

Firm Size, Finance, and Investment

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There is something in our national consciousness that looks fondly upon the small firm. This affection for small business is not entirely unwarranted. Small firms account for an important part of economic activity.¹ A vast majority of all businesses in the United States are small; over 90 percent have fewer than 20 employees. Small firms accounted for between 40 and 50 percent of GNP and over 60 percent of net job growth in the 1980s.² Such figures have drawn considerable attention in recent discussions of attempts to ease securities and bank regulation or to promote other policies concerning the financing of small firms.

This long-standing affection has at times generated significant public policy. Much of our antitrust policy was arguably generated more by a general mistrust of bigness and desire to protect small business than by a concern for the inefficiencies of monopoly pricing. Recently, much attention has been paid to the plight of the small firm in raising capital in the face of recently strengthened bank regulation. Indeed, it seems that a necessary part of the debate over any proposed public policy action, from health care to tax policy, is the question of how it will affect small firms.

■ A related working paper, "Learning, Firm Size and Investment," was presented at the University of Kentucky, and the author thanks the seminar participants, and Dan Black in particular, for their comments. This article has also benefited from discussions with Jeff Lacker and with Gordon Phillips on this and ongoing joint work. The views expressed herein are the author's and do not necessarily represent the views of the Federal Reserve Bank of Richmond or the Federal Reserve System.

¹ Small firms can be defined as those with fewer than 500 employees or those with revenues or assets below some standard. The Small Business Administration uses the employment definition, while the Securities and Exchange Commission uses a revenue standard (\$15 million annually) for exemption from some registration requirements.

² These figures are drawn from the Small Business Administration (1992).

This article examines some aspects of the financial behavior of small firms as compared to larger firms. A particular focus is the question of whether there is a failure in financial markets that limits the activities of small firms. Both theoretical and empirical analyses of financial behavior have suggested that such a market failure might exist. The theoretical arguments center on problems of asymmetric information; when lenders are less well informed than borrowers about borrowers' conditions and activities, credit markets may not clear in the conventional fashion.³ Such a failure of markets to function efficiently might suggest a role for government intervention to improve the allocation of financial capital.

Recent evidence on the investment behavior of large and small firms suggests the possibility that informational problems weigh more heavily on small firms. In particular, there is evidence that investment by smaller firms is more sensitive to factors that, in a world of perfect capital markets, are not expected to affect investment. The first section of this article surveys some of the evidence on differences in financial behavior across firm sizes, including the evidence on investment behavior.

The second section turns to theoretical interpretations of the evidence. The first of these interpretations is the theory of market failures due to asymmetric information, building on the idea that a firm's insiders will often know more than outsiders about the firm's prospects. This asymmetry can increase the cost of raising funds from outside investors. The asymmetric information perspective has led some to conclude that the market typically fails to provide sufficient financial capital.

While the likely effects of informational constraints may well vary with firm size, the interpretation of differences in behavior in terms of asymmetric information implicitly treats firm size as exogenous. The central point of this article is that an attempt to provide a theoretical explanation of differences in behavior across firm sizes should begin with a theory of firm size. The next subsection describes such a theory, drawing from the industrial organization literature; it is a life cycle theory in which firms, when they are young, learn about their productive capabilities. This learning drives the differences in behavior between large and small firms. It turns out that this theory, without informational market failures, is consistent with much of the evidence on firm size and financial behavior. Hence, movement toward a theory that jointly determines size and financial behavior weakens the case for a market failure interpretation of the evidence.

Section 3 discusses some implications for public policy toward the financing of small firms. Under the theory of market failure due to adverse selection,

³ Greenwald and Stiglitz (1986) present a general theory of market failures in the presence of asymmetric information.

investment undertaken by small firms is inefficiently low compared to a world of perfect information. Some have argued that government intervention can move financial markets in the direction of greater efficiency by giving favorable treatment to small firms. Under the alternative theory, there is no market failure and no role for government intervention.

1. FINANCIAL BEHAVIOR OF SMALL AND LARGE FIRMS

An image of small business that has appeared in the popular media in recent years is one of entrepreneurs starved for capital. According to this image, recent banking legislation reduced the flow of bank loans to small firms. At the same time, venture capital provision of equity financing fell from the peaks it achieved in the middle of the last decade. Without access to external financing, small firms have been limited in their ability to grow and contribute to employment.

Parts of the above image are no doubt accurate. Most measures of the flow of external finance to small firms show a decline in recent years. Such numbers, however, must be understood in the proper context. Has the recent experience of small firms been qualitatively different from that of larger firms? By at least some measures, the answer is no. For instance, commercial and industrial bank loans to all firms, large and small, fell in 1991.⁴

To gain greater perspective on the recent experience of small and large firms, one might ask whether there are any systematic differences in the financial behavior of firms of different sizes. One approach to such a question is to examine the balance sheet characteristics of small firms. The Census Bureau's Quarterly Financial Report provides aggregate balance sheet data for all manufacturing firms and for small manufacturing firms (firms with less than \$25 million in assets). These data give rise to a few observations. Most notably, small manufacturing firms use more bank debt, as a percent of assets, than do larger firms. From 1986 to the first quarter of 1993, small firms' loans from banks have averaged about 20 percent of total assets, while the corresponding figure for all firms has been less than 10 percent. The difference in the reliance on bank loans is particularly pronounced in long-term debt (with a maturity of greater than one year). While smaller firms have fewer long-term liabilities (about 40 percent of total liabilities compared to almost 60 percent for all firms), more than half of all long-term debt of small firms is in the form of bank loans. For all firms, bank loans constitute less than one-third of all long-term debt.

The observations above on the reliance of small firms on banks are consistent with findings from earlier periods. Andrews and Eiseman (1981) find

⁴ The Federal Reserve Bulletin provides figures on commercial and industrial loans.

the same pattern in data from the 1970s and from 1958. The importance of banks for small firms is also apparent in survey evidence, such as the Federal Reserve's National Survey of Small Business Finance. In an analysis of that survey's data, Elliehausen and Wolken (1990) uncover the additional result that the smaller the firm, the greater the importance of local rather than distant banks. This result suggests the importance to small firms of having a close relationship with suppliers of funds. Correspondingly, small firms are less likely to raise funds in public securities markets.

Since the set of firms that have not issued public securities tends to consist of firms smaller than those in the set of public corporations, it should not be surprising that those firms issuing securities for the first time are often small relative to those already public. Most often, a firm's first public issue is of common stock equity (an initial public offering, or IPO). While the size distribution of firms undertaking IPOs varies from year to year, it typically includes many small firms (assets less than \$10 million). In 1984, virtually all IPOs were by small firms, while in 1985 and 1986, small firms conducted about half of all offerings.⁵

Even within the population of only public corporations, there are differences across firm size categories. In addition to the same tendencies cited above, it is worth noting the covariation of firm size and dividend behavior among public firms. Fazzari, Hubbard, and Petersen (1988), in their study of the investment behavior of a panel of firms, divide their sample into three classes based on dividend behavior: firms with a dividend to income ratio persistently less than 0.1; those with a dividend to income ratio between 0.1 and 0.2; and those who persistently paid out at least 20 percent of their income in dividends. The average size (measured by 1970 capital stock) of the highest dividend-paying group was more than four times that of the middle group and more than ten times that of the lowest group.

Another way in which smaller firms seem to differ systematically from larger firms is in the relationships between financial variables and real economic decisions. Most notably, there appear to be differences in the determinants of investment. A useful benchmark for thinking about investment and its relation to financial conditions is the irrelevance result of Modigliani and Miller (1958). The "Modigliani-Miller Theorem" states that a firm's financial policy (capital structure, payment of dividends, etc.) has no effect on its real decisions, including investment. Technological and product market opportunities determine investment and other real decisions. The firm's financial choices, for instance, of debt versus equity financing, should have no bearing on its real opportunities.

The Modigliani-Miller result applies to a frictionless world of perfect markets in which all market participants are always fully informed about firms'

⁵ Small Business Administration (1992).

opportunities. Empirically, the result seems to fail frequently. Financial characteristics are correlated with firm behavior, and such relationships are most apparent for smaller firms.

One focus in the literature on financial characteristics and real behavior has been on the relationship between cash flow and investment. In the frictionless world of the Modigliani-Miller theorem, the two should be unrelated. A firm with good investment opportunities should be able to fund its investment either out of its own cash flow or by raising external funds. In a world of perfect information, a firm with good opportunities will face no barrier in raising funds from outside investors or financial institutions. Hence, unless the size and quality of the firm's investment opportunity set is correlated with current cash flow performance, there is no reason to expect a correlation between cash flow and investment. Contrary to this theoretical perspective, there is considerable evidence that for at least some firms, cash flow does help determine investment.

The evidence on investment and cash flow comes in two forms, corresponding to two standard approaches to the empirical study of investment behavior. The first of these is based on the Tobin's q theory of investment.⁶ Under this theory, the ratio of a firm's market value to the replacement cost of its assets (Tobin's q) serves as a measure of the firm's investment opportunities. The theory suggests a regression equation of the following nature:

$$I_{it} = \beta_{0i} + \beta_{0t} + \beta_1 q_{it} + \beta_2 CF_{it} + \epsilon_{it}, \quad (1)$$

where I_{it} is firm i 's investment in fixed capital in time period t (as a fraction of current fixed capital input), q_{it} is the Tobin's q ratio and CF_{it} is cash flow (as a fraction of current fixed capital input). The null hypothesis is that $\beta_2 = 0$. This approach is followed by Fazzari, Hubbard, and Petersen (1988). They reject the null hypothesis, estimating positive values of β_2 on a sample of public corporations. In particular, when the sample is divided into subsamples according to dividend behavior, cash flow is most strongly related to investment for the subsample of firms paying the lowest dividends.

A central focus in interpreting the results on cash flow and investment is the extent to which, conditional on other variables included in the analysis, cash flow provides information on the firm's investment opportunities. If cash flow does provide such information, then the empirical findings are not necessarily contrary to the Modigliani-Miller results. This issue is the concern of much of the next section. With this concern in mind, there have been some recent studies that have supplemented the evidence on cash flow and investment. One such study is by Fazzari and Petersen (1993). They augment equation (1) to estimate

$$I_{it} = \beta_{0i} + \beta_{0t} + \beta_1 q_{it} + \beta_2 CF_{it} + \beta_3 \Delta W_{it} + \epsilon_{it}, \quad (2)$$

⁶ Tobin (1969).

where ΔW_{it} is the change in firm i 's working capital in period t (as a fraction of current fixed capital input).⁷ Like cash flow, working capital can serve as an internal source of funds for fixed investment. For a sample of firms paying low dividends, Fazzari and Petersen estimate a statistically significant negative value for β_3 . They interpret this result as further suggesting the importance of internal finance to these firms; holding cash flow constant, a firm finances increasing investment by drawing down its holdings of liquid assets. A similar finding was obtained by Whited (1991) who examined the tendency of firms to accumulate liquid financial assets before undertaking a program of fixed investment.

The second approach used in studying investment behavior involves the direct estimation of the "first-order condition" in a firm's value-maximizing choice of investment. A simplified version of such a condition for a typical firm can be expressed as

$$E_t[mpk_{t+1}] = \rho_t, \quad (3)$$

where E_t denotes expectation conditional on information available at time t , mpk_{t+1} is the marginal product of the capital input, and ρ_t is the "user cost of capital," which, in its simplest form, includes the rates of interest and capital depreciation between times t and $t + 1$. Equation (2) determines the desired amount of capital in the next period (period $t + 1$), and (net) investment is simply the change in capital input from the current to the next period. Gilchrist (1990) and Whited (1992) are among the authors using this approach, the so-called Euler equation approach. The findings tend to parallel that of Fazzari, Hubbard, and Petersen. Equation (2) fits the data well for a sample of firms that regularly pay dividends but not for firms with low, irregular, or no dividend payment histories. While both approaches outlined above divide the samples of firms according to dividend policy, it should be noted that this procedure also tends to divide firms by size. As mentioned above, Fazzari, Hubbard, and Petersen provide evidence on the correlation between size and dividend policy.

The evidence suggests distinct differences in financial behavior across firms in different size classes. Smaller firms tend to make considerably less use of public securities markets for raising external funds. Accordingly, when they do raise external funds, they are more likely to borrow from a bank or other financial institution. Lastly, smaller firms seem to rely more on internally generated funds to finance their investment activities.

⁷ Working capital is current assets (primarily inventories, cash, and accounts receivable) less current liabilities (short-term debt and accounts payable).

2. TWO THEORETICAL PERSPECTIVES ON FIRM SIZE AND FINANCE

While the empirical studies reviewed above provide a picture of how small and large firms differ, they give little insight into why they differ. Providing such insight is the role of economic theory. This section provides two theoretical perspectives that might be used to interpret the empirical picture painted above. The focus of the first is on imperfections in financial markets. The second focuses on the causes of variations in firm sizes in a dynamic, competitive economy.

Informational Market Failures

The apparent rejections of Modigliani-Miller results have led many economists to seek out the market imperfections, or sources of market failure, that cause financial behavior to differ from the idealized model. One imperfection on which much attention has been focused is the problem of incomplete or asymmetric information. A transaction is made under incomplete information when one party to the transaction has information that is relevant to the other party's decision. For instance, a seller may know details about the quality of the product or service being sold. It may be difficult for the buyer to perfectly discern all these details on inspection, or even upon receiving the product or service. In such a situation, a seller of a truly high-quality product may be unable to receive a price which fully reflects the product's quality. If high quality is more costly to provide, then the inability to extract a higher price may serve to drive high-quality providers out of the market. This problem, first analyzed in some detail by Akerlof (1970), is known as the "lemons" problem or "adverse selection" problem.

Another variety of asymmetric information problem is the "moral hazard" problem. The term "moral hazard" refers to the fact that the observable performance of one party to a transaction often depends partly on that party's unobservable actions and partly on random events. Hence, the contract governing the transaction cannot directly prescribe the "morally hazardous" action. Desired actions must be indirectly induced through the payment incentives in the contract.

An extensive theoretical literature has examined the implications of private-information problems for financial markets. The focus, here, will be on that part of the literature which finds that asymmetric information can raise a firm's cost of obtaining external finance. If the cost is raised enough, the firm may be forced to rely entirely on internal funds to finance its investment projects. One line of this research examines the implications of adverse selection for the ability of firms to raise funds through the issuance of debt to a competitive market of

investors or institutions.⁸ The key insight in this line of work is that, as in the lemons problem, a high-quality borrower (that is, one with a low probability of default) may have difficulty credibly conveying credit quality information to lenders. Hence, even a good borrower will have to pay an interest rate that compensates for the probability that any borrower might be a bad borrower (with a high probability of default). In some cases examined in this work, the problem becomes so severe that some (high-quality) borrowers are unable to obtain funds at any interest rate. Stiglitz and Weiss (1981), among others, have argued that such a credit rationing result is to be expected in financial markets subject to incomplete information.

There also has been work that has argued that moral hazard can impair a firm's access to external funds. A notable example is Gertler (1992). In such models, outside investors are unable to directly monitor all of the resource allocation decisions made inside the firm. An insider (manager) may have an incentive to misallocate resources for personal benefit. This incentive is reduced when the manager's own resources are put at risk in the enterprise.

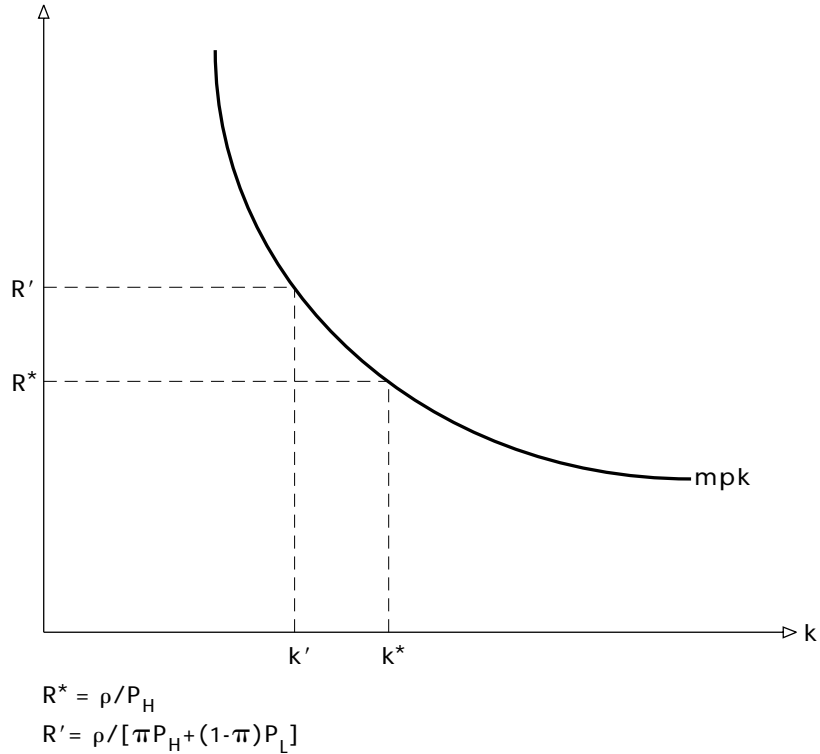
When viewing financial markets through the lens of asymmetric information theory, financial intermediaries often emerge as institutions that can partially resolve the problems of adverse selection and moral hazard by spending resources on information production. A bank or other intermediary might, for instance, invest resources in evaluating a borrower prior to lending, as in Boyd and Prescott (1986). Alternatively, such an institution might engage in costly monitoring of the borrower's performance after a loan has been made, as in Diamond (1984). This perspective is consistent with the popular view of banks and other intermediaries as institutions that specialize in information-intensive financial arrangements.

When asymmetric information affects the availability or cost to a firm of securing external funds, then the Modigliani-Miller results on the independence of financial behavior and real investment may not hold. A simple example may be useful.⁹ Consider a firm that initially has no assets, either in the form of fixed capital or in the form of more liquid assets. The firm chooses its investment in fixed capital, k (in nominal value), and funds its purchase in a competitive credit market. If it is successful, the firm will produce output according to a production function, $f(k)$ (giving output in nominal value). Corresponding to this production function is a downward-sloping marginal product curve, as in Figure 1. If unsuccessful, the firm produces nothing and defaults on its

⁸ Lacker provides a thorough and critical review of this line of research in this issue of the *Economic Quarterly*.

⁹ The analysis of this example is admittedly incomplete, for a number of reasons. The purpose is not to give a complete model of financial markets but to give a sense of the directions in which asymmetric information can move financial behavior away from the benchmark case of full information.

Figure 1 Demand for Capital by a High-Quality Firm



loan. There are two possible types of firm. High-quality firms succeed with probability P_H and low-quality firms succeed with probability $P_L < P_H$.

Consider the problem facing a high-quality firm. If quality is known to all participants in the credit market, then the high-quality firm can borrow at an interest rate R per unit borrowed such that $P_H R = \rho$, where ρ is the rate of return available to lenders from an alternative risk-free investment. In this case, the firm's choice of k would be determined by equating the (expected) marginal product of capital to its (expected) marginal cost, as in equation (2). This choice is given by k^* in Figure 1.

Suppose now that only a firm's insiders know the firm's true quality. Lenders know only that some fraction, π , of all firms are high-quality. If the financial market cannot discriminate and must lend to all on equal terms, then the interest rate on loans, R , must be such that $[\pi P_H + (1 - \pi)P_L]R = \rho$. Facing such a rate, a high-quality firm chooses an amount of capital given in Figure 1 by $k' < k^*$.

The presence of low-quality borrowers who cannot be screened out might be said to impose an externality on the high-quality borrowers. Note, however, that this externality is only relevant to a high-quality borrower without internal resources. If, before making its investment decision, the firm received a windfall of cash, it would make the higher investment k^* . Hence, this simple example suggests how, in the presence of asymmetric information, a firm's investment decision can be sensitive to random shocks to cash flow. It is also worth noting that the example suggests conditions under which a firm might find it worthwhile to utilize the type of costly information production provided by a bank. If we think of this information production as providing a "stamp of approval" or certification of true quality, then the value of obtaining such certification depends on the premium resulting from asymmetric information. This premium, the difference between R' and R^* in Figure 1, is decreasing in π , the fraction of high-quality borrowers in the population. Hence, if the role of financial intermediaries is to produce information that counteracts problems of adverse selection, then the services of intermediaries will have greater value the more severe the adverse selection problem faced by high-quality borrowers.

Under the asymmetric information view of financial markets, some firms will undoubtedly be more subject to the problems of adverse selection than others. Some firms will have a track record of past performance that will make it difficult to hide flaws and overstate virtues. Others, particularly young firms, will come to financial markets as relatively unknown entities. Hence, if one looked at a cross section of firms, one might expect deviations from the benchmark of frictionless finance to be inversely related to a firm's age and experience. The empirical evidence summarized above suggests an inverse relationship between such deviations and firm size. Therefore, the results of the asymmetric information approach will best conform to observed behavior if firm size and age are correlated. It is probably not surprising that age and size are, in fact, positively correlated in large cross sections of firms. One might imagine, then, a life cycle theory of the firm: as firms grow, they acquire publicly observed experience that enables them to loosen the bounds of financial constraints. Occasionally, as a result of changes in technology, preferences, or personnel, a firm's past experience becomes irrelevant for its future performance. At this stage, a firm either ceases to exist or returns to an earlier stage in the life cycle.

Life cycle models like that suggested above have, in fact, been used in analyzing the distribution of firm sizes in markets and economies. As will be discussed in the next subsection, the examination of such a model reveals that many of the empirical facts outlined above can be explained simply by the life cycle features of the model, without the additional feature of asymmetric information. This finding should prompt caution in considering the possible public policy implications of analyses based on informational market failures.

A Life Cycle Approach to Firm Size and Behavior

Analyzing differences in financial behavior among firms of different sizes is a bit like reading a book from the middle onward. You find characters reacting to a situation, but you do not know how they got into that situation. Similarly, in understanding differences between large and small firms, it may be useful to have a notion of what determines firm size. In other words, it may be useful to have a theory of the size distribution of firms in a market or an economy. Such a theory should be broadly consistent with empirical facts about size distributions.

The industrial organization literature has established a number of facts about size distributions. Simon and Bonini (1958) observed many of these facts, and more recent studies have provided some confirmation and some revision.¹⁰ The first such fact is that there are, indeed, persistent differences in firm size within industries as well as across industries. Size distributions, either at the industry or aggregate level, tend to be skewed, with relatively small numbers of the largest firms and a large mass of firms in the smaller size ranges. Earlier studies concluded that rates of growth were independent of firm size, but more recent work, such as Evans (1987) and Hall (1987), has found this to be true only among larger firms. Overall, there is a negative correlation between size and growth. In addition, firm size is positively correlated with firm age, as found, for instance, by Evans (1987) and Dunne, Roberts, and Samuelson (1988). This last fact strongly suggests that life cycle effects may be important for understanding differences between the average behavior of small and large firms.

What the facts outlined above suggest is that there is a considerable amount of heterogeneity among firms. A model of a competitive economy that recognizes these facts of industrial organization should incorporate some form of heterogeneity into the fundamentals of the model economy. One such model has been provided by Lucas (1978). In a simplified version of that model, there is a generic technology available for using capital input to produce an output. Productivity, however, also depends on the ability of the entrepreneur or manager using the input.¹¹ Hence, the manager-specific technology can be represented by $y = \theta f(k)$, where y is output, k is capital input, and θ is the ability of the manager. Choice of inputs is like that represented in Figure 1, in which marginal product of capital is set equal to ρ , the market cost of capital. The curve mpk is higher the greater is the parameter θ . Accordingly, for any market cost of capital ρ , firms managed by managers with higher θ s will be bigger than those with lower θ s.

¹⁰ For instance, see Evans (1987) and Hall (1987).

¹¹ Lucas' model also considers labor input and the division of the economy's population between workers and manager-entrepreneurs.

In the Lucas model, the underlying distribution of ability in the population determines the size distribution of firms. As a static model, however, it cannot directly address facts concerning the growth of firms. A related model, first studied by Jovanovic (1982), adds a dynamic learning process to an environment similar to that of Lucas. A firm begins its lifetime uncertain of the value of θ , its firm-specific productivity parameter. Output has a stochastic component, so that experience provides imperfect information about ability. As a firm accumulates more experience over time, uncertainty about the parameter, θ , declines.

In both the Lucas and Jovanovic models, there is an opportunity cost to the manager of continuing to produce. This might be, for instance, the value of working for the market wage or the value of starting a new productive endeavor. In the static model of Lucas, the existence of such an opportunity cost simply means that there is a “marginal” level of ability θ_0 . Anyone with $\theta > \theta_0$ becomes a manager and hires inputs, while anyone with $\theta < \theta_0$ pursues the alternative activity. More precisely, if the value of not being a manager is C (independent of ability), then the marginal ability level is determined by

$$\theta_0 f(k(\theta_0)) - \rho k(\theta_0) = C. \quad (4)$$

In equation (4), the notation $k(\theta)$ indicates that the optimally chosen level of capital input is a function of managerial ability. The determination of θ_0 is depicted in Figure 2. In that figure, $v(\theta)$ is the return to being a manager with ability θ . Figure 3 shows how the determination of θ_0 serves to truncate the distribution of abilities in the population. Hence, even if the underlying distribution is symmetric, as in the figure, the distribution of ability among those who operate firms will be skewed. This skewness carries over to the distribution of sizes, because size rises with ability.

In the Jovanovic model, the marginal ability level would be determined exactly as in equation (4) if managers were fully aware of their abilities from the outset. With initial uncertainty and learning through experience, a manager with *expected* ability less than θ_0 may find it worthwhile to continue to produce on the chance that, through favorable experience, he will learn that he is able enough to remain a manager in the long run. In other words, a firm may be willing to take an operating loss, because production has *informational value*.

A manager’s willingness to incur a short-term loss in exchange for information depends on two things: the current expected value of θ and the age of the firm. The lower the manager’s expected ability, the greater the expected operating loss from continuing to operate and the smaller the probability that the next observation will be good enough to raise expected θ above θ_0 . The older the firm, the more experience it has accumulated. This experience serves to reduce the remaining uncertainty about θ . Less uncertainty about θ , in turn, implies a lower probability of experiencing output much greater than expected.

Figure 2 The “Marginal” Firm

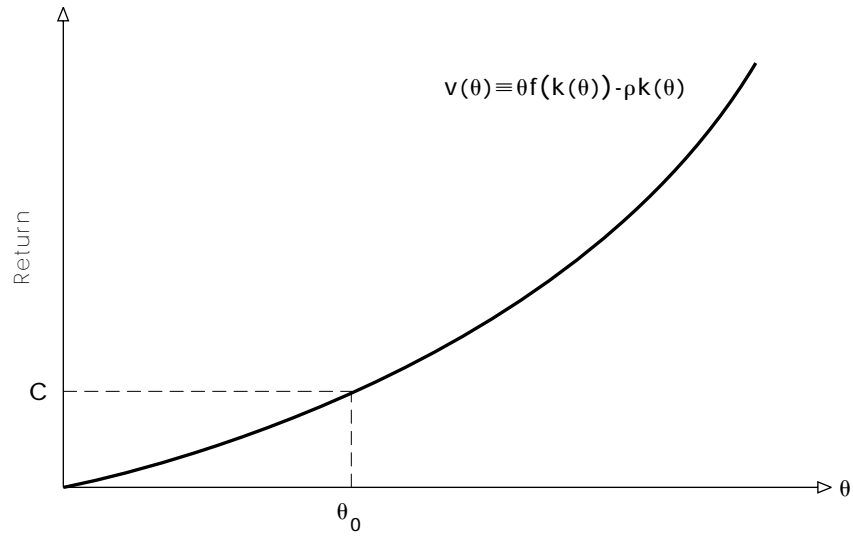
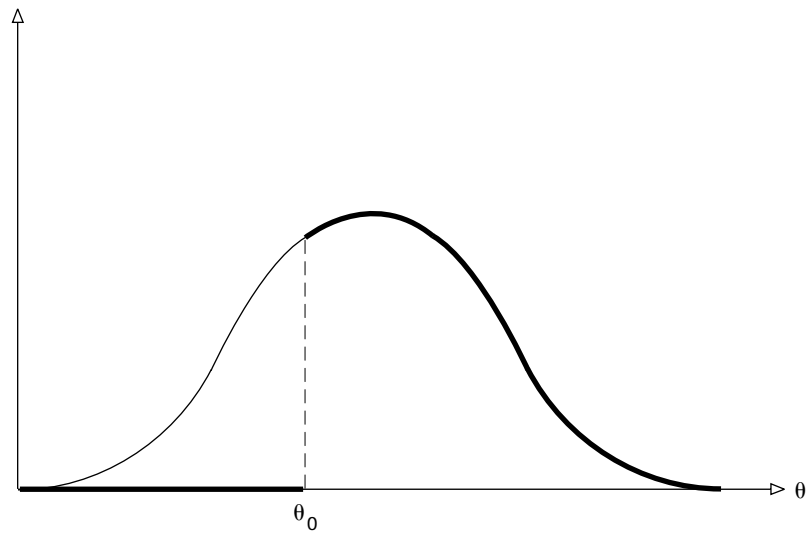


Figure 3 The Distribution of Abilities Is Truncated



Consequently, the probability of a substantial shift in expectation is reduced. In the learning model, then, a manager will continue to produce as long as expected ability is greater than some marginal value, θ_{0n} , where n is the age of the firm (the number of periods for which it has been operating). Hence, there is a sequence of thresholds for firms to continue operating. This sequence has two notable properties. First, $\theta_{0n} < \theta_0$, indicating that firms will be willing to take losses in the short run. Second, $\theta_{0n+1} > \theta_{0n}$, stating that older firms will be less willing to take such losses.

Since expected ability determines size, the learning model predicts a positive correlation between size and age; the further below θ_0 , the smaller the firm and the less experienced it is likely to be. A very stark version of this model appears in Weinberg (1993). In that version, a firm starts with a prior expectation of its productivity. This prior might come from the manager's past experiences in other activities or from pre-production research and development work. Hence, there are a variety of prior expectations in the population. By producing for a fixed amount of time (one period), the firm learns its true ability with certainty. In this way, the population of firms can be separated into two classes: young firms, who are in the process of learning, and mature firms, who have already learned their types. If each firm, young or old, faces an exogenous probability of disappearing (due to exogenous shocks to its technology or personnel), there will tend to be a steady-state mixture of young and mature firms in the economy. Young firms will be smaller, on average, than mature firms. They will also face a higher probability of exit, since they can exit either because of exogenous shocks or because they learn that their ability is not great enough to merit continued operation.

The simple, two-class version of the learning model makes it quite easy to examine differences in investment behavior. The investment of mature firms is very simple. Since they have learned their firm-specific abilities, their investment (acquisition of capital for the next production period) will not respond to current output. In fact, their investment will, on average, merely replace depreciation (unless there are other sources of firm growth). Young firms, on the other hand, learn about their abilities from their current output. Hence, conditional on initial size, better performance implies a higher realized ability level, which, in turn, implies greater investment.

Notice that the relationship between investment and current performance is very similar to the empirical relationship discussed in Section 1, where cash flow was used as the measure of current performance. In the models discussed in this section, there are no imperfections in the capital markets; firms face no purely financial constraints. The authors of studies that found an effect of cash flow on investment certainly recognize that cash flow *could* be serving as an indicator of investment opportunities. What they overlooked, perhaps, was that economic theory should give us a strong a priori reason to believe that, in such regressions, cash flow *is* playing that role, for small firms in particular.

Comparing the Theoretical Approaches

The two perspectives sketched above represent the two most common explanations of findings of a cash flow effect in investment behavior of small, growing firms; an unexpected boost to cash flow might loosen the financial constraints arising from asymmetric information, or it might provide a signal of enhanced profitability and thereby shift investment demand. Notice that information plays a central role in both of these stories. In one, problems arise from the inability of some market participants to credibly convey private information to other participants. In the other story, information accumulates over time, but in a public way. While either one of these approaches can potentially explain the relationship between investment and cash flow, how do they compare in addressing some of the other facts outlined in Section 1? This section examines that question.

In the asymmetric information approach, cash flow affects investment, because firms subject to adverse selection pay a premium for external funds. Some of the evidence seems to support this notion. The firms for whom the cash flow effect is the greatest are firms that pay very little in dividends to shareholders. For these firms, working capital, which consists of short-term, liquid assets, can serve as an additional source of internal investment funds.

In a full information, Modigliani-Miller world, a firm would be indifferent between the use of internal and external funds. If, as in the learning model, current income served as a signal of profitable investment opportunities, then paying the income out as dividends and raising investment funds externally would be equivalent to using the income to fund investment internally. Hence, the Modigliani-Miller framework makes *no* prediction about the choice between internal and external funds. Suppose that, in an otherwise frictionless environment, there were a *small* transactions cost associated with raising external funds.¹² Firms would then have sufficient reason to prefer internal funds. That is, rather than paying dividends and raising funds externally as needed, a young firm with good growth prospects will retain earnings to fund its likely investment needs. Hence, problems of asymmetric information are sufficient but not necessary for a preference for internal funding.

The learning model, then, is consistent with the observations on investment behavior and the use of internal funds. Small firms are more likely to be young firms and engaged in learning. For these firms, the presence of favorable investment opportunities is correlated with the presence of ample internal funds, generated from current and recent favorable performance. Larger firms are more likely to be mature. For these firms, investment opportunities are less tied to firm-specific learning from experience. They are correspondingly more likely

¹² The type of cost considered here might be the cost of negotiating with an individual investor or the cost of making the public aware of an issue of public securities.

to have opportunities arise in times of low internal resources, requiring them to go to external sources for funds.

Other than the observations on investment behavior, the key facts discussed in Section 1 concerned where firms go for external funds. Most significantly, small firms go to banks for more of their financing than do large firms. Under the asymmetric information approach, one might suppose that asymmetric information problems are more severe for small firms, so that the value of using bank evaluation and monitoring services is greater for small firms than for large firms. Diamond (1991) develops a model in which such monitoring is provided to firms with mid-level reputations. If such a firm enjoys good performance, it can improve its reputation and raise public funds. While firm size is not directly incorporated in that model, it is not difficult to imagine a direct link between reputation and size. A similar line of reasoning can be followed under the life cycle approach. Small, young firms are likely to face the greatest uncertainty about their own long-run productivities. Again, the value of the information production services of banks will be greatest for these firms. In both approaches, banks are seen as producers of information. In the former case, they produce information in an attempt to undo the effects of asymmetric information, while in the latter, they produce new information that is useful to the firm in making its resource allocation decisions. In either case, once a firm has accumulated enough information to know (or to convince others) that it is profitable enough to continue producing, it enters the class of more mature firms that utilize public debt and equity markets for their external financing needs.

In summary, a theoretical perspective based on asymmetric information that produces financial constraints is capable of explaining observed deviations from the type of behavior predicted by the frictionless framework of Modigliani and Miller. By itself, however, this perspective cannot fully explain how those deviations tend to be more apparent for smaller than for larger firms. Some explanation of why the asymmetric information problems weigh more heavily on some firms is needed. Such an explanation can be found in a life cycle perspective. As firms age and grow, they acquire a public reputation that can partially undo the constraints imposed by informational frictions. One finds, however, that the life cycle perspective is capable of explaining a great deal of the observed behavior by itself.

Clearly the two theoretical approaches discussed herein are not mutually exclusive. Firms that are young and still accumulating knowledge about themselves are likely to be firms about which insiders are better informed than outsiders. Knowledge of self precedes public reputation. However, the presence of financial constraints seems not to be necessary for explaining the empirical facts discussed above. Since the magnitude of asymmetric information problems is inherently difficult to measure, it would be discomfoting to rely on a theory that draws its explanatory power from informational frictions. The life cycle approach provides an attractive alternative.

3. SOME PUBLIC POLICY IMPLICATIONS

There has been a great deal of concern in recent years about the difficulties that small firms face in securing funds from financial markets and institutions. A number of regulatory and legislative initiatives have been put forward to address the financial needs of small firms.¹³ Some of these proposals seek to expand credit to small firms by easing regulations. The federal agencies with regulatory responsibilities for depository institutions have jointly developed a plan to allow well-capitalized banks to make some small business loans with reduced documentation requirements. Similarly, the Small Business Incentive Act would exempt small issuers from some of the registration and disclosure requirements for issuing public debt and equity securities. A third regulatory approach is represented by the Small Business Loan Securitization and Secondary Market Enhancement Act. This measure would ease banking and securities regulations to facilitate the establishment of a secondary market in small business loans, similar to that which exists for home mortgage loans. The establishment of such a secondary market is also the aim of the Small Business Credit Act, which would create a government-sponsored enterprise to buy and securitize small business loans. Hence, under this proposal, the federal government would play a more direct role in intermediating between loan originating banks and the secondary market. Finally, there have been proposals to provide direct government subsidies to small business lending. The Small Business Capital Enhancement Act would create a loan loss reserve fund with contributions from the government as well as from lenders and borrowers.

While the proposed approaches vary in how they would expand credit to small firms, they all share a fundamental premise: if faced with the same terms and rules as other firms, small firms would be underserved by the financial markets. Such a premise is consistent with the conclusions that have been drawn by some from the asymmetric information perspective. In this view, financial constraints impose inefficient limitations on the operations of small firms. Some have argued that such inefficiency can be countered by government intervention in financial markets. Even within the asymmetric information framework, however, the case for efficiency-enhancing intervention is weak.¹⁴ Briefly, there is no reason to suppose that the practices we observe in financial markets and institutions are not efficient responses to the informational frictions present in the economic environment. Since government intervention cannot remove those frictions, there is no reason to suspect that the government can improve on the responses developed by market participants. Under the life cycle approach, there is no market failure and, therefore, no reason to suspect

¹³ Humes and Samolyk (1993) describe the proposals mentioned here.

¹⁴ A critique of the case for intervention in the presence of asymmetric information is given by Lacker in this issue of the *Economic Quarterly*.

that the allocation of financial capital can be improved upon by government intervention.

As noted above, a number of the recent proposals have taken the form of easing regulatory requirements as opposed to directly or indirectly subsidizing the financing of small firms. These proposals might be based less on the notion of informational market failure than on the idea that financial markets and institutions face an excessive regulatory burden. If regulation is excessive, however, why should its easing be targeted to small firms? Again, there must be some reason why small firms are underserved. One possibility is the presence of informational market imperfections. Another is that the regulatory burden may be excessive for the financing of small firms but not for larger firms. This possibility could arise if, for instance, the costs of complying with regulations had a sizeable fixed component. This line of thinking probably lies behind proposals to allow small-firm exemptions from documentation and disclosure requirements for bank lending and issues of public securities.

Government intervention in favor of small firms, then, can be viewed as partially offsetting the effects of existing government intervention. Desirability of such a move depends on the reasons for the original intervention and on the judgment of how much regulation is excessive. Consider the case of easing bank regulations for small-firm lending. Suppose that financial behavior follows a version of the life cycle model in which banks provide information production services that aid firms (younger firms in particular) in their productive decisions. In this model, the population of potential firms is divided into three groups, depending on their priors: those that raise funds in public securities markets; those that receive bank funding and information services; and those that do not receive funding. Regulations on bank lending can be interpreted as increases in the costs of producing these information services. This increase in costs does two things. On the "high end," firms with sufficiently favorable priors will be induced to forgo bank services and raise more of their funds in public markets. These firms will be larger than the average bank client but smaller than the average public firm. On the "low end," firms with marginal priors will find themselves priced out of the market for bank lending. They will be among the smallest firms. Recent years have seen just such a coincidence of reduced bank lending with increasing numbers of initial public offerings.

A small-firm exemption to some bank regulatory requirements will reverse the low-end effect and, depending on the cut-off size, possibly the high-end effect. Is such a reversal desirable? Suppose that the original regulations were put in place to counter the perceived incentives for excessive risk taking induced by (implicit or explicit) government guarantees to bank depositors. The effects of such guarantees are similar to the effects of reducing the cost of bank information services. Hence, the various policies and counter policies serve to shift the margin between those firms that rely on bank financing and those that use public markets as well as the margin between those that are able to obtain

bank financing and those that are priced out of the market. Choosing the “best” setting for those margins is a difficult judgment.

The question of choosing the best setting of bank regulations has arisen in discussions of recent legislative and administrative changes in bank regulatory policy. Some have argued that stricter examination standards in the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 and risk-based capital requirements in the Basel Accord have driven the cost of bank lending so high as to contribute to a “credit crunch.” Such arguments have been made, for instance, by Bizer (1993) and others, on the editorial pages of *The Wall Street Journal*. On the other hand, with only a limited time since the Act’s implementation, it is difficult to disentangle the effects of FDICIA from other influences on aggregate credit market behavior.¹⁵ While it does seem to be the case that financing of small firms has been particularly slow since the implementation of FDICIA, it is also true that small-firm financing and productive activity is generally more volatile and responsive to business cycle fluctuations than that of larger firms.¹⁶ This greater volatility is consistent with the life cycle approach; while the responses of large firms to a change in market conditions are likely to be mostly “movements along demand curves,” the responses of small firms are more likely to include changes in decisions to enter or exit from markets.

In summary, neither the asymmetric information approach nor the life cycle approach provides a definitive justification for a tilt toward small firms in financial market policy. One might argue for a policy favoring small firms on other grounds. Since small firms account for a large share of employment growth and since many small firms engage in highly innovative activities, one might argue that small-firm activity generates external benefits that contribute to the long-run growth of our economy. If such an argument is used to justify policies favoring small firms, it is not clear why such policies should work through financial market manipulation. A simpler approach might come in the form of targeted tax breaks.

4. CONCLUDING REMARKS

Financial behavior should not be viewed in a vacuum. If we observe systematic financial differences across firm sizes, or across some other firm characteristic, we should seek to understand those differences in the proper context. This article has asked the question, “What does economic theory have to say about

¹⁵ For a discussion of the problem of identifying credit crunches, see Owens and Schreft (1993).

¹⁶ The generally greater volatility of small-firm behavior is found, for instance, by Gertler and Gilchrist (1991).

the *joint* determination of firm size and financial behavior?" By contrast, the interpretations of financial behavior leading to conclusions of market failure have been conducted out of context, lacking an explicit theory of the determination of firm size. While the market failure interpretation might suggest a positive role for government intervention in financial markets, this conclusion is less tenable when the empirical facts are viewed in the context of a theory of the size distribution of firms.

By taking size differences as given in interpreting financial differences, the market failure approach amounts to partial equilibrium analysis; one market (the financial market) is examined in isolation from other markets in the economy. Attempting to understand the joint determination of size differences and financial behavior is a step toward general equilibrium analysis. Hence, the arguments presented in this article might be viewed as contributions to the case for the benefits of conducting applied economic analysis within a general equilibrium framework.

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