish the same objective.

This observation suggests a particular perspective on Coase's (1937) enduring question about what determines the boundaries of the firm: loosely speaking, a collection of assets should optimally reside under the roof of a single firm to the extent that the firm's internal capital market can do a more efficient job of allocating capital to these assets than would the external capital market, if the assets were located in distinct firms.

Such a capital-allocation-centric point of view on the boundaries question appears in recent papers by Bolton and Scharfstein (1998) and Holmström and Kaplan (2001)[57]. Bolton and Scharfstein write (p. 111):

> ... integration fundamentally changes the resource allocation process by increasing centralized decision making under corporate headquarters ... integration can lead to inefficient outcomes from decision-making processes (in this case the allocation of capital) in contrast to the efficient outcomes from bargaining that always occur in the Grossman–Hart–Moore paradigm. In our view, corporate headquarters, agency problems, and the resource allocation process must play a key role in any realistic theory of the firm."

In a similar spirit, Holmström and Kaplan give this example of the limits of integration:

> It would make little sense for shareholders to become directly involved in General Motors' choice of car models ... But if resources are to shift from car manufacturing to computer manufacturing, there is little reason to believe that having General Motors start making computers, an area in which the company currently has little expertise, would make economic sense. Instead, the market may have a role to play in funneling capital toward the new companies.

While there may yet be no single fully-articulated model of firm boundaries which captures all the important nuances of this capital-allocation-based perspective, several bits and pieces of the theory are clearly present in the work surveyed above. For example, one reason why it may make sense for GM's CEO to be the one to allocate resources across different lines of cars and trucks – even though some of these lines could in principle be housed in stand-alone firms – flows from the complementarity of authority and monitoring incentives. This is the idea that a CEO's authority will make

[57] Bolton and Scharfstein (1998) provide a nice discussion of how this approach differs from the GHM property-rights paradigm [Grossman and Hart (1986), Hart and Moore (1990), Hart (1995)]. The common element is the heavy reliance on GHM notions of authority and control in an incomplete-contracting environment. One important distinction is that in GHM, everything is driven by the impact of asset ownership on agents' ex ante incentives. This tends to imply that assets should be owned on a very individual basis, making the GHM model hard to reconcile with large firms where virtually none of the employees other than the CEO have clear-cut control rights [see also Holmström and Roberts (1998) and Holmström (1999b)]. Also, the capital-allocation perspective emphasizes ex post inefficiencies – namely, misallocations of capital – in addition to the sort of ex ante incentive effects seen in GHM.

her more willing to invest in learning about any given business that she oversees than would be say, a bank lender, or an atomistic shareholder. A natural corollary to this idea is that if the CEO is to be given authority over multiple lines of business, these should be lines of business that can potentially be well-monitored and well-understood by a single properly-motivated individual.

Moreover, if the CEO's authority-based incentives help lead her to become an expert with respect to multiple lines of business that report to her, this can in turn have beneficial incentive effects on the agents further down in the hierarchy. Stein (2002) argues that the desire of these lower-ranking agents (e.g., division managers) to attract a larger share of the overall capital budget need not always have adverse consequences. In particular, the more expert is the CEO – in terms of being able to assess the value implications of data presented to her by her subordinates – the more likely it is that the subordinates' attempts at advocacy will take the form of useful information creation as opposed to wasteful and uninformative lobbying.

In contrast, if the CEO is not able to develop significant expertise across lines of business (as might be the case in the Holmström–Kaplan example of an integrated car/computer company), the potential bright side of giving authority to the CEO is obviously not exploited. And indeed, when an ill-informed CEO allocates capital, the outcome can be *strictly worse* than one in which capital is allocated by an equally ill-informed capital market. Now the fact that the CEO has the authority to move resources around inside the firm, but no expertise, suggests that the sorts of rent-seeking problems identified by Meyer, Milgrom and Roberts (1992), Rajan, Servaes and Zingales (2000) and Scharfstein and Stein (2000) are most likely to come to the fore. In this context, the capital market has the advantage that even if it is no better informed, its impersonal and hence objective nature – there is no single identifiable person vested with so much authority over resources – makes it much less subject to such rent-seeking distortions.

In sum, according to this informal theory, the boundaries of the firm are determined by the following tradeoff between managers vs. markets as allocators of capital. On the one hand, by giving a CEO control over a set of assets, and the authority to redistribute capital across these assets, one sets her up with high-powered incentives to become a delegated expert. On the other hand, the very fact that she has the authority to move capital around makes her vulnerable to rent-seeking on the part of her subordinates; all the more so because she is herself only an agent of investors and hence will not necessarily respond to the rent-seeking pressure as a principal might want her to.

This managers vs. markets tradeoff can be thought of as loosely analogous to the question of what types of political issues should be put to a direct vote of the general electorate, as opposed to being decided by previously-elected representatives (e.g., in Congress). Since elected officials are vested with legislative powers, they have more incentive to become informed about the details of the issues before them – their power will allow them to put their information to good use. It is hard to imagine, for example, that the average citizen would devote as much time as a Congressman to learning the arcane details of a banking deregulation bill. However, precisely because they as

agents are vested with legislative powers, elected officials are more subject to lobbying and the potential for corruption than ordinary citizens. The general electorate, like the capital market, may be less well-informed than the delegated experts, but it is also less vulnerable to rent-seeking. As with the boundaries of the firm, the goal is to strike a proper balance.

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