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Empirical Capital Structure: A Review

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Abstract

This survey provides a synthesis of the empirical capital structure literature. Our synthesis is divided into three parts. The first part examines the evidence that relates to the cross-sectional determinants of capital structure. This literature identifies and discusses the characteristics of firms that tend to be associated with different debt ratios. In the second part, we review the literature that examines changes in capital structure. The papers in this literature explore factors that move firms away from their target capital structures as well as the extent to which future financing choices move firms back toward their targets. Finally, we complete our review with a set of studies that explore the *consequences* of leverage, rather than its determinants. These studies are concerned with feedback from financing to real decisions. For example, we explore how a firm's financing choices influences its incentive to invest in its workers, price its products, form relationships with suppliers, or compete aggressively with competitors.

1

Introduction

Corporations fund their operations by raising capital from a variety of distinct sources. The mix between the various sources, generally referred to as the firm's capital structure, has attracted considerable attention from both academics and practitioners. The empirical capital structure literature explores both the cross-sectional determinants of capital structure as well as time-series changes. This survey reviews both aspects of this literature.

Our review is organized around a simple framework that contains three key ingredients. The first is that at any point in time, there are benefits and costs associated with various financing choices, and that the trade-offs between these benefits and costs lead to well-defined target debt ratios. The second is the existence of shocks that cause firms to deviate, at least temporarily, from their targets. The third is the presense of factors that prevent firms from immediately making capital structure changes that offset the effect of the shocks that move them away from their targets. Almost all of the papers we examine can be conveniently classified as addressing one or more of these ingredients.

We begin our review with a group of studies that primarily deal with the first ingredient, the costs and benefits that determine a firm's capital structure. These can include the tax benefit of debt, deadweight costs of liquidation or reorganization, financial distress, and so on. The studies we discuss here are mostly cross-sectional in nature, addressing the extent to which firm characteristics, such as size and asset tangibility, line up with observed capital structures in a way consistent with theory. An implicit assumption of these cross-sectional studies is that the observed debt ratios are relatively close to the firm's actual targets. That is, shocks that move debt ratios from their targets are generally considered to be of second order importance in the interpretation of these cross-sectional leverage regressions.

These shocks are the focus of the second group of studies we consider. These studies focus explicitly on events in a firm's life that may cause it to be over- or under-leveraged relative to its target. These shocks can include "market timing" opportunities (periods where equity financing is temporarily cheap), periods of high (low) profitability that allow the firm to passively accumulate (deplete) its cash reserves, or rapid improvements in a firm's prospects that substantially change the value of a firm's equity. Additionally, deviations from value-maximizing targets can also stem from the firms' management who may realize private benefits from lower debt ratios. We discuss each of these alternatives in detail, exploring both the cross-sectional and time-series implications of such shocks.

Next, we move to the final ingredient — identifying factors that may prevent firms from constantly maintaining debt ratios that match their targets. To address this issue we first survey the empirical evidence on capital structure changes. For example, studies of the timing of the issuance of securities ask whether the debt vs equity issuance choice is consistent with firms acting to move toward their debt ratio targets. Then we turn to "speed of adjustment" models that examine how quickly firms move toward their targets. Such tests should be thought of as a joint test of ingredients one and three. That is, if leverage shocks are not rapidly corrected, then there are two possibilities — either target capital structures are not particularly important, or the adjustment costs are simply too high to warrant an adjustment.

This latter case describes what has been referred to as "pecking order" behavior, which is the subject of the next group of studies that we consider. According to the pecking order described by Myers (1984) and Myers and Majluf (1984), because of information asymmetries, firms issue equity only as a last resort, funding investments first with retained earnings followed by debt proceeds. Tests of the pecking order are also time-series regressions, and are often run as a horse race against standard speed of adjustment models.

To conclude our review, we examine a class of studies that consider how a firm's business decisions are influenced by how it is financed. For example, how does a firm's debt ratio influence how aggressively it prices its products? Can firms with high leverage extract rents from their workers, e.g., labor unions? Does leverage impede a firm's ability or willingness to invest? There are a number of studies in this literature that consider this feedback from capital structure to business decisions, and although these feedback channels have implications about the total costs and benefits of debt, we segregate these studies from our discussion of the target capital structure choice because the empirical issues are very different. In particular, the direction/causality in these studies run from the capital structure choice to the firm characteristic rather than vice versa.

The review is organized as follows. In Section 2, we briefly discuss some specification and econometric issues that will be important for many of the tests we consider. Then, in Section 3 we begin our review of cross-sectional capital structure determinants, focusing mostly on costs and benefits involving the firm's managers and suppliers of capital. Section 4 then explores factors that pull firms away from their leverage targets. Then, in Section 5, we discuss reasons why firms might not immediately reverse the effect of these leverage shocks, apparently allowing deviations from their targets to persist for extended periods of time. In Section 6, we explore a group of studies that looks at the leverage problem from a different perspective. Rather than asking what determines leverage, these studies explore how leverage feeds back into a firm's real business decisions. Finally, Section 7 concludes and provides suggestions for new research.

2

Econometric and Specification Issues

Perhaps the earliest cross-sectional observations about capital structure came from industry studies (e.g., Schwartz and Aronson (1967) and references therein), which documented significant differences in leverage across sectors. Regulated utilities and real estate firms, for example, tend to use substantial amounts of debt financing while firms in more technology-oriented industries tend to use very little debt. In addition, researchers have noted that even within industries, there is a sizeable variation in capital structures. For example, as of early 2008, the debt-to-equity ratio of ConocoPhillips (.25) was over three times larger than that of ExxonMobil (.08), despite the fact that they are very similar integrated oil companies. Moreover, individual firms often change their debt ratios over time, perhaps responding to changes in investment opportunities, agency costs, etc.

In order to explain these cross-sectional and time-series differences, capital structure theory focuses on the costs and benefits of the use of debt vs equity financing. When compared with equity financing, three aspects of debt financing deserve special consideration. First, the interest payments on debt are tax-deductible, whereas dividends paid to shareholders are not.[1] Second, debt is a hard claim that generally forces the firm to make cash disbursements regardless of its economic condition. Third, debt has strong liquidation rights (it is senior to equity), which can affect the decisions of firms when liquidation is likely. While in general tax effects favor the use of debt financing, the special cash flow and liquidation rights of debt can lead to financial distress costs that can offset the tax benefits of debt.

The empirical literature identifies a number of proxies that represent firm characteristics that are likely to be correlated with the costs and benefits of debt financing. For example, the tangibility of a firm's assets likely affects its losses in the event of financial distress, and therefore its target capital structure. Likewise, larger firms with more diversified assets may be able to avoid or mitigate financial distress costs, leading them to choose higher leverage ratios.

Before exploring these issues in more detail, it is worthwhile to highlight some potential specification issues, and outline ways in which they are addressed in the literature. As a starting point, consider a generic regression of a measure of firm leverage on a set of firm characteristics, the workhorse of many cross-sectional studies of capital structure:

$$Lev_{it} = X_{i,t-1}\beta + \varepsilon_{it}, \tag{2.1}$$

where Lev_{it} refers to firm i's debt ratio at time t, $X_{i,t-1}$ is vectors of firm i's characteristics (often measured from time $t-1$), and ε_{it} is the random disturbance. In most circumstances, the researcher is interested in one or more of the β coefficients, the sensitivities of a firm's observed debt ratio to variables expected to proxy for the costs or benefits of leverage. The problem is that there is a considerable ambiguity in the choice and interpretation of both the dependent and independent variables in these regressions.

The first problem is that the choice of the dependent variable is not completely obvious. Should debt be scaled by the market value of assets, or by the book value of assets? Scaling by market values is theoretically attractive (for example, in calculating a firm's weighted-average

[1] It should be noted that the tax advantage of debt financing differs substantially across countries. A number of countries have dividend imputation systems that effectively eliminate the tax advantages of debt financing.

cost-of capital), since market prices reflect future expectations of tax benefits, financial distress costs, etc. But because several popular proxies for determinants of capital structure (e.g., size, market-to-book ratios) include market values in their construction, a mechanical relation can arise. For example, Titman and Wessels (1988) note that even if firms choose "target" book leverages completely randomly, a spurious statistical relation may arise between market leverage and variables similarly scaled by market value. When market values increase, both the right- and left-hand side variables are simultaneously affected, albeit by reasons that have little to do with the spirit of the test.

For this reason, many researchers prefer to scale debt by book assets instead. This approach enjoys the additional advantage that managers appear to be concerned mostly with book leverage, as indicated by survey evidence (Graham and Harvey, 2001). Welch (2007) argues that there is still substantial ambiguity relating to how the debt ratio is measured, and suggests that researchers should focus either on debt scaled by capital or total liabilities scaled by total assets. The failure of a unified consensus in the literature perhaps reflects the merits (or pitfalls) of each, largely explaining why many empirical studies include multiple specifications.

In the section that follows we will discuss a set of independent variables that are used in a number of cross-sectional capital structure studies. These variables are generally viewed as imperfect proxies for the true underlying determinants of capital structure. As we will discuss, because of measurement problems and issues relating to endogeneity, the interpretation of these variables, and their relation to capital structure, have been subject to considerable debate.

3

The First Ingredient: Determinants of Target Leverage

A firm's target capital structure depends on a comparison between the present value of the benefits and costs of leverage. We begin this section with a brief discussion of the tax benefit of leverage, reviewing studies that attempt to document a relation between tax exposure and debt ratios. Then, we explore some of the costs that may offset this benefit. In particular, we focus mostly on costs that arise from financial distress costs, inefficient liquidation, and investment distortions driven by conflicts between equity holders and creditors. We organize this discussion by firm characteristics, e.g., asset tangibility, size, etc. Importantly, the discussion in this section assumes that firms are managed in the interest of their shareholders. We will subsequently discuss the implications of managers having different incentives than shareholders.

3.1 Tax Exposure

Theoretically, the most straightforward benefit of leverage is the tax deductibility of interest payments.[1] Because of these tax benefits, firms that are likely to generate higher levels of taxable income should, all else

[1] For a thorough treatment of taxes and leverage, see Graham (2006).

equal, include more debt in their capital structures. However, despite this straightforward theoretical prediction, empirically confirming the relationship between the tax benefits of debt and observed debt ratios has proved to be challenging.

To understand the tax benefits of debt, note that when a dollar of pre-tax earnings is distributed to shareholders (through either capital appreciation or dividends), taxes are levied both at the corporate tax rate, τ_C, as well as the rate paid by investors on equity, τ_E.[2] Thus, shareholders receive only $(1 - \tau_C)(1 - \tau_E)$ percent of the before-tax dollar of earnings. In contrast, since interest payments are tax deductible, earnings distributed as interest payments are taxed only once, at the investor's personal tax rate on ordinary income, τ_P.[3] Thus, for each dollar of interest expense, the double taxation of equity and the potentially different tax rates between equity and interest distributions imply a combined tax savings of:

$$(1 - \tau_P) - (1 - \tau_C)(1 - \tau_E) \tag{3.1}$$

The above expression assumes that each dollar of interest payments can be used as a tax shield. However, as DeAngelo and Masulis (1980) stress, firms often exhaust their tax shields (and thus pay zero taxes) and because of this possibility, the expected tax benefits of debt may be substantially less. This will be the case when the firm has a substantial amount of debt along with depreciation deductions, tax credits, and net operating losses (NOLs). Because these nondebt tax shields (NDTS) partially substitute for the tax shields generated from debt financing, we expect that firms that are likely to generate less taxable earnings, in the absence of debt financing, to select lower debt ratios.

Early studies of tax rates and leverage found surprisingly weak evidence for tax variables playing significant roles in leverage choices. Bradley et al. (1984), for example, find that firms with ample NDTS have higher leverage ratios than those with fewer nondebt shields. This evidence is confirmed in Titman and Wessels (1988), who also find no

[2] For simplicity, assume that τ_E is the average of the tax rates paid on dividends or long-term capital gains.

[3] Importantly, the double taxation of equity distributions is a feature of the U.S. tax code, and in general, will not apply to all economies.

evidence that NDTS reduce leverage.[4] These findings are particularly puzzling, given that when firms have substantial NDTS, such as NOLs or investment credits, they may not have enough taxable income to fully utilize both debt-based and non-debt-based tax shields.

MacKie-Mason (1990) argues however, that for most firms, NDTS probably should not have an impact on target leverage. The reason is that a substantial portion of NDTS is due to investment tax credits (ITC) that are likely to be generated by highly profitable firms with large capital expenditures. Because these firms generate substantial amounts of taxable earnings, the presence of substantial NDTS does not necessarily imply a lower marginal tax rate, and as such, does not necessarily imply a lower debt ratio. To get a better gauge of the effect of taxes on capital structure MacKie-Mason (1990) analyzes the decision to issue debt (rather than the debt ratio) and examines not only different types of NDTS, but interacts measures of NDTS with the probability that the firm will have no taxable earnings. He finds that debt issues are: (1) negatively related to tax-loss carry forwards (TLCF), (2) not related to ITC, and (3) negatively related to the interaction between ITC and the probability of having no taxable earnings. The first result follows the persistence of profitability — a firm that experiences a net loss one year is likely to also experience a loss the next (and as such, will not be able to use interest deductions from debt). His second and third findings are intuitive once it is recognized that ITC do not affect the marginal tax rates of profitable firms, and only has an impact for firms close to incurring an operating loss. He concludes that "tax shields do affect financing when they are likely to change the marginal tax rate on interest deductions (p. 1473)."

Graham (1996a) continues this line of research and attempts to quantify a firm's marginal tax rate (MTR) by taking into account its profitability history, tax rates, nondebt tax shields, accelerated depreciation, etc. The essential procedure is as follows. In each year t, for each firm i, a firm's income is simulated (50 iterations) for the years t through $t + 18$, which accounts for the fact that net-operating-losses

[4] Other early papers that fail to find reliable evidence of a tax effect on leverage include Marsh (1982), Long and Malitz (1985). Ang and Peterson (1986), and Fischer et al. (1989).

(NOLs) and investment tax credits (ITC) can be used for 15 years. The change in taxable income, ΔTI_{it}, is simulated as a random walk with drift, i.e.,

$$\Delta TI_{it} = \mu_i + \varepsilon_{it}, \tag{3.2}$$

where μ_i and ε_{it} are estimated as sample mean of ΔTI_{it} and ε_{it} is normally distributed with mean zero and variance equal to that of ΔTI_{it} for the sample. The beginning year (time t) taxable income is taken from Compustat. After this, the present value of the firm's tax bill for each simulated income path is calculated using the entire corporate tax schedule (not just the top statutory rate), incorporating NOLs, ITCs, and other features of the tax code. This process is then repeated for a different starting value of taxable income.

The difference in present values between the relative tax shields "represents the present value of taxes owed on an extra dollar of income," (p. 47) which is equivalent to a simulated MTR. Graham (1996a,b) then uses this estimate of each firm's MTR to predict changes in debt in a pooled time series using annual data from 1981 to 1992. He finds that changes in debt ratios are related to the simulated MTR in the ways predicted by static trade-off, i.e., firms with high marginal tax rates issue more debt than their counterparts with lower effective tax exposure. This result is robust to the inclusion of other control variables (many of which are subsequently discussed), suggesting that, e.g., proxies for growth or profitability are not driving the results. Subsequent studies also employing simulation techniques have confirmed this finding, both for debt ratios and debt levels (e.g., Graham (1996b), Graham et al. (1998), Graham (1999)).

Although most research has focused on the cross-sectional effects of taxes, it is also of interest to examine whether firms change their capital structures in response to changes in the tax code. The Tax Reform Act of 1986 provides a relatively rare example of an exogenous shock to the benefit of leverage, reducing the corporate tax rate for most corporations, and thereby decreasing the tax gain to leverage. Givoly et al. (1992) indeed find that debt became less popular after the reduction in tax rates, with highly taxed firms decreasing debt the most.

More recently, the 2003 tax act reduced the tax rate that investors pay on corporate dividends to 15%. This rate cut could potentially have two offsetting effects. The first effect is that it could increase the amount of dividends firms pay out, which would have the effect of decreasing retained earnings and thus increasing leverage ratios. Chetty and Saez (2005) present evidence that firms did indeed increase dividends after the 2003 dividend tax cut. However, since a cut in the dividend tax also increases the attractiveness of equity financing, it is not clear whether this will ultimately lead to an increase or decrease in debt ratios.

Compared to those exploring taxation at the corporate level, there are far fewer studies of the extent to which personal taxation matters for firms' capital structure policies. Examination of Equation 3.1 reveals that a decline in the tax rate individual investors pay on equity distributions tax (τ_E) increases the attractiveness of equity.[5] It is similarly clear that increases in the personal tax rate on ordinary income (τ_P) should make debt less attractive (Miller, 1977). However, because personal tax rates are both heterogeneous and difficult to observe, very little work has been done in this area.

One exception is Graham (1999) who follows Gordon and MacKie-Mason (1990) and estimates both the personal tax rate on equity (τ_E) and the tax rate (τ_P) on ordinary income, and then tests whether leverage ratios adjust to changes in either in ways predicted by Equation (3.1). The personal tax rate on equity τ_E is estimated using a combination of firm-specific and economy-wide information.[6] The second personal tax variable, τ_P, is considered an economy-wide "marginal

[5] Because the tax rate on equity, τ_E, is a blend of that on dividends and capital gains, a shift in either one can affect leverage ratios. A decrease in the personal tax rate on dividends reduces the tax advantage of paying out profits through interest payments, leading firms to choose lower leverage. Similarly, a reduction in the capital gains rate lowers the firm's cost of equity, leading firms to choose lower leverage.

[6] Specifically, τ_E is estimated as $[d + (1 - d)g\alpha]\tau_P$, where d is the payout ratio, g measures the fraction of long-term taxable gains, and α measures the extent to which taxes on long-term gains are reduced. While the dividend payout ratio is allowed to vary across firms and over time, constant values for both g and α are assumed. This means that any cross-sectional difference in τ_E arise solely from differences in payout ratios (i.e., not from directly observing the tax rates of investors), consistent with the idea that investors form tax clienteles on the basis of dividend payout ratios. Given that dividends are chosen by the firm and that there is a mechanical relationship between dividend payout and debt ratios, there are complex endogeneity issues that much be resolved with this specification.

investor," estimated by observing the yield spread of taxable government bonds over one-year tax-exempt municipal bonds. He then uses both of these estimates as inputs into simulations (see the previous discussion in this section) to obtain the benefit of leverage *net* of personal taxes. Finally, he runs cross-sectional market leverage ratios against these simulated tax benefits of debt, as well as against a variety of control variables. His results suggest that the inclusion of personal taxes in his simulated tax variable generates somewhat better explanatory power in the leverage regressions.[7]

3.2 Cash Flow Volatility

Intuitively, one would think that there should be a relation between the volatility of a firm's cash flows and its target debt ratio. The traditional argument has been that in the presence of bankruptcy costs, firms with more volatile cash flows, which are exposed to a higher probability of bankruptcy for any given level of debt, should choose less debt. Bradley et al. (1984), Wald (1999), and Booth et al. (2001) all document a negative relation between cash flow volatility and leverage, which is consistent with this intuition.[8] However, other studies have found either the opposite (Toy et al. (1974), Long and Malitz (1985)) or no significant relation between debt ratios and cash flow volatility (Titman and Wessels, 1988).

Most of the existing empirical work assumes that the relation between volatility and the optimal debt ratio is monotonic. However, the tax-based model of Kale et al. (1991) suggests that the relation may not in fact be monotonic. In their model, the firm chooses a capital structure that minimizes the sum of firm's corporate taxes and the personal taxes paid on their distributions to debt and equity holders.

[7] Interestingly, Graham does not find time-series tax effects. That is, when firm fixed effects are added to the leverage regressions, the tax variable has an incorrect, statistically insignificant sign. Graham's conjecture is that although tax rates changes substantially over his sample period, *both* personal and corporate taxes changed in tandem, leaving the net benefit of debt relatively constant.

[8] The particular specifications of volatility differ somewhat across studies, but are similar enough to be compared. For example, Bradley et al. (1984) calculate volatility as the standard deviation of the first difference of EBITD divided by the average value of totals assets (compare to Kale et al. (1991)).

The government's tax receipts, in this setting, can be viewed as a portfolio of options — the government is long a call option on the firm's profits (the strike price being the sum of the firm's debt service and nondebt tax shields), but is short a call option to the firm's creditors (the strike price being the firm's debt service).[9] Cash flow volatility has an ambiguous effect on firm value- for a low (high) debt level, an increase in volatility decrease (increase) the firm's tax bill, causing the firm to choose lower (higher) debt.

To estimate this nonmonotonic relation, the authors run cross-sectional leverage regressions that include both CV (cash-flow volatility) and CV^2 in addition to the usual explanatory variables (size, intangible assets, tax carryforwards, etc.).[10] The theoretical prediction is that the coefficient on CV will be negative, but that the coefficient on the square term will be positive. In a sample of 243 firms in the years 1984 and 1985, the authors find a positive and significant relation between leverage and CV^2, indicative of a nonlinear relation as suggested by their theory. The estimated coefficient of CV was negative, but in most specifications was insignificant.

In a theoretical model, Ross (1985) also considers the effect of cash flow volatility on optimal leverage, but focuses on the systematic component of default. He shows that if bankruptcy costs are more likely to occur during bad times, then holding total risk constant, firms with higher *systematic* risk will have lower optimal debt ratios. The intuition for this result is that holding all else equal, the expected risk-adjusted (or certainty equivalent) bankruptcy cost is higher for firms that are more likely to go bankrupt during an economy-wide downturn.[11] This implication is tested in Sugrue and Scherr (1989) and Kale et al. (1991). Sugrue and Scherr (1989) estimate firm cash flow betas either against

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[9] The authors assume that the tax rate on equity distributions is equal to zero, implying that personal taxes are only levied on distributions up to the firm's maximum interest charge.

[10] To conform the empirical tests to the theoretical predictions, the authors scale the volatility of each firm's cash flows (σ) and variance (σ^2) by the mean of the firm's cash flows (μ). For the same reason, leverage is calculated as (interest expense/μ) $-$ 1.

[11] Almeida and Philippon (2007) apply this argument and point out that ignoring the systematic component of default can underestimate financial distress costs by nearly a factor of three.

the S&P 500 Index return or against aggregate consumption expenditures. These estimated betas then enter as explanatory variables in pooled cross-sectional regressions. Although the results depend somewhat on the specification, the authors find that the leverage ratios are negatively related to systematic risk, consistent with Ross (1985). Kale et al. (1991) also examine the relation between systematic risk and leverage, regressing debt ratios on unlevered equity returns. Their results are sensitive to how the firm's cash flow variation (the CV term discussed above) is measured. When measured in simple OLS regressions, asset betas and leverage are strongly negatively related. When CV is estimated as a first order auto-regressive process, beta is no longer significant.

3.3 Size

Firm size is found in many studies to be positively related to leverage. This finding is quite strong (and is evident in a number of countries) in the specification estimated in Rajan and Zingales (1995), but is much weaker in Titman and Wessels (1988) and the relation was not found in Kim and Sorensen (1986) and Mehran (1992). Although the effect of size on leverage appears somewhat weaker than other determinants, two types of explanations have been offered.

The first is based on the simple intuition that the fixed costs of refinancing are proportionally more costly for smaller firms. In a dynamic setting, this implies that compared to large firms, small firms will require larger deviations from their leverage targets to refinance. If being over-leveraged is more costly than being under-leveraged, then smaller firms facing comparatively high refinancing costs may choose lower leverage ratios *ex ante*.[12]

[12] This explanation shares some features with the dynamic explanation for the size-leverage relation recently offered by Kurshev and Strebulaev (2007), but in their model, small firms choose *higher* leverage ratios at refinancing points. However, it is the presence of fixed costs that causes small firms to refinance less often, giving rise to the negative relation between size and leverage at a given point in time (i.e., not limiting the unit of observation to refinancing points). In other words, at a random point in the refinancing cycle, smaller firms are thus under-levered, both by comparison to their target capital structures and to the debt ratios of larger firms. Of course, both of these hypotheses are

The second explanation contends that there is no "pure" size effect at all, but that any cross-sectional relation arises because firm size is correlated with a number of omitted factors that influence borrowing costs. For example, because larger firms tend to be more diversified, it is likely that they exhibit lower volatility in profits, cash flows, and firm values. This would lower the probability of costly bankruptcy or financial distress, and would allow larger firms to take on larger debt burdens. Two pieces of evidence make this an appealing explanation. Shumway (2001) shows that for any given debt ratio, larger firms are less likely to go bankrupt, while Berger and Ofek (1995) and Comment and Jarrell (1995) find that more diversified firms tend to use more debt financing.

Alternatively, firm size may also be inversely related to the costs a firm faces *conditional* on incurring distress or bankruptcy. This can be for purely technological reasons (e.g., larger firms may have trouble adjusting their investment plans to harm bondholders), or may be related to governance (e.g., large firms have more active institutional holders and more media coverage).[13] Another possibility is that in the event of distress, large firms may be able to raise cash more easily by selling assets. Perhaps, given that they are more diversified, they may be better able to avoid selling assets into a distressed industry. As Shleifer and Vishny (1992) show, if financial distress impacts many firms within an industry simultaneously, then liquidating assets may be particularly costly, especially if the assets are difficult to redeploy outside the sector.

A final possibility is that there are important *credit-side* considerations that influence leverage choices, and that these factors are correlated with firm size. For example, we expect that banks will be less likely to ration credit to larger firms, either because they have a better reputation (Diamond, 1989), or simply because they are a more significant account. A closely related possibility is that large firms include more debt in their capital structures because they have better access to debt markets. Faulkender and Petersen (2006) provide evidence that

empirically testable — do smaller firms rebalance less often, and when they do so, are the magnitudes (percentage-wise) larger than their larger counterparts?

[13] See Tetlock (2007) for evidence that firm size is positively associated with media coverage.

access to credit markets is in fact quite important, and that firms with better *access* to public debt markets tend to have higher debt ratios. In cross-sectional leverage regressions, rated firms have about 35% more debt than their nonrated counterparts.

Of course, a regression of debt ratios on a rating dummy raises obvious endogeneity concern — a firm's willingness to bear the expense to obtain a public debt rating likely reflects other relevant attributes that influence its leverage. To address this endogeneity problem, Faulkender and Petersen (2006) identify a number of instruments for the rating dummy, which they argue, influence whether the firm has access to public debt markets, but does not (independently of this effect) influence the firm's leverage. One candidate is a firm's "visibility," the idea is that it is easier for investment banks to place the public debt of firms that are already familiar to investors. Their proxies for visibility include whether its stock is traded on the NYSE, whether it is a member of the S&P 500 Index, and whether it is more than three years old. Additionally, because it is easier to evaluate a firm if other firms in the industry are already being evaluated, the authors use the percentage of firms within the firm's 3-digit SIC code that are also rated. Finally, the authors proxy for whether the firm's size allows it to issue enough debt to be incorporated into a corporate bond index.[14]

In the instrumental variables specification, the effect of the rating dummy remains strongly significant, although its magnitude is somewhat reduced when compared to the baseline specification. It is noteworthy, however, that even in the instrumental variables specification, the effect of size on the debt ratio becomes insignificant when access to the bond market is included in the regression.

3.4 Asset Tangibility/Liquidity

The tangibility of a firm's asset mix, often measured as the ratio of fixed-to-total assets, is positively related to leverage. This result,

[14] This latter instrument is motivated by the idea that firms are more able to issue public debt if they issue in a size large enough to be included in the Lehman Brothers Corporate Bond Index. Because small firms issue smaller dollar amounts, such a threshold will be harder for these firms.

which is consistent with a number of interpretations, is documented in several studies including Marsh (1982), Titman and Wessels (1988), Friend and Lang (1988), and Rajan and Zingales (1995), and Frank and Goyal (2004). Perhaps the most commonly cited rationale is that tangible assets better preserve their value during default, and as such, increase the recovery rates of creditors. But this simply begs the question, "Why is the value of intangible assets particularly damaged during bankruptcy or financial distress?" At least part of the answer is the interaction between asset tangibility and bargaining power after default or financial distress (Hart and Moore, 1994). Consider the problem faced by a bank that has extended a loan to an audit/consulting firm whose principal assets are its long-term relationships with its clients. Now suppose that the firm falls upon hard times, and wishes to renegotiate more favorable terms on its existing debt. In a situation like this, the bank has virtually no bargaining power with the consulting firm. If the bank refuses to renegotiate, it will end up with a business that (without the support of management) is virtually worthless. Anticipating this hold-up problem, the bank will be reluctant to offer attractive financing *ex ante*, and the firm will likely choose less leverage.

A closely related idea is that — should default occur — the costs of redeploying tangible assets is lower than for intangible assets. This can occur for two reasons. The first, articulated by Harris and Raviv (1991), recognizes that reorganization requires creditors to expend resources to figure out the best uses for the firm's assets (i.e., whether to liquidate or continue). They argue that intangible assets are more difficult to evaluate, and as such, impose a deadweight cost on creditors should they take control of the firm.[15] All else equal, the higher these costs, the less debt a firm should have.

A second reason why tangible assets are likely to provide better collateral relates to the price creditors can fetch for assets in the event

[15] In their model, debt functions to counteract management's tendency to keep the firm from liquidating, even when this is the efficient choice. When the firm defaults, creditors take over and although they always make the efficient continuation–liquidation choice *ex post*, they must expend resources to correctly decide. Note that this need not be strictly interpreted. If, instead, intangibility increased the probability that creditors make the incorrect choice, the same result would obtain.

that they are liquidated. When intangible assets are sold, they are not likely to hold the same or even similar value for all potential bidders. For example, a struggling biotechnology firm's natural buyer is another firm in the industry, where knowledge overlap and managerial expertise are likely to preserve substantial value. In contrast, hard assets are often more easily be redeployed — either because they have uses outside the industry, or because of the ease in finding alternative operators (Williamson, 1988; Shleifer and Vishny, 1992).[16] This reasoning suggests why debt can be especially costly for firms with intangible assets that may be difficult to redeploy outside the industry. If firms within an industry tend to be financially distressed at the same time, then the set of buyers for intangible assets shrinks exactly when the need for an external market for the assets are most needed. For this reason, firms with intangible assets requiring specialized expertise and know-how might be particularly poor candidates for high debt ratios.[17]

Another possibility is that debt-equity holder conflicts are less of a problem for firms with highly tangible assets. For example, in industries with fixed capital, such as power plants or oil refineries, it is difficult for management to substantially change the firm's strategy to harm creditors (i.e., asset substitution). In addition, if firms with tangible assets are easier for creditors to value, then it is likely to be easier for them to raise capital to fund their future investment opportunities. In contrast, firms with intangible, difficult-to-value assets may expect to be financially constrained in the future and thus may want to maintain more financial slack.

[16] Pulvino (1998), for example, finds that when airlines encounter financial distress, they sell airplanes both other airlines, as well as those outside the industry (e.g., financial institutions and leasing companies). Interestingly, even in the case of highly tangible assets, there can be substantial discounts when firms are forced to sell assets. For example, when an airplane is sold to an industry outsider during a recession, the "fire sale" discount is nearly 30%.

[17] Shleifer and Vishny (1992) discuss how these issues can influence the debt capacity of an industry rather than an individual firm. If a firm sees that its competitors have low leverage, it can choose a high debt ratio knowing that in the event of distress it has a ready market for its assets. Similarly, if a firm's competitors are all very highly levered there is an incentive to have financial slack, which would position the firm to buy cheap assets from its competitors in the event of an industry downturn. For more on the industry debt-capacity and its empirical implications, see Almazan and Molina (2005).

3.5 Market-to-Book Ratio

In the cross-section, debt ratios are strongly negatively related to the ratio of market value of equity to book value of equity (M/B). This is one of the strongest and most reliable predictors of leverage, regardless of whether book or market leverage is used as the dependent variable.[18] The relation has been extensively documented, e.g., Smith and Watts (1992), Rajan and Zingales (1995), Jung et al. (1996), Barclay et al. (2006), Baker and Wurgler (2002), Hovakimian (2004), and Frank and Goyal (2004).

The market-to-book effect is consistent with several interpretations. The first is that a firm's market-to-book ratio provides information about the nature of its asset mix. Specifically, firms with high market values relative to book values are likely to have good future prospects relative to the value of their assets in place.[19] This is relevant to the firm's capital structure choice for a number of reasons. First, growth opportunities add to firm values but do not generate current taxable income — a firm with substantial growth opportunities can eliminate their taxable income with only modest amounts of debt. Second, firms with good growth opportunities are likely to invest heavily in the future, and may therefore choose to maintain financial slack to fund these investments. The motive to maintain financial slack to fund anticipated investments may be due to the debt overhang and asset substitution problems discussed earlier or to information asymmetry problems describes in Myers and Majluf (1984) and Myers (1984). An alternative interpretation is that firms with high market-to-book ratios are overvalued, and have an incentive to use more equity financing because it is favorably priced. We discuss this possibility in more detail in Section 4.

Although the cross-sectional relation between market leverage and market-to-book ratios is very strong, it is partly mechanical, i.e., because equity values affect both the right- and left-hand side variables

[18] In some studies, the market-to-book ratio includes both the firm's debt (usually its book value) in both the numerator and denominator.

[19] This is because the expected profits of future investment opportunities affect market values but not book values.

by construction.[20] While the negative relation between book leverage and M/B is not mechanical, Chen and Zhao (2006) argue that this relation is driven by a few small firms with very large market-to-book ratios.[21] Adding these potential difficulties to those already discussed regarding multiple interpretations, we suggest caution when using and interpreting market-to-book ratios in leverage specifications. When possible, it would appear more prudent to proxy for the attributes of interest that do not share these difficulties.

3.6 Product Uniqueness

Titman and Wessels (1988) suggest three potential measures for the uniqueness of the products that a firm sells. The first is Selling Expenses/Sales — more unique products require a more intensive selling effort. The second is R&D/Sales — the point of R&D is to develop more unique products. The third is the rate at which employees quit their jobs — firms in industries in which products are more unique have less transferable skills and find it more costly to leave their jobs. Their study and others find that firms with high R&D/Sales and high Selling expenses/sales (i.e., firms that tend to produce unique products) tend to have low debt ratios. Similarly, firms in industries with high quit rates (i.e., industries that produce less unique products) tend to have high debt ratios.

The authors suggest that a firm's nonfinancial stakeholders are more likely to be concerned about the financial health of more unique firms. For example, the purchaser of scientific equipment that may need future servicing may be quite concerned about the seller's financial health. In contrast, the financial health of a supplier of commodities is not likely to have a major influence on the choices of their customers. Hence, one can interpret the observed relation between uniqueness and capital structure as supportive of Titman (1984), which predicts lower

[20] For a discussion of the potential for spurious correlation between variables scaled by the same quantity, see Titman and Wessels (1988).

[21] Specifically, the authors note that a positive relation between market-to-book and leverage holds for 88% of all firms (representing over 95% of the total market capitalization).

debt ratios for firms whose liquidation imposes significant costs on its workers, customers, and suppliers.

It should be noted that R&D/Sales and Selling Expenses/Sales are also likely to be correlated with both growth opportunities and the extent to which the assets of a firm can be used as collateral. Hence, the previous discussion regarding the negative relation between growth opportunities and debt ratios and the positive relation between collateral value and debt ratios may explain the observed negative correlation between these variables and debt ratios.

3.7 Industry Effects

Despite a number of firm characteristics shown to predict leverage in the cross section, there are clear limits to what can be learned about a firm's capital structure choice by observing accounting statements and stock returns. For example, consider a firm that operates in a very competitive industry that maintains a low leverage ratio to see it through lean times, price wars, etc. If such a competitive threat is poorly captured by the available proxies (e.g., profitability, size, etc.), then at best, an important determinant of the firm's leverage ratio will be ignored. In addition, the omitted effect (an unobserved predator) may be correlated with one or more observable proxies, leading to biased coefficient estimates. For this reason, some researchers include industry dummies.

In addition to numerous studies that include industry dummy variables, Hovakimian et al. (2001) examine leverage changes for individual firms, and find that adjustments are made in the direction of the industry median leverage ratio. MacKay and Phillips (2005) take this a step further, documenting an even stronger effect for similarly leveraged firms within the same industry. That is, a firm in the bottom leverage quintile for a certain industry will adjust its leverage only when other firms within that same quintile adjust their leverage. This suggests that although industry affiliations are likely to contain information about target debt ratios, they do not capture everything. Even within industries, different sensitivities to the costs and benefits of debt can generate leverage "cohorts" that exhibit similar leverage and adjustment behavior.

In addition to large cross-sectional differences in both mean and median leverage ratios, there are substantial cross-industry differences in leverage ratio dispersion. Specifically, firms in some industries appear to have very similar capital structures, whereas in other industries, two otherwise similar firms can choose very different capital structures. This issue is explored by Almazan and Molina (2005), who study the extent to which capital structure dispersion is consistent with theoretical predictions.

They first address the role of debt as a way to discipline managers who may, left to their own devices, allow their personal preferences to influence capital structure choices. Because these factors are largely idiosyncratic to managers (e.g., determined by the manager's age, wealth, risk aversion, etc.), the authors argue that dispersion in leverage ratios should be highest when managerial behavior is less constrained. Consistent with this prediction, they find that firms in competitive industries, as well as those with better corporate governance, choose more similar debt ratios.

A second set of predictions is tied closely to the nature of the assets within an industry. Shleifer and Vishny (1992) argue that when the natural buyers of assets are one's competitors, then dispersion in capital structure will arise endogenously.[22] Consistent with this argument, Almazan and Molina (2005) show that in industries in which assets are easily redeployed, debt ratios are more disperse. Technological features also influence the dispersion of debt ratios within an industry. MacKay and Phillips (2005) and Almazan and Molina (2005) both consider the relation between technology and leverage dispersion, the former estimating technological and leverage changes in a simultaneous equation framework. Both papers find that in industries where firms have very different technologies, they also tend to have different capital structures.

[22] In equilibrium, firms are indifferent between choosing high and low leverage levels. The benefits of high leverage are balanced by the cost of increased financial distress. Conversely, the opportunity cost of low leverage (e.g., increased agency problems) is balanced by the potential windfall profits when highly leveraged competitors sell assets at attractive prices.

3.8 Firm Fixed effects

More recently, researchers have estimated leverage regressions with firm fixed effects. Like other similar techniques (such as using lags of dependent variables, first differencing, etc.), the inclusion of fixed effects sweeps out unobserved across-firm heterogeneity that is constant over time. In the fixed effects or "within" transformation, each firm has its own separate intercept in leverage regressions, so that the slopes (i.e., coefficients on size, profitability, etc.) are identified solely from each firm's time-series variation. However, because firm fixed effects sweeps out any time-constant firm-specific effect, any determinants that do not change over time can no longer be identified. For this reason, firm fixed effects have generally not been used in cross-sectional studies.

Lemmon et al. (2008) suggest an interesting test that illustrates the importance of firm fixed effects — they compare the explanatory power of a regression of the debt ratio on the firms' characteristics (e.g., size, asset tangibility) to that of a regression that includes only the firm's lagged (perhaps by many years) capital structure as a determinant of its current capital structure. If the proxy variables measure the actual determinants quite accurately, and if these characteristics change substantially over time, then in the absence of substantial adjustment costs the characteristics should explain current debt ratios much better than sufficiently lagged debt ratios. On the other hand, the lagged debt ratios can have better explanatory power if a combination of the following is true: (1) the characteristics are very weak proxies, (2) firms face substantial adjustment costs, or (3) the actual determinants of capital structures do not change much over time.

Lemmon et al. (2008) show that although many of the standard determinants are related to observed leverage ratios in ways that are consistent with firms optimally trading off the costs and benefits of debt, a firm's lagged debt ratio (in many cases by as much as 15 years) is still a highly significant determinant of its current debt ratio.[23] An analysis of variance tells a similar story. The R^2 of a typical cross-sectional book leverage regression without firm fixed effects is about

[23] Indeed, the coefficient of a firm's initial debt ratio is second in magnitude only to the coefficient of the median debt ratio for the industry in which the firm operates.

29%, but when fixed effects are included it jumps to 65%, with nearly all of the explanatory power (92%) due to the fixed effects.[24] Because the fixed effects estimator removes all the cross-sectional variation in both the explanatory and dependent variables, only "within" firm variation remains to identify how characteristics like size, profitability, industries, etc., influence the capital structure choice. This largely explains why, when firm fixed effects are added to a cross-sectional regression, the estimated impact of the standard determinants substantially decreases.[25]

The importance of firm fixed effects raises two important questions. The first is how to *interpret* studies that fail to account for unobservable, firm-specific, time-invariant determinants of leverage. The second is how to *identify* these important sources of cross-sectional variation in leverage that current proxies fail to capture. Indeed, there are a number of persistent but difficult to measure firm attributes that can conceivably affect financing choices; such as managerial preferences, governance structure, geography, competitive threats, "corporate culture," and so on. As our ability to measure these attributes improves, so will our understanding of how they influence firm policies of interest.

3.9 Quantifying Optimal Debt Ratios

We conclude our discussion of target leverage determinants by discussing some limitations of the studies we have considered thus far. The ideal empirical test would tell us not only *which* firm attributes matter for leverage, but also *how much* they matter. Unfortunately, most of the tests so far are not designed to address these quantitative issues. To do so requires taking a stand on the magnitudes of the costs and benefits of leverage, as well as on how sensitive each is to changes in leverage.

[24] MacKay and Phillips (2005) arrive at similar conclusions in a somewhat smaller sample of 315 competitive manufacturing firms from 1981 to 2000. They find that 13% of cross-sectional variation in leverage is due to industry fixed effects, 54% to firm fixed effects, and the remaining 33% to within firm variation over time.

[25] For example, see Table 5 of Lemmon et al. (2008). When fixed effects are added to a book leverage regression, sales, profitability, and cash flow volatility lose 41%, 80%, and 163% of their respective magnitudes.

Comparing tax benefits and financial distress costs is quite challenging on a number of dimensions. While estimating financial distress costs may be more difficult than estimating tax benefits, determining a forward-looking estimate of future tax benefits includes a number of complexities (see the preceding discussion on taxes and leverage) that arise because of past profitability, investment tax credits, etc. Graham (2000), who was the first to seriously model forward looking tax benefits, concludes that tax benefits are quite large (approximately 10% of firm value net of personal taxes) and that most firms are not close to having exhausted their potential tax shields. Specifically, Graham (2000) finds that most firms could double their debt obligations before the tax benefits begin to abate. Without large costs of debt to offset these tax gains, Graham's (2000) evidence would suggest that firms are using debt too conservatively.

The problem of quantifying *ex-ante* financial distress costs is equally challenging. First, there are few quantitative studies of ex-post financial distress, Opler and Titman (1994) and Andrade and Kaplan (1998) being notable exceptions. Second, even if *ex-post* losses given distress were known at the firm level, pricing them *ex-ante* is not trivial. One common approach is to estimate default probabilities from credit ratings (e.g., Graham (2000), Molina (2005)), and use these to proxy for the probabilities of distress. However, as Ross (1985) and Almeida and Philippon's (2007) point out, because default is more likely to occur during bad times, objective default probabilities can differ substantially from their risk-adjusted (i.e., "risk-neutral") counterparts. Using risk-neutral probabilities that they infer from bond prices, Almeida and Philippon (2007) argue that the risk-neutral expected financial distress costs are substantially larger than previous estimates, perhaps, enough to offset the tax benefits.

An alternative approach is to benchmark the costs and benefits of leverage with structural models that take into account dynamics, adjustment costs, tax benefits, distress costs, etc. Earlier examples include Fischer et al. (1989), Leland (1994), and Leland and Toft (1996), and more recently Strebulaev (2007) and Tsyplakov and Titman (2007). If one can take seriously the structure imposed and obtain the inputs required to estimate these models, then such structural models can be valuable in helping us better understand the trade-offs firms face. In particular, such complex specifications capture a richer set of dynamics, such as allowing the firm to experience losses *prior* to default, or adjusting tax shields for systematic risk. Future research will hopefully generate realistic, but parsimonious specifications that generate sharp, testable empirical implications.

4

The Second Ingredient: Deviations from Target Leverage Ratios

In the previous section we examined cross-sectional determinants of capital structure that are likely proxies for the determinants of a firm's target capital structure. For the most part, the proxies we examined relate to either the tax benefits of leverage or the expected costs associated with bankruptcy or financial distress. In contrast, the focus of this section is on factors that cause firms to deviate from their target capital structures. The first of these factors are time-series shocks to cash flows and stock prices that may either move firms away from their target debt ratios or alternatively, may create "windows" of market timing opportunities. While, as we discuss below, there are reasons to believe that these variables also capture cross-sectional differences that relate to target capital structures, our interpretation of the evidence is that the variables capture deviations from the target. The second are the preferences, "styles," or entrenchment of the firm's managers that influence financing in a way that may not be optimal for shareholders.

4.1 Profitability

Whether measured as a fraction of market or book value, leverage ratios are negatively related to firm profitability. This is documented in Titman and Wessels (1988) and Rajan and Zingales (1995) and has been confirmed in numerous subsequent studies. Several specifications for profitability have been examined, virtually all of which generate the same result. For example, both Titman and Wessels (1988) and Rajan and Zingales (1995) measure profitability with operating income scaled by firm size.[1]

The negative relation between profitability and leverage has spawned considerable debate among academics. The central issue is whether profitability captures a source of variation in target debt ratios or whether it is a determinant of deviations from optimal targets. One reason why profitability may be related to the capital structure target is that more profitable firms have higher tax exposures, which (holding everything else equal) should lead to higher target debt ratios. Another reason is that profitability may be a proxy for changes in a firm's asset mix — i.e., holding stock returns constant, increases in profitability is likely to be due to productivity improvements in the firm's assets in place relative to its growth opportunities. Because assets in place are better candidates for debt finance, a shift toward more assets in place is likely to increase a firm's target debt ratio.

It is also likely that more profitable firms have debt ratios that are lower than their targets. This will be the case if firms tend to use excess cash flow to pay down debt and tend to finance cash flow deficits by issuing debt rather than equity. As Myers and Majluf (1984) emphasize, this is likely to be the case if managers are better informed about their firms' value than outside investors. Tax and transaction costs argument can also generate empirical predictions with respect to profitability. For example, suppose that paying out profits to equity holders (in the form of a dividend or a share repurchase) triggers personal taxes for

[1] Fama and French (2002) argue for the inclusion of both the firm's pre-interest-pre-tax and pre-interest-post-tax earnings. While the firm's pre-tax earnings proxies the total income that could potentially be shielded with deductions from interest payments, examining the firm's post-tax earnings gives information about the firm's ability to shield these earnings.

shareholders, while paying down debt does not. In each of these cases, firms tend to decrease their use of debt financing when they become more profitable.[2]

The above discussion of the effect of profitability on capital structure, as well as the discussion below on market timing and the effect of stock returns on capital structure, has implications for changes in capital structure as well as levels. We will be considering these issues in more detail in Section 5.

4.2 Market Timing

When a firm's management thinks that its stock is cheap, it may choose to take advantage of this mispricing by issuing equity. Whether or not these timing attempts have a lasting influence on a firm's capital structure is of significant interest to economists, and is the subject of an influential study by Baker and Wurgler (2002).[3] Baker and Wurgler's main empirical test is the following cross-sectional regression:

$$\left(\frac{D}{A}\right)_t = a + b\left(\frac{M}{B}\right)_{efwa,t-1} + c\left(\frac{M}{B}\right)_{t-1} + d\left(\frac{PPE}{A}\right)_{t-1} + e\left(\frac{EBITDA}{A}\right)_{t-1} + f\log(S)_{t-1} + \mu_t.$$

The dependent variable is book leverage, and the rest of the variables are self-explanatory.[4] The main coefficient of interest, b, is on the firm's "external finance weighted-average" market-to-book ratio, defined as:

$$\left(\frac{M}{B}\right)_{efwa,t-1} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{\sum_{r=0}^{t-1} e_r + d_r} \cdot \left(\frac{M}{B}\right)_s, \tag{4.1}$$

[2] See Auerbach (1979) and Hennessy and Whited (2005).

[3] There are many previous studies of market timing, (e.g., Taggart (1977), Marsh (1982), Ritter (1991), Loughran et al. (1994), Jung et al. (1996), Lerner (2001), and Hovakimian et al. (2001)). However, in contrast to Baker and Wurgler (2002), most of these are time-series tests showing that firms issue equity after stock price run-ups.

[4] Leverage is defined alternatively as "book debt to assets (book value) or book debt to the result of total asset minus book equity plus market equity (market value) and is expressed in percentage terms."

where e_s and d_s represent net equity and debt issues respectively, and the summations are calculated each year after a firm's IPO. This variable measures the extent to which the firm raises capital when its M/B ratio is high. The idea is that if timing is important, firms that raised capital when their stock price was high will tend to have more equity in their capital structures. Importantly, the market-timing variable uses information no more recent than one year ago, allowing the pure M/B effect (discussed in the previous section) to show up through the coefficient c. This construction allows the authors to argue that the coefficient b separates the effect of past market timing attempts from those due to cross-sectional differences in M/B ratios.

The authors find that their market-timing variable is the single most powerful cross-sectional predictor of both market and book leverage, and that its explanatory power increases with the time horizon. For example, a one standard deviation change in the lagged weighted average market-to-book ratio is associated with a 6.51 (7.99) percentage points change in book (market) leverage three years in the future. A similar calculation ten years ahead yields book and market leverage changes of 10.49 and 10.45 percentage points, respectively. The effect is remarkably persistent. Even when the market timing variable alone is lagged *ten years,* it remains highly significant. In other words, "capital structure as of the year 2000 depends strongly upon variation in the firm's market-to-book ratio before 1990 and before, even controlling for the 1999 value of the market-to-book." These results lead Baker and Wurgler (2002) to conclude that managers have clear preferences to raise capital when market values are high relative to book values, and that such attempts have long-lasting impacts on observed capital structures.

A potential criticism of the Baker and Wurgler (2002) interpretation is that the M/B ratio that they use as a measure of mis-valuation is public information. While it is quite likely that managers have private information that can help them time their equity issues, it is hard to understand why they would time their financing choices based on public information. However, supporting the Baker and Wurgler interpretation is evidence by Jenter (2005) who finds that M/B ratios are also strong predictors of insider trading. In particular, Jenter documents a strong contrarian pattern in executives' trading patterns around SEOs, finding more selling among firms with high M/B ratios. In addition, Chang et al. (2006) find that Baker and Wurgler's (2002) market timing variable best explains the capital structures of small firms with limited analyst coverage. Given that these firms are the most likely to be mis-valued, this finding supports the market timing interpretation.

However, other studies have challenged Baker and Wurgler's (2002) interpretation. One possibility acknowledged by the authors is that their market timing variable (which is constructed from several historical M/B observations) may provide a better measure of the firm's growth opportunities than a single M/B observation. In other words, while the coefficient c is supposed to capture cross-sectional differences in growth opportunities, if it is measured with noise, then some of the "pure" M/B effect will be transferred to coefficient b.

Kayhan and Titman (2007) consider this possibility, decomposing Baker and Wurgler's (2002) market timing variable into two components: a "true" market timing component (the scaled variance of a firm's M/B ratio and its need to raise external finance), and its long-term average M/B ratio. The latter component should have little to do with market timing motives, but may contain important information about target debt ratios. Kayhan and Titman (2007) find that the Baker and Wurgler's (2002) results are driven largely by the average M/B ratio rather than the market timing component of their variable, which has a weaker and short-lived effect on firm's future capital structures.

Leary and Roberts (2005) also challenge Baker and Wurgler's (2002) conclusion, arguing that when firms find it costly to rebalance their capital structures, the long-lived effects of market timing are weaker. Leary and Roberts (2005) first ask whether equity issuers and nonequity issuers have persistently different leverage ratios. They match firms by size and M/B ratio, but then split them into issuers and nonissuers. They find that although issuing firms are under-leveraged in the short-term compared to their matched nonissuers (for example, by about 6% for large firms with low M/B ratios), any such effects completely vanish within four years. Importantly, this is driven at least in part by debt issuance.

Next, the authors replicate the BW findings for subsets of the sample split on proxies for the cost of issuing debt: estimated underwriter spreads, Altman's Z-score, and credit rating. For the first measure, they use Altinkilic and Hansen's (2000) empirical model of debt underwriter spreads, which allows for both fixed and variable cost components. The second measure is a proxy for financial distress costs and the third is a proxy for distress costs or access to debt markets (Faulkender and Petersen, 2006). Leary and Roberts (2005) find that although the BW market timing variable is still significant in every specification, it is generally much stronger for firms with high adjustment costs. For example, the BW coefficient for firms with high credit spreads is nearly twice as large as for those with low spreads. This evidence leads the authors to downplay the relevance of market timing for long-run capital structures — whether or not market timing is important in the long-run depends on firms' adjustment costs, which is consistent with dynamic rebalancing with frictions.

A final related study comes from Alti (2006), who also provides evidence suggesting that at least for younger firms, capital structure persistence is much weaker than documented in Baker and Wurgler (2002). Like Baker and Wurgler (2004), his tests are cross-sectional, but make use of time-series information to construct the independent variable of interest. Using a sample of IPO firms that went public between 1971 and 1999 (inclusive), Alti (2006) compares those that raise capital in a favorable environment ("hot" IPO markets) with those that do so in a less favorable environment ("cold" IPO markets).[5]

Consistent with market timing motives, he finds that firms that go public in hot market periods raise substantially more proceeds than those that go public in cold-market periods (76% vs 54% of pre-IPO asset value), and as a result, have lower debt ratios following the IPO. However, this difference steadily disappears. The effect is reduced by over half within the first half year, and completely vanishes by the end of the second year. This finding suggests that any effects of

[5] Hot and cold markets are defined according to the number of IPOs that occurred in a given month. Months containing a large number of IPOs (net of a time trend to account for growth in the general economy) were considered "hot," with the balance labeled "cold."

market timing are short-lived, at least for young firms that may have a particularly easy time adjusting their capital structures.

4.3 Stock Returns

Welch (2004) documents a very strong negative relation between past stock returns and debt ratios. He runs regressions of the form:

$$\frac{D_{t+k}}{D_{t+k} + E_{t+k}} = \alpha_0 + \alpha_1 \frac{D_t}{D_t + E_t} + \alpha_2 \frac{D_t}{D_t + E_t(1 + r_{t,t+k})} + \varepsilon_{t,t+k}, \tag{4.2}$$

where D_t is the time t book value of debt, E_t is the time t market value of equity, and $r_{t,t+k}$ is the return of the firm's stock between time t and time $t + k$. If firms do not rebalance their capital structures in response to their stock price changes, then α_1 should equal zero and α_2 should equal one. This is essentially what Welch finds. When k is less than three years, the coefficient on α_2 is statistically indistinguishable from one, and it falls somewhat when the time horizon increases.

As described in the previous discussion of the relation between market-to-book and the debt ratio, the relation between stock returns and the debt/market value ratio is to some extent mechanical — an increase in a firm's stock prices will increase the denominator of this debt ratio, thereby lowering the debt ratio. However, the relation documented by Welch (2004) is not purely mechanical because there remains a relation, albeit weaker, between debt/book value and stock returns.

The explanations for the negative relation between stock returns and the debt ratio are related to those advanced for the M/B effect. First, it is possible that stock returns convey information about firm's target debt ratio. Specifically, firms with high recent stock returns are likely to have high growth opportunities, and may prefer to fund these opportunities with equity. The fact that managers tend to issue equity after stock price run-ups is consistent with this hypothesis. However, this need not be the case — managers could also be attempting to profit from their perceptions of mispricing.

One interpretation of this evidence is that firms do not have strong target capital structures, and are content to allow their leverage ratios to drift. This interpretation has been challenged, in particular by Leary and Roberts (2005), who claim that these results are also consistent with the alternative of dynamic rebalancing with adjustment costs (the paradigm that we discussed in the introduction). Specifically, if firms face costs of adjustment, then their reactions to stock returns will (generally) be delayed or incomplete. To support this reasoning, the authors simulate a dynamic capital structure model in the spirit of Fischer et al. (1989), and then run Welch's (2004) test on the simulated data.[6] They simulate data under different assumptions for the adjustment costs that include both a fixed and proportional component. These distinctions are important, as they imply different time series patterns of rebalancing, both with respect to the size and frequency of recapitalization.[7]

Although all of the tests produce very similar results, the proportional cost regime in particular produces coefficients almost identical to those found in Welch (2004). For example, the one-, three-, five-, and ten-year coefficient on α_2 are 1.02 (1.02), 0.90 (0.94), 0.83 (0.87), and 0.70 (0.71) for the simulated (Welch, 2004) data, respectively. This and similar evidence for the alternative cost regimes lead the authors to conclude that Welch's (2004) main test lacks statistical power against the alternative of dynamic rebalancing with adjustment costs.

4.4 Managerial Preferences and Entrenchment

Up to this point our discussion has assumed that firm's choose their capital structures to maximize either total firm value or the value of the firm's equity. However, in reality, capital structure choices are generally made by managers, who may or may not be acting in the interests of their shareholders. Because leverage reduces free cash flow and creates performance pressure, entrenched and/or powerful managers might be expected to choose lower debt ratios than what shareholders would

[6] See also Alti (2006) and Strebulaev (2007).

[7] The main difference is that when firms face a fixed as opposed to a variable cost, they "fully" rebalance, in the sense that their post-capitalization leverage ratio coincides with the target. With proportional costs, firms prefer to avoid such large adjustments, instead rebalancing in smaller, more frequent amounts. These smaller adjustments move firms closer to their targets, but generally stop short of the adjustments under only fixed costs. See Leary and Roberts (2005) for more extensive discussion.

otherwise prefer.[8] Hence, in this section we will explore how observed debt ratios are affected by variables that may proxy for management's incentives and preferences.

Most of the studies in this section explore this hypothesis, investigating the connection between managerial entrenchment, corporate governance, and financing choices. However, a second hypothesis is that leverage choices simply reflect different managerial "styles," and need not stem from agency problems. Bertrand and Schoar (2003) explore the effect of such styles on corporate policies, including leverage.

There are two types of agency problems that can affect a firm's capital structure choices. The first arises from distortions between the firm's equity holders and creditors (e.g., asset substitution, debt overhang, etc.), which perhaps explains why firms that expect to invest substantial amounts choose to use less leverage. The second stems from the different objectives of management and the firm's equity holders. Although the firm's management is often modeled as being aligned with equity holders, this assumption fails to capture important features of managerial preferences that are relevant for capital structure. For example, a manager's human capital is likely to be closely tied to the firm's risk, leaving him in a somewhat undiversified position.[9] Another possibility, raised by Jensen and Meckling (1976), is that managers bear the full cost of exerting effort (or alternatively, realize the full benefit of shirking), but realize only a fraction of the associated benefits. Motivated by these possibilities, we explore four studies that analyze how managerial entrenchment, incentives, and characteristics influence financing choices.

Friend and Lang (1988) are among the first to explore the extent to which managerial self-interests play meaningful roles in firms' financing

[8] However, some authors have argued that high debt ratios can help existing managers maintain control. Harris and Raviv (1991) and Stulz (1988) argue that high leverage increases managers' ownership stake, enabling them to have greater control of the firm and helping them to defend against takeover challenges. Israel (1992) argues that high leverage reduces takeover threats because of wealth transfers to the target's existing debt holders.

[9] Gilson (1989) presents evidence consistent with this conjecture. He shows that managers of financially distressed firms are more likely to lose their jobs and that displaced managers are not able to find similar positions quickly (in the study, he examines three years after the displacement).

choices. Studying 984 firms from 1979 to 1983, the authors examine the relation between ownership structure and capital structure. To do this, the authors first designate firms as either (1) "closely held" (CHC), in which the fraction of equity held by managerial insiders was above the sample median (approximately 13%), and (2) "publicly held" (PHC), which comprise the balance of the sample. Their reasoning for separating the data in this fashion is that managers of closely held firms have fewer constraints on their behavior. Then within each sort, each firm is characterized by the presence of a large blockholder (at least one party holding in excess of 10% of the firm's stock). Thus, there are closely held firms without blockholders (CHC0), publicly held firms with blockholders, PHC1, and so on.

They find that among closely held firms, managerial ownership is negatively associated with book leverage ratios, regardless of whether a blockholder exists or not. In other words, when the manager has more control of the decision he chooses lower debt ratios. Interestingly, the presence of a large blockholder among CHC does little to change this relationship. Consistent with this they find that for publicly held firms, debt ratios tend to be higher, which suggest that firms are more levered when managers are less able to exert influence in corporate decisions. For these firms, the relation between managerial ownership and capital structure is mixed — for PHC1 firms, the relation is negative (as for CHC firms), but for PHC0 firms, the relation is positive.

Mehran (1992) extends Friend and Lang's (1988) analysis in several dimensions. Analyzing a smaller set of firms (some 170 manufacturing firms from 1979 to 1980), he studies how managerial compensation influences leverage, as well as how board characteristics and the presence of institutional monitors affect leverage choices. Contrary to Friend and Lang (1988), he finds a significant relation between book leverage and the fraction of the firm's equity owned by the CEO, entire top management team, or both. Further, the fraction of top management's compensation awarded in options is also significant. The authors interpret the former as evidence that a higher ownership stake in the firm aligns incentives between shareholders and managers, and the latter as evidence that stock options increase management's willingness to take risk.[10]

Mehran (1992) also explores board characteristics, particularly whether the presence of bank representatives or investment bankers influences the firm's leverage choice. He finds that firms with investment bankers on the board have significantly higher leverage. However, this finding is difficult to interpret. It is possible that investment bankers exert influence on the firm's debt policy, an effect that does not necessarily improve firm value (for example, if investment bankers are themselves subject to agency problems and use their position at the firm to generate investment banking business). It is also possible that investment bankers are chosen when firms need to raise debt, either to obtain advice or favorable financing terms. Distinguishing between these possibilities would be empirically challenging.

Berger et al. (1997) extend this line of analysis in several dimensions. In particular, they measure managerial entrenchment and/or monitoring in several ways: tenure, board size, board composition, excess compensation (i.e., the residual in a log wage equation), direct stock ownership (as a percent of common shares), options held (as a percent of common shares), and the presence of a major blockholder. Generally, their results are consistent with more entrenched or less monitored managers choosing lower debt levels. For example, managers with longer tenures choose lower leverage, whereas those governed by a smaller board choose to use more debt. Most of the compensation variables are also consistent with an entrenchment interpretation (i.e., more options and stock holdings increases leverage). However, as acknowledged by the authors, these results may also obtain for reasons other than managerial entrenchment or lack of monitoring. For example, Smith and Watts (1992) argue that option-based compensation increases a manager's risk-taking incentives (which could lead him to increase leverage).

[10] Mehran (1992) notes that differences between his findings and that of Friend and Lang (1988) could be due to measurement error. According to Mehran (1992), Friend and Lang (1988) use a different data set than his, one in which blockholders are identified only during transactions (thus, blockholders that do not trade will not be detected).

To better identify the connection between entrenchment and leverage, the authors then turn to the time series, asking whether exogenous shocks to a manager's entrenchment generate leverage changes in the predicted direction. The shocks they consider are: (1) an outside offer to acquire the firm, (2) the replacement of the company's CEO, and (3) the addition of a major blockholder to the firm's board of directors. For each type of event, leverage increases during the event year and appears to remain permanently higher: for unsuccessful tender offers about 12%, for CEOs who leave voluntarily 7%, and after adding a major blockholder to the board an additional 7%.

Although managerial entrenchment and incentive problems appear to influence leverage choices, neither are strictly required for managers to be an important determinants of their firms' financial policies. Bertrand and Schoar (2003) present evidence that "managerial styles" matter for a wide range of corporate policies including investment, acquisition policy, and leverage. In their sample, spanning 1969–1999, the authors examine the subset of firms for which at least one top executive can also be observed at another firm. This allows them to pursue their main empirical strategy — to analyze the explanatory power of a standard cross-sectional leverage regression both with and without managerial fixed-effects.

In the benchmark case, the authors regress book leverage on firm fixed-effects and a vector of time varying controls (e.g., return on assets, size, etc.), finding an R^2 of 0.39. Although adding CEO fixed-effects does not change the explanatory power, accounting for the companies CFO and other top executives increases the explanatory power to 0.41, an increase that is significant at the 2% level. The results are stronger for an alternative measure of leverage, interest coverage, where CFO fixed-effects increases the R^2 from 0.31 to 0.41. Perhaps even more interesting is that the manager's birth cohort is a predictor of his or her tolerance for financial risk. Bertrand and Schoar (2003) find that older CEOs, all else equal, choose lower leverage — every 10-year increase in birth year increases leverage by 2.5 percentage points, and also increases cash holdings, evidence the authors cite as consistent with older managers exhibiting more conservative styles.

We conclude this section by revisiting two of the cross-sectional leverage determinants we discussed in Section 3. Recall that profitability and past stock returns are strongly negatively related to leverage in the cross-section. In a setting with a relatively powerful board and a weak CEO, debt may be used to discipline management and force them to pay out their free cash flow (as discussed in Jensen (1986)). This describes the situation of firms that are acquired by private equity firms. However, firms with powerful CEOs and relatively passive boards are likely to use the cash flow to pay down debt and thereby reduce leverage, suggesting that observed debt ratios may be negatively related to past profits even when value-maximizing capital structures may include more debt for more profitable firms.

The above argument suggests that past performance may influence capital structure because of how it affects the CEOs power relative to the board. The CEO of a firm that performs well has more power to set his or her own agenda with the board, which suggests that leverage ratios may reflect managerial preferences more strongly after strong performance. This might explain, at least partially, why more profitable firms, and firms with high stock price performance, tend to have lower debt ratios.

5

Capital Structure Changes

The main insight of Section 3 was that firms have target debt ratios, which possibly vary over time. Section 4 discussed why, even if these targets do not move, firms' debt ratios might. In this section we more closely examine these capital structure changes.

First, we ask the simplest possible question — are the issuance and repurchase decisions of firms consistent with the idea that firms have target capital structures. Discrete choice models of debt vs equity issuances and repurchases suggest that generally what they are (Marsh, 1982; Hovakimian et al., 2001), although there are notable exceptions. Next, we ask whether these adjustments are done in sufficient magnitude to matter. The workhorse here is the "speeds of adjustment" (SOA) regression, where leverage changes (usually yearly) are regressed against their inferred "distances" from target leverage ratios. With immediate and perfect adjustment, the coefficient of such a regression will be unity. Anything less is, at best, a partial adjustment. Although these "speed of adjustment" tests have been around for over 35 years, different authors have come to very different conclusions about how quickly firms move toward their target debt ratios. Part of the problem interpreting adjustment speeds is the lack of a proper benchmark. In the presence of adjustment costs, what constitutes a "fast" adjustment speed? Another problem is that target debt ratios are not observable, requiring the econometrician to use noisy proxies (see Section 3 for more discussion). We pay careful attention to each of these issues in our discussion.

Given the evidence on capital structure changes and adjustment speeds, we complete Section 5 by asking which factors influence firms' incentives to change their capital structures. We explore several possibilities. The first is that because of asymmetric information issuing securities may be associated with wealth transfers from the firm's existing equity holders. Myers (1984) and Myers and Majluf (1984) describe an extreme form of this problem in which firms almost never issue equity. In the "pecking order," firms fund their investments with sources least likely to be affected by adverse selection: retained earnings, debt, and then equity. A series of closely related studies beginning with Shyam-Sunder and Meyers (1999) examines whether such pecking order considerations are sufficient to explain the time-series patterns of debt issuance.

5.1 The Choice of Debt vs Equity

Research investigating the debt vs equity choice can be traced to Baxter and Cragg (1970), who report probit and logit estimates for this and related decisions (stocks vs convertibles and preferred vs bonds) in a sample of 230 security issues from 1950 to 1965, and Taub (1975), who uses a similar framework to examine 172 debt and equity issues between 1960 and 1969. Building on these earlier studies, Marsh (1982) examines a larger sample (748 issues) in the United Kingdom from 1959 to 1970 to explore what factors influence the decisions of firms to issue debt or equity.

The methodology in Marsh (1992) forms the foundation for many of the later studies that we discuss in more detail. His estimation procedure consists of two steps:

$$Pr(Z_{jt} = 1) = Pr[(D^*_{jt} - D_{jt}) < 0], \tag{5.1}$$

$$D^*_{jt} - D_{jt} = \beta' x_{jt} + \mu_{jt}, \tag{5.2}$$

where $Pr(Z_{it} = 1)$ is the probability that firm j issues equity at time t, D^* represents its (unobservable) target debt ratio, and the vector x_{jt} is a set of firm characteristics that influence either the target debt ratio or deviations from the target. Marsh explores various specifications for the target debt ratio, which include the long-run average debt ratio, as well as the fitted values from regressing the debt ratio on size, operating risk, and asset composition.[1] His market timing variables were both firm specific (the firm's recent share price performance) and market-wide (a forecasting model for both equity and debt based on previous total issues and returns).

The results in Marsh (1982) generally confirm the predictions of the trade-off theory. In particular, he finds that firms with debt ratios that are below their target debt ratios, smaller firms with few fixed assets, and those with less bankruptcy risk are more likely to issue equity.

Hovakimian et al. (2001) build on this work, expanding both the sample size as well as the number of covariates considered. Specifically, they examine the debt vs equity issuance choice of firms that choose to raise a significant amount of capital as well as the debt vs equity repurchase choice of firms that choose to retire capital. Similar to Marsh (1982), they proceed in two steps, first estimating a proxy for the target debt ratio by using the fitted values from a (double censored) tobit regression of observed debt ratios on a vector of determinants previously used in cross-sectional studies. In the second stage, a firm's financing decision is regressed against a vector of explanatory variables:

$$D_{it} = \beta LevDef_{i,t-1} + X_{i,t-1}\gamma + \varepsilon_{it}, \tag{5.3}$$

where $LevDef_{i,t-1}$ is the difference between the firm's observed debt ratio and inferred target from the first stage, $X_{i,t-1}$ is a family of firm characteristics, and ε_{it} is a well-behaved error term. Included in the vector $X_{i,t-1}$ are variables that may proxy for being under- or over-leveraged, proxies for impediments to an adjustment toward target leverage, and measures related to market timing motives.

[1] Size is measured as the logarithm of the total capital employed. Operating risk was measured in various ways, including the standard deviation of EBIT, White and Turnbull's "bankruptcy risk," and the systematic risk (beta) of the company's equity.

The dependent variables in these regressions are dummy variables that in one case indicate whether a firm is issuing equity rather than issuing debt and in the other case indicate whether the firm is repurchasing equity rather than retiring debt.

In the first stage, the authors confirm the results of previous cross-sectional studies. R&D Expense and Selling Expense/Sales are negatively related to leverage. Size and Asset Tangibility have the expected positive coefficients. Stock returns and market-to-book ratios have negative signs, and Profitability is strongly negatively related to leverage.

In the second stage logistic regressions the authors find that the coefficient of the leverage deficit variable has the expected sign, indicating that firms take actions that reverse deviations from their leverage targets. This effect is quite strong in the regressions that explain equity repurchases vs debt retirements, but is only marginally significant when debt or equity is issued. Furthermore, they find that more profitable firms are more likely to issue debt than equity, and that firms with recent net operating losses are more likely to issue equity. Both of these results are consistent with firms using debt to shield taxable income, but the profitability result is especially noteworthy because it suggests that profitable firms, which may passively become less levered over time, take actions to reduce leverage when they are making active choices. Finally, strong recent stock performance is associated with firms reducing their leverage, either by issuing equity or retiring debt. This last finding is consistent with multiple interpretations. One is that holding cash flows constant, firms with high recent stock returns are likely to have realized improved growth opportunities, making equity finance more attractive. A second alterative, discussed in Section 4, is that managers may view the price run-ups as an indicator that their equity is overpriced (or less underpriced), which would make an equity issue more attractive. A final alternative, discussed in Section **, is that managers have more power following stock price run-ups, and use their greater influence to make choices that they personally favor, such as decreasing leverage.

Leary and Roberts (2005) also explore what factors influence a firm's decision to change its capital structure, paying special attention to transactions costs. First, they document that firms issue equity less frequently than debt, which is consistent with Altinkilic and Hansen's (2000) claim that equity issuance costs are nearly five times larger than those for debt issuance (5.38% vs 1.09% on average). Then, the authors estimate hazard models separately for each type of refinancing event, i.e., for both debt (issuance and retirement) and equity (issuance and retirement). Looking at each in isolation allows the author to be specific about factors that are likely to affect a specific type of refinancing event.

In these hazard specifications, the time or "spell" h between refinancing events is parameterized as:

$$h_{ij}(t|\omega_i) = \omega_i h_0(t) \exp\{x_{ij}(t)'\beta\}, \tag{5.4}$$

where ω_i captures unobserved heterogeneity (capturing both the "error term" as well as any firm-specific fixed effect), $h_0(t)$ is the baseline hazard rate, and x_{ij} is a vector of covariates including proxies for adjustment costs that are specific to the type of refinancing event considered. In the model for equity issuance, the authors use Altinkilic and Hansen's (2000) empirical model of underwriting spreads, and for equity repurchases, they consider proxies for the firm's stock liquidity. Although there are few if any proxies for the costs of repurchasing debt, the authors use three estimates of the firm's costs of issuing debt: credit ratings, Altman's Z-score, and estimated underwriter spread.

In general, the results from the hazard analysis confirm that transactions costs play a role in firms' rebalancing decisions. When the estimated debt issuance spread increases, firms are less likely to issue new debt. Similarly, firms repurchase more frequently when the trading volume on their stock is higher. Finally, Leary and Roberts (2005) argue that the *shapes* of the hazard curves are instructive, providing insight into the types of adjustment costs (i.e., fixed or convex) faced by firms.[2] Overall, Leary and Roberts (2005) argue that when firms

[2] In particular, the hazard function with both fixed and convex components is downward sloping, but more so if the fixed cost component is removed. The intuition is that with only proportional costs, firms prefer to make very small adjustments. Once a firm reaches a recapitalization boundary, it corrects any adjustments *back to the boundary* rather than to the leverage target. This means that when a firm's leverage is close to the boundary, it will likely have several consecutive, small adjustments. On the other hand, with a fixed cost,

dynamically adjust their capital structures they consider the impact of frictions on their adjustments.

5.2 Speed of Adjustment

Conceptually, the studies considered in this subsection are similar to the debt vs equity studies just considered. Rather than rely on discrete choice models, however, tests that analyze firms' speeds of adjustment (SOA) generally examine *changes* in leverage ratios rather than issuance and repurchase choices. Specifically, most studies estimate a variant of the following specification:

$$L_{it} - L_{it-1} = \gamma(TL_{it} - L_{it-1}) + \beta' Z_{i,t-1} + \varepsilon_{it} \tag{5.5}$$

$$TL_{it} = f(X_{it-1}), \tag{5.6}$$

where L and TL are observed and target debt ratios, respectively, Z is a vector of characteristics that affect firms' incentives to adjust their leverage ratios, X is a vector of firm characteristics thought to determine target debt ratios, and ε is a normally distributed disturbance. The main coefficient of interest is γ, the fraction of the leverage "deficit" for firm i that is reversed each period (usually annually).

Early speed of adjustment (SOA) studies include Spies (1974), Taggart (1977), Jalilvand and Harris (1984), and Auerbach (1985). Like the later studies that follow, estimates of the adjustment speed vary considerably. For example, Taggart (1977) finds annual long-term debt adjustment speeds around 13% while Jalilvand and Harris (1984) estimate SOA nearly three times as large. We focus our discussion on three recent studies, paying attention to the econometric and specification issues that lead to differences in estimated speeds of adjustment.[3]

What largely distinguish the studies we discuss are the specifications for target leverage, the second equation in the above system of equations. For example, in Flannery and Rangan (2006), cross-sectional

firms recapitalize less frequently but in larger amounts. Thus, although the proportional cost implies that the hazard rate is decreasing, it is less so when proportional costs are admitted.

[3] A notable omission is study by Fama and French (2002) that, with a considerably different specification, finds adjustment speeds in the neighborhood of 7%–15%.

differences in target leverage are driven largely by time-invariant, firm-specific (although unidentified) factors. As the authors argue, by ignoring these firm fixed-effects, the speed of adjustment in these earlier studies are biased downwards. As they show, when firm fixed-effects are included in the target leverage specification, the speed of adjustment increases to almost 38%, roughly three times the magnitude they find when fixed effects are ignored.

Flannery and Rangan's (2006) SOA regressions use market leverage as the dependent variable, and are thus subject to the concern that stock prices, rather than managerial choices, may be driving the results. To address this, the authors analyze changes in book leverage. Specifically, the authors first sort firms into quartiles by absolute level of market leverage. Then, within each market leverage quartile, they test whether firms adjust their *book* leverage to counteract deviations from their target (market) leverage. They find that over (under)-leveraged firms in period $t-1$ reduce (increase) their book leverage, consistent with a trade-off interpretation. Importantly, this finding holds for all firms, regardless of market leverage, suggesting that a mechanical reversion to the mean is not driving their previous results.

However, a more fundamental concern about the Flannery and Rangan (2006) methodology is that the introduction of fixed effects into the target leverage specification introduces a bias in the speed of adjustment estimate. To better understand this concern, we denote firm i's unobserved leverage determinant as η_i, so that the target leverage equation is

$$TL_{it} = \delta X_{it-1} + \eta_i + v_{it}, \tag{5.7}$$

and the equation to be estimated becomes

$$L_{it} = \gamma\delta X_{it-1} + (1-\gamma)L_{it-1} + \beta' Z_{i,t-1} + \gamma\eta_i + (\gamma v_{it} + \varepsilon_{it}). \tag{5.8}$$

The bias in the estimate of the adjustment speed, γ, is due to the unobserved heterogeneity in η_i. As we just mentioned, the original SOA studies that ignore this fixed effect underestimates the speed of adjustment.[4]

[4] Flannery and Rangan argue that failing to account for firm fixed-effects is analogous to introducing estimation error in the target leverage specification, which will bias the

The usual fix for unobserved heterogeneity in cross-sectional regressions is to demean both the right- and left-hand side variables, thereby sweeping out the firm fixed-effects η_i. However, in dynamic panel models, as described by Bond (2002), this transformation induces a look-ahead bias that causes adjustment speeds to be overstated. Specifically, including each firm's fixed effect as part of its target leverage induces a mechanical relation between leverage adjustments and the estimated fixed effect. Flannery and Rangan (2006) recognize this bias, and attempt to correct for it by instrumenting for lagged market leverage with lagged *book* leverage and the remaining explanatory variables. This transformation makes little difference, resulting in adjustment speeds in the neighborhood of 35%.

Lemmon et al. (2008) argue that book leverage is likely to be a weak instrument for market leverage, and thus take a different approach to the estimation. Instead, they estimate speeds of adjustment using "system GMM" estimates (Blundell and Bond, 1998), which are specifically designed to circumvent these biases. The authors report SOA adjustments in the range of 25% for this specification, approximately the midpoint between the OLS and fixed effects estimates which, as discussed above, are biased in opposite directions. Huang and Ritter (2008) take the SOA estimation one step further, arguing that the system GMM estimates in Lemmon et al. (2008) is biased when the autoregressive parameter is highly persistent. Because leverage is highly persistent, Huang and Ritter use Hahn et al.'s (2007) recommendation of using a long differencing estimator for highly persistent time series. In their analysis, SOA range from about 17% for book leverage and 23% for market leverage.

5.3 Tests of Pecking Order Behavior

In his Presidential address, Myers (1984) refers to the financing pecking order, which was originally discussed in Donaldson (1961). Based on informal surveys, Donaldson found that managers prefer to finance

estimated speed of adjustment toward zero. To illustrate this point, they show that adjustment speeds are indeed very low when noise is purposely injected into the target leverage specification.

first with retained earnings, second, after exhausting the supply of retained earnings, with debt, and only after the ability to secure debt is exhausted (or imprudent) the firm issues outside equity. Pecking order behavior, which can be motivated with a variety of information, transaction cost and tax arguments, is often viewed as an alternative to the traditional tradeoff theories. The idea is that rather than reflect a target capital structure (determined by the usual trade-offs), observed debt ratios simply reflect the history of a firm's cash flow shortfalls and surpluses. According to this theory, when firms have sufficient retained earnings to fund their investments their debt ratios will decline, and when their investment choices require substantial amounts of outside financing, their debt ratios will increase.

Shyam-Sunder and Meyers (1999) compare the implications of the pecking order and static trade-off models in a sample of 157 firms from 1971 to 1989. Their study has two aims. The first is to demonstrate that while both have some power to explain the time series of debt issuance and retirement, the pecking order wins the horse race. The second is a more general criticism of standard tests of the static trade-off theory. Specifically, the authors run simulations indicating that such tests have little statistical power against the pecking order alternative — even when a firm's financing is constrained to strictly follow the pecking order, it will appear to be adjusting its debt ratio toward a long-run target.

The first main test of the paper as follows:

$$\Delta D_t = a + b_{PO} DEF_t + e_t, \tag{5.9}$$

where the left hand-side is the amount of debt retired (or issued), DEF is the firm's financing deficit,

$$DEF_t = DIV_t + I_t + \Delta W_t - C_t = \Delta D_t + \Delta E_t, \tag{5.10}$$

and e_{it} is a well-behaved error term. An important issue in this and similar regressions is that the firm's financing deficit can be viewed as exogenous with respect to the firm's capital structure. In reality, these variables, particularly the firm's investment expenditures, are likely to be partially determined by the firm's capital structure.[5] The pecking order coefficient, b_{PO}, is expected to be near 1, although the authors acknowledge that for very high debt levels, this is unlikely to be the case. For their sample of firms, the authors estimate that b_{PO} is about 0.85, with a very precise standard deviation of 0.01.

The alternative hypothesis is a standard target leverage adjustment model (Equation 5.8), in which target leverage is specified in various ways.[6] All variables in each equation are scaled by size (either by sales or book assets). Shyam-Sunder and Myers find speeds of adjustment, γ, in the neighborhood of 0.3 to 0.4, depending on the target leverage specification.

When both b_{PO} and γ are estimated in the *same* regression, the magnitude of the pecking order coefficient is largely unaffected (decreasing by less than 10%) while that of the target adjustment coefficient falls by well over 50%. A comparison of R^2 tells a similar story. Alone, the target adjustment model explains only about 25% of the time series of debt activity, while adding the financing deficit as an explanatory variable almost triples the explanatory power to nearly 75%.

Frank and Goyal (2003) extend Shyam-Sunder and Meyers (1999) by considering a longer time period and a larger cross-section of firm. Studying over 50,000 firm-year observations from 1971 to 1998, Frank and Goyal (2003) test the extent to which debt ratios change in response to changes in *components* of a firm's financing deficit. Specifically, a firm's financing deficit (*DEF* in the equation above) is the sum of dividends, investments, and changes in net working capital minus cash flow from operations. In contrast to Shyam-Sunder and Meyers (1999), who test for a unit coefficient on the aggregate leverage deficit, Frank and Goyal (2003) test for unit coefficients on each of the components of the leverage deficit. The authors alternatively use *net* as well as *gross*

[5] For more discussion of this issue, see the subsection entitled "Debt and Investment" in Section 7.

[6] In one specification, the authors use the firm's average debt ratio over the sample period. In another, they follow Jalilvand and Harris in using the firm's three- or five-year trailing average leverage as a proxy for its target. Finally, they use a parsimonious cross-sectional model of target leverage motivated by previous empirical work: plant, R&D, tax rate, and earnings. They report that various specifications of target leverage do not alter the results.

debt proceeds as the dependent variable, generally finding results more supportive of the pecking order story with the former specification.

When net proceeds are analyzed, the coefficient on the *aggregate* leverage deficit is nearly 0.75 (similar to Shyam-Sunder and Myers) among large firms with continuous records of their financing deficits. However, the results for the individual components are less compelling. For example, for the case where net debt issued is the dependent variable, dividends have a positive coefficient (0.372 to 0.884 depending on the sample of firms), but have a negative coefficient (−0.209 to 0.516) when gross proceeds are used. None of the other coefficients change sign across specifications, but most are far less than one in absolute value. The coefficient on investments varies between 0.189 and 0.744, the coefficient on working capital between 0.068 and 0.723, and the coefficient on internal cash flows between −0.161 and −0.739.

Frank and Goyal (2003) also subject the pecking order to cross-sectional scrutiny, asking whether it holds more strongly for firms expected to have the highest adverse selection costs — small firms with high growth prospects. Their evidence fails to support this hypothesis, suggesting that the pecking order could be due to other imperfections, such as managerial incentive issues or taxes.

A more recent paper by Kayhan and Titman (2007) examines the relation between financing deficits and changes in the debt ratio over longer time intervals. The idea is that it is likely that in the very short run firms fund their financial deficits with debt, but over longer periods, they adjust their debt ratios toward their target, reducing the influence of previous financial deficits. Indeed, in regressions of changes in the debt ratio on the financial deficit the coefficient estimate is much lower (but still quite significant) when the regression is estimated over five-year intervals rather than one-year intervals. In addition, there is evidence that at least part of the change in the debt ratio that is due to the financial deficit is subsequently reversed. This evidence suggests that although the pecking order behavior described by Myers (1984) has a relatively long-term influence on observed capital structures, that over very long time intervals, firms make choices that at least partially offset this effect.

We conclude this section with a recent paper by Chang and Dasgupta (forthcoming), who consider a series of simulations that allow them to reexamine the implications of many of the studies we have discussed. Specifically, they generate simulated data under different assumptions about how firms fund their financial deficits, and armed with this synthetic data, they evaluate a number of the tests that examine movements toward a target debt ratio. In these simulations, firms are assumed to *randomly* choose how to fund or retire the positive or negative deficits. Their particular modeling assumptions are

- *Model 1 (benchmark)*: Financial deficits are taken from actual balance sheet data, and a coin flip is used to decide whether they are funded (or retired) with debt or equity.
- *Model 2*: Financial deficits are taken from actual balance sheet data, but empirical probabilities are used to simulate the debt vs equity choice. In the data, about 75% of positive deficits are funded by issuing debt, and about 65% of negative deficits are used to retire debt.
- *Model 3*: Both financial deficits *and* debt vs equity choice are randomly chosen. In modeling the evolution of financial deficits, the means and standard deviations of the financial deficits are preserved, but any serial correlation in the financial deficits is broken. In modeling the debt vs equity choice, equal probabilities are assigned to each.
- *Model 4*: Firms attempt to time the market. Financial deficits are taken from actual balance sheet data, but firms' debt vs equity decisions are determined by their stock returns. If the firm-specific stock return is above the 75th percentile for the history of that firm's returns, then: (1) if the financial deficit is positive, it issues equity, and (2) if the financial deficit is negative, it repurchases debt. The converse behavior is assumed if the firm's stock-specific return is below the 25th percentile.

The authors make two main points. The first is that data patterns often cited as evidence of active target adjustment can arise for purely mechanical reasons. As in Leary and Roberts (2005), Chang and Dasgupta track leverage differences between firms that have large equity or debt issues, and those that do not. Initially at the issue date, there are significant leverage differences between issuers and controls. Firms that issue equity (debt) initially have lower (higher) leverage than the control group, but such differences gradually diminish over time. While Leary and Roberts (2005) attribute this to dynamic rebalancing, this clearly cannot explain the similar pattern in the simulated data. Instead, Chang and Dasgupta explain that even in the simplest framework (Model 1), there exists significant mean reversion. This is easily seen by considering a firm with a high debt ratio, say, 0.8. If it has a positive financial deficit and needs to issue securities, according to Model 1, equity and debt are each issued with equal probabilities. However, because an equity issue will decrease the debt ratio more than a debt issue of the same size, the *expected* new debt ratio after adjustment is clearly lower than 0.8. For this reason, firms with high (low) debt ratios will tend to mean revert, even if they are not actively targeting particular debt ratios.

The second main point speaks to the explanatory power of many of the firm characteristics generally thought to influence target debt ratios (Section 3). Chang and Dasgupta show that even though debt vs equity choices are made independently of firm characteristics in their simulated data, most of the usual characteristics, e.g., PPE/Assets, R&D/Assets, etc., show a significant relation with the debt ratio in their simulated regressions. As the authors explain, the correlation with the simulated debt ratio arises because these characteristics tend to be correlated with the financial deficit. Because the typical firm will issue debt 75% of the time if it needs to raise money, any characteristic that predicts a firm's financial deficit will also predict its debt ratio.

To better understand this point it is instructive to consider how the debt ratio covaries with the market-to-book ratio (M/B). Empirically, firms with large M/B have high investment needs, low cash flows, and low debt ratios. Because of this, in Chang and Dasgupta's simulated data, M/B and debt ratios are *positively* correlated with leverage. This counterfactual result arises because firms generally choose to issue (retire) debt when financial deficits are positive (negative). Increases in M/B are associated with larger future investments, which lead to increases in leverage. It is only in Model 4 where market timing is hard-wired into the model that a negative relation between M/B and leverage is found in the simulated results. This and similar examples highlight the difficulty in interpreting cross-sectional regressions of the type described in Sections 3–5. Because many firm characteristics are correlated with *both* a firm's financing needs and its target capital structure, teasing out the latter, argue Chang and Dasgupta, is very difficult within the context of standard cross-sectional regressions.[7]

[7] The authors argue that this is true even in models that include firm fixed-effects. While Flannery and Rangan (2006) and Lemmon et al. (2008) argue that unobserved costs and benefits of leverage lead firms to choose persistently low leverage ratios, Chang and Dasgupta argue that such persistence can arise for a different reason. If a firm's particular path of financing deficits is what ultimately determines its leverage ratio rather than a persistent preference for equity or debt, then this explains why incorporating fixed effects into a "target leverage" specification adds significant explanatory power. Indeed, in simulations where all firms are initially endowed with identical leverage, a terminal dispersion in leverage ratios that approximates *actual data* can obtain, even though firms are obeying identical refinancing rules.

6

Stakeholders, Competitive Strategy, and Investment

Until now, we have taken a somewhat limited view of financial distress and bankruptcy costs. In particular, the studies discussed so far have largely taken the firm's strategic behavior as given. The goal of the studies in this section is to expand our understanding of how debt can fundamentally alter the way a firm conducts business — potentially changing its investment policy and the way it interacts with its customers, suppliers, workers, and competitors. In other words, the studies examined here consider the role of feedback between capital structure and the firm's real business decisions.

Although understanding the dynamic nature of such feedback is important, the empirical challenges are quite substantial. Because a firm's capital structure and operating decisions are closely linked by a family of joint determinants, clean identification of a pure "leverage effect" is usually difficult. For this reason, the standard cross-sectional regressions that we have examined until now are no longer appropriate. Instead, most of the studies in this section make use of an exogenous shock (either to leverage or another firm characteristic of interest) that makes identification possible. We devote substantial attention to the econometric challenges presented in this literature, as well as to the various ways that researchers have attempted to circumvent them.

There is a growing literature that discusses how financial leverage affects the relationships between firms and their stakeholders and competitors. The stakeholders include customers who may be concerned about the quality of the firm's product or may anticipate additional interaction with the firm after an initial purchase, workers who develop firm-specific human capital, and suppliers who may require an investment in their relationships with the firm. Each of these parties may require compensation for the costs they will bear if the firm goes out of business, thus imposing "financial distress" costs on a firm whose capital structure introduces the possibility of bankruptcy. In addition, a firm can also face financial distress costs that arise from the actions of its *competitors*, who may choose to compete more aggressively when the firm is financially weakened.

This literature examines how debt affects wages, the level of employment, sales, and product market prices. Although many of these studies present evidence of financial distress costs, it is often difficult to identify the specific sources of these costs. For example, the decline in sales and market share of financially distressed firms could potentially be caused by aggressive rival firms or by customers wary of doing business with a struggling company. In some cases, the empirical methodology allows us to directly identify which of a firm's specific relationships are impacted by financial distress; in others, the results may only be suggestive.

6.1 Debt and Investment

Perhaps the most important example of a corporate decision that can be influenced by financing choices is the firm's investment choice. In theory, the use of debt financing can lead firms to invest less. For example, Myers and Majluf (1984) describes a debt overhang problem in which highly levered firms pass up positive NPV investment opportunities, (see also Myers (1984), Jensen (1986), and Hart and Moore (1990) for similar discussions of the relation between investment and leverage). However, despite its importance, very few studies specifically examine this issue because of significant endogeneity and measurement problems.

The most important problem is that the direction of causation between the level of investment and financial leverage can go either way. In particular, as a number of authors point out, because excessive debt impedes the ability to initiate positive NPV investments, firms with good investment opportunities are likely to choose lower debt ratios. The challenge then is to disentangle the extent to which the negative correlation between debt ratios and investment expenditures is due to the fact that debt impedes investment rather than being caused by firms with more modest investment opportunities choosing higher debt ratios. At least in theory, both effects should be relevant.

The problem associated with identifying the direction of causation is exacerbated by the difficulties associated with accurately measuring investment opportunities. For example, Tobin's q, which is the most used control variable in this literature, is also an endogenous variable that is influenced by the investment strategy of firms. When firms make value-maximizing investment choices, Tobin's q, which measures the firm's value relative to the replacement value of its assets in place, is likely to capture the value of the firm's growth opportunities. However, firms managed by individuals with incentives to overinvest will tend to have lower values, and hence lower Tobin's q. As a result, the coefficient of Tobin's q in an investment equation is likely to be biased downward. Since Tobin's q is correlated with capital structure, the bias in the coefficient of Tobin's q can also bias the coefficient on the debt ratio.

The three papers we explore in this subsection address these endogeneity problems with similar identification strategies. Each study examines the investment decisions of a division within a diversified firm, with the assumption that the capital structure decision, which is made at the firm level, is relatively independent of the investment prospects in any one division. This is similar to the empirical strategy seen in the investment-cash flow literature, e.g., Lamont (1997), who examined how the investment decisions of oil firms' subsidiaries, which were not associated with the oil business, were influenced by the cash flows of the parent, which were determined in part by oil prices.

Lang et al. (1996) study the investment policy of 640 large firms (with over $1 billion in year 1989-adjusted sales) from 1970 to 1989. Their baseline test is a simple OLS cross-sectional regression of net investment (scaled by fixed assets) on book leverage (scaled by assets) and a vector of other determinants.[1] (The authors also explore other specifications for investment such as one- and three-year *growth* in capital expenditures, as well as growth in the firm's employees.) In this baseline specification, leverage is strongly negatively related to all measures of investment and growth, although as the authors note, drawing conclusions is premature due to potential reverse causation.

To address this, the authors examine data (from 1986 to 1991) that allows them to differentiate between core segments and noncore segments of their sample firms, identified by comparing the parent's four digit SIC code to the SIC code of each division. As previously discussed, evidence that noncore investments are affected by the firm's leverage is compeling evidence that leverage influences real investments. The hypothesis of causation running from investment opportunities to the capital structure choice is less compeling in this case since the firm's overall capital structure choice is unlikely to be affected by the investment prospects of their noncore segment. The authors find that although noncore segment investments are not as sensitive to leverage as those in core segments, the leverage effect is nevertheless highly significant. This result, which indicates that a firm's debt ratio influences its investment choice, is robust to alternative specifications of investment, as well as alternative definitions of noncore segments.

Finally, the authors explore whether the negative relation between leverage and growth opportunities holds across firms with different investment prospects. When the baseline regression (i.e., not the noncore vs core investment comparison) is run for firms split by their Tobin's q ratios, a reliable relation between leverage and investment is found only for firms with low Tobin's q, i.e., those with poor investment opportunities. This finding is consistent with two interpretations. The first interpretation is that debt serves as a discipline mechanism, reducing overinvestment among firms whose prospects are poor. The second interpretation is that firms with good investment prospects are able to raise external funds easier than their counterparts with poorer

[1] These include cash flow (scaled by assets), lagged capital expenditures (scaled by fixed assets), sales growth, and Tobin's q.

opportunities, so that for these firms higher leverage does not constrain their investment choices. It is noteworthy that Ofek et al.'s (1996) "no-result" among the firms with high q are not driven by a lack of dispersion in leverage ratios that would reduce the statistical power of the regression. Although firms with low q have higher leverage ratios, the dispersion between the two groups is very similar, indicating that power is unlikely to be an issue.[2]

Peyer and Shivdasani (2001) conduct a similar exercise, except that they specifically examine how segment investment respond to leverage increasing recapitalizations.[3] Their relatively small sample of 22 firms is limited by both the need for a completed recapitalization, as well as having each firm report multiple lines of business. Within this sample, they find that large increases in leverage weaken the relation between investment and Tobin's q within each segment. Like others that study segment level investments (e.g., Shin and Stulz (1998), the authors proxy for Tobin's q with the median Tobin's q of public firms with the same two digit SIC. Prior to recapitalizing, segments with better growth opportunities received higher investment/sales allocations than firms with poor prospects, confirming the prior results of Shin and Stulz (1998). However, the situation changes after recapitalization, when segment Tobin's q are much more weakly related to segment level investment allocations.

The authors note that one explanation for this finding is that the pressure to service large debt payments may encourage managers to choose investments that generate higher immediate cash flows. To explore this possibility, they regress segment level investment to sales ratios on the cash flows of that segment, as well as on the cash flows of other segments. Comparing the same segment cash flow coefficients before and after recapitalizations reveals that segment cash flows are more than twice as important for determining investment after leverage increases. To provide further evidence, the authors split firms based on

[2] Ahn et al. (2006) examine segment level investment across a sample of diversified firms as a function of the overall leverage ratios of the firms. They find that firms with higher debt ratios invest less in *all* of a firm's segments, not just those with poor growth opportunities.

[3] Although they do not control for endogeneity issues, Denis and Denis (1993) also examine a sample of leveraged recapitalizations, and show a significant reduction in capital expenditures following the increase in leverage.

their interest coverage ratios and find that this effect is the strongest for those firms with the lowest coverage ratios, which are those with the most pressure to generate cash flows.

Finally, a pair of related studies by Sufi and Roberts (2007) and Chava and Roberts (2007) examines the connection between leverage and investment by examining what happens after debt covenant violations. Such covenant violations provide a particularly clean test by imposing a discontinuity (shock) in the firm's access to debt financing. Sufi and Roberts (2007) find that following violations, creditors reduce firms' access to finance, on average reversing the flow of debt from 0.8% (as a percentage of lagged assets) four quarters prior to −0.25% two quarters after the violation.[4] Importantly, the authors' estimates indicate that the violations themselves are responsible for the leverage declines, rather than investment opportunities, firm performance, or other factors that would impede creditors' willingness to provide capital.

Chava and Roberts (2007) show that covenant violations can have a significant impact on investment. After a violation, capital expenditures fall by approximately 1% of capital per quarter, which is roughly 13% of investment expenditures prior to the violation. Interestingly, investment suffers the most for firms that are likely to have the highest agency costs or information asymmetries. For example, firms with high cash balances experience greater investment declines after violations, consistent with the free-cash flow hypothesis (Jensen and Meckling, 1976); firms with relationships with long-time lenders suffer less, consistent with reputation being an important consideration for lenders (as described by Diamond (1989)).

6.2 Debt and Workers

For many firms, the most important investment choice is its investment in its employees. Like other investment choices, a firm's investment in its employees is likely to be influenced by its financial structure.

[4] The authors examine a sample of SEC filings to determine the specific mechanism that leads such reductions in debt flows, finding that creditors accelerate payment schedules, terminate credit facilities, and demand additional collateral.

Indeed, studies by Sharpe (1994) and Hanka (1998) find that firms with high leverage pay lower wages, fund pensions less aggressively, and provide less job security to their workers during downturns. Both studies are careful to account for the potentially endogenous relation between leverage and employment decisions, e.g., hiring and firing of workers.

Sharpe's basic specification acknowledges that although employment growth should be related to current and expected sales growth, sales growth is an endogenous variable that may also depend on employment. Alternatively, both sales and employment may *mutually* depend on factors unobserved by the econometrician. Sharpe estimates pooled time-series regressions of the form:

$$\begin{aligned}\Delta E_{it} = {} & (\beta_1 + \beta_3 Lev_{i,t-2} + \beta_5 \mathrm{SIZE}_{i,t-2})\Delta S_{i,t+1} \\ & + (\beta_2 + \beta_4 Lev_{i,t-2} + \beta_6 \mathrm{SIZE}_{i,t-2})\Delta S_{i,t} \\ & + (\beta_0 + \beta_7 Lev_{i,t-2} + \beta_8 \mathrm{SIZE}_{i,t-2}) u_{i,t+1} \end{aligned} \tag{6.1}$$

in which E refers to the number of employees at year end, LEV to book leverage, *SIZE* to inflation-adjusted capital stock, and S to sales. All changes are scaled by their initial levels. Sharpe's primary interest is to ask whether leverage or size affects a firm's tendency to "hoard labor" during downturns. The signs of β_3 and β_4 tell us whether employment changes in highly levered firms are more sensitive to shocks in current and future sales than those of their less levered counterparts. Similarly, coefficients β_5 and β_6 indicate whether a firm's size influences how sensitive its employment is to current and future sales stocks.

There are several potentially important endogeneity considerations. The first is that sales and employment growth are mutually dependent, since changes in employment can certainly cause changes in sales (think about reducing the size of the sales force). To address this issue, sales changes are regressed against a set of macroeconomic instruments (e.g., interest rates, ratios of inventories to sales, growth in industrial production) that are taken as exogenous. By effectively asking whether firms with different leverage ratios react differently to changes in the business cycle, Sharpe is able to isolate the effect of size and leverage on *unexpected* shocks to a firm's demand.

Perhaps a more fundamental concern is that capital structure choices may be influenced by management's expectations of employment changes. To address this, Sharpe uses lags of both book (alternatively market) leverage and size in his empirical model. The hope is that debt ratios chosen at least a year in the past are not correlated with *changes* in current employment, after controlling for current and future sales growth with macroeconomic instruments. Sharpe acknowledges, however, that using lagged debt ratios do not completely solve the endogeneity problem. For example, a firm may choose a higher debt ratio if it can more easily reduce its labor force and cut costs in downturns.

Moreover, Sharpe's evidence is consistent with other interpretations, even if we accept the causal link between leverage and employment changes. For example, Jensen (1986, 1989) suggests that debt provides discipline to managers who incur personal costs from laying off their workers during recessions. In particular, Sharpe's finding of an asymmetry between hiring and firing (debt increases layoffs during recessions but does not increase hiring during expansions) is consistent with this interpretation.

Hanka (1998) claims that although Sharpe's results are suggestive; his empirical design makes it difficult to infer a causal link between layoffs and leverage. What if, Hanka argues, the observed correlation between debt and employment reductions is due to factors that were not included as controls, such as poor historical performance or low-growth opportunities? Using a set of variables from 1950 to 1993 that includes wages, funding of pensions, and use of seasonal employees, Hanka extends Sharpe's analysis by explicitly controlling for determinants of these dependent variables. Supporting Sharpe's conclusions, he finds that highly levered firms pay lower wages, are more likely to lay off their employees, and fund pensions less generously.

Hanka runs a censored (at zero) regression of employment layoffs on various sets of controls.[5] In a benchmark model without controls for divestitures, performance, and growth opportunities, debt is positively

[5] Hanka argues that a Tobit specification — where employment increases are censored at zero — is appropriate, since the goal of the model is to measure debt's impact on a worker's probability of being laid off. Although such a model ignores variation with regard

associated with layoffs. A firm that increases its debt from the 10th to the 90th percentile increases its layoffs by a factor of 1.4. However, this effect is cut in half when controls for asset sales are added, and is halved again when controls for current and prior performance are added. Nevertheless, while controls for operating efficiency and divestitures remove a significant amount of debt's impact on employment reductions, debt is still seen to play a significant, albeit reduced role in a firm's employment policy.[6]

Hanka interprets his results as consistent with the "disciplining" role of debt, i.e., that debt forces management to make choices that may be personally unpleasant. These results (as well as those in Sharpe) are thus consistent with Jensen's (1986) free cash flow theory. It may also be possible to develop an explanation for these results based on Myers (1977) debt overhang theory — a highly levered firm may underinvest in its employees when they are financially distressed or financially constrained. Finally, like Sharpe's findings, Hanka's results are also consistent with the idea that firms with more flexible labor forces can handle higher debt loads.

The final paper we discuss in this section views the firm–employee relationship through the perspective of labor unions, showing how debt can influence the bargaining power of unions. Bronars and Deere (1991) provide empirical support for a model in which debt induces unions to act less aggressively.[7] There are two specifications of the model. In the first, a labor union faces the choice of either accepting a lower wage or forcing the firm into bankruptcy and then negotiating with creditors. Because creditors are assumed to operate the firm with an efficiency loss, it can be shown that the union's optimal strategy is to accept lower wages and avoid bargaining over a smaller surplus. In the second

to *increases* in employment, Hanka mentions that the results are still significant without censoring.

[6] Hanka also presents evidence that firms with higher debt ratios pay lower wages, after controlling for size, industry, changes in employment, and the fraction of assets depreciated (to capture life-cycle effects). A firm that increases its leverage from the 10th to 90th percentile pays about $2300 less annual wage per employee, which is slightly less than 8% of the average of $28,000. In accompanying tests, Hanka also shows that highly levered firms fund pensions less generously and that more levered firms are more likely to rely on seasonal employees.

[7] See also Dasgupta and Sengupta (1993) and Perotti and Spier (1993).

specification, the union forms and sets its wage simultaneously. In both specifications, debt reduces wages. The resulting empirical implication is that firms facing a greater threat of unionization choose higher debt ratios:

$$DE_{fi} = X_{it}\beta + \gamma\pi_{fi} + \varepsilon_{fi}, \tag{6.2}$$

where DE_{fi} is firm f's debt-to-equity ratio in industry i, X_{it} is a vector of control variables, π_{fi} is the (unobserved) probability that firm f is unionized, and ε_{fi} is an error term. Importantly, because unionization is a binary variable, Bronars and Deere use the *industry average* unionization as a proxy for the threat of unionization at the firm level. Thus, two firms with differing union status within the same industry are treated as having identical threats of being unionized.

Bronars and Deere are aware of a significant empirical hurdle: when unions form unexpectedly, market values of equity decline (to reflect potential wealth transfers from equityholders to the union), which increase the measured values of firm leverage. Thus, comparing unionization and debt ratios across industries will result in a mechanical (positive) correlation due to the negative impact on equity value caused by unionization. In this case, the researcher would likely overestimate the effect of unionization on leverage.

Bronars and Deere address this potential bias in two ways. First, they estimate an empirical model that measures the reduction in equity value when unionization campaigns are successful. An adjustment factor for each industry is calculated, based on that industry's unionization rate and the average fraction of equity lost after successful campaigns.[8] The second adjustment is based on the idea that higher wages earned by union workers are financed by equity. By taking the present value of the union rents and adding them back to the observed equity values, the authors produce estimates of equity values when facing only the *threat* of unionization, not its actual occurrence.

Although regression results using the second (that based on the union wage premium) adjustment yielded an insignificant coefficient on

[8] The authors note that because they are adjusting the dependent variable (leverage) by an adjustment factor that is itself a function of one of the regressors (unionization rate), coefficients are downward biased.

unionization rates, the majority of Bronars and Deere's results remain strongly supportive of a positive relation between the threat of unionization and debt ratios.[9] In both regressions using the first adjustment to equity as well as those with an alternative leverage measure that does not require adjustments (debt-to-margin and debt-to-paid in capital), debt ratios are strongly positively related to the unionization rates in their industries.

6.3 Debt and Customers

We now turn our focus to how a firm's sales and/or market share are impacted by its financing choices. There are two empirical challenges. The first is to properly assign causation — although firms with high leverage ratios may suffer declines in market share, it is also possible for sales shocks to influence leverage ratios. The second is to identify the channel through which leverage and sales are connected. Although customers may prefer to do business with financially healthy firms, predation by competitors may also be responsible for lost sales of financially distressed firms. In this section, we focus mostly on two studies (Opler and Titman, 1994; Zingales, 1998) that suggest that debt may damage the firm–customer relationship, leading to poor performance.

Opler and Titman (1994) study how differences in leverage ratios predict firms' abilities to weather industry level shocks. Studying a 20-year period spanning from 1972 to 1991, they run regressions of the following form:

$$\begin{aligned}&\text{Firm performance}\\&\quad = \alpha + \beta_1 \,\text{Log(Sales)} + \beta_2 \,\text{Lagged industry-adjusted profitability}\\&\qquad + \beta_3 \,\text{Industry-adjusted investment/assets}\\&\qquad + \beta_4 \,\text{Industry-adjusted asset sale rate}\end{aligned}$$

[9] In Bronars and Deere's setting, it may be tempting to ask why labor unions do not explicitly bargain over the debt ratio. The reason is that labor laws specifically prohibit unions from negotiating over corporate policies that do not directly affect working conditions and wages.

$$+\beta_5 \text{ Distressed industry dummy}$$
$$+\beta_6 \text{ High leverage dummy}$$
$$+\beta_7 \text{ Distressed industry dummy} \times \text{High leverage dummy} + \varepsilon \qquad (6.3)$$

In this regression, the distressed industry dummy takes a value of one when the industry median sales growth is negative and the median stock return is below −30%. Firm performance is measured with industry-adjusted sales growth, industry-adjusted stock returns, and industry-adjusted operating income. Because financial distress is most likely for highly levered firms that are firms experiencing economic distress (as measured by the distressed industry dummy), the main interest is in the coefficient of the interaction term, given by β_7.

The coefficient estimates on leverage (β_6) are negative when the measures of performance are either industry-adjusted stock returns or industry-adjusted sales growth, indicating that highly leveraged firms performed worse than their peers with lower leverage even in *good* times. The interaction term is also statistically significant and negative in each empirical specification, indicating that this effect is magnified in downturns. Specifically, during industry downturns, a firm in the most leveraged decile experiences industry-adjusted sales declines of 25% more than its peers in the least leveraged decile. However, when operating income is the dependent variable, the coefficient on the interaction term is the correct sign but not significant.

The authors acknowledge that although these results are consistent with costs of financial distress, there are also other interpretations that are consistent with the data. For example, although the empirical design largely mitigates reverse causality (debt ratios are chosen prior to the realization of industry), it is possible that high leverage firms are also the least efficient. If poorly run firms are the fastest to fail in an industry decline, then what appears to be a negative relation between leverage and performance may simply reflect differences in operating quality. In addition, the stock return evidence is consistent with a pure leverage effect — i.e., the stocks of highly leveraged firms *should* do worse than average during bad times.

To consider these possibilities and to further characterize the performance declines, the authors run the same regressions on subsamples split by their R&D/sales ratios. Consistent with customer-driven financial distress, the authors find that among highly leveraged firms, those with high R&D ratios lose the most sales in industry downturns. If customers anticipate that firms with specialized or unique products can impose costs on them during liquidation (think about trying to claim a warranty from a bankrupt manufacturer), then firms may lose sales or need to lower prices to maintain market share. Importantly, this finding is unlikely to be driven by "efficient downsizing," whereby struggling firms cut scale in response to economic distress. Indicators of downsizing such as asset sales or investment reductions are not different between highly and conservatively leveraged firms. These finding suggests that instead of cost-cutting by value-driven managers, highly leveraged firms — and particularly those with distinct products — appear to be losing customers that are reluctant to do business with a struggling firm.

Another study that addresses the firm–customer relation is Zingales's (1998) study of the trucking industry's deregulation in 1980. During this time, the Interstate Commerce Commission (ICC) eased new entry and liberalized rate-setting, resulting in intense price competition and declines in market value for incumbent trucking firms. For most firms, this causes an enormous upward shock in their leverage ratios, providing a nice way to examine the effects of capital structure on the product market environment.

Zingales's (1998) main tests are survival regressions of the form:

$$Pr\{\text{survival in 1985}\}_i = f(X_i^{1977}, Lev_i^{1977}) + \varepsilon_i,$$

where X_i^{1977} refers to a vector of proxies for the level of operating efficiency, Lev_i^{1977} is the net debt-to-capital ratio (calculated as total debt minus cash reserves divided by total debt plus equity), and ε_i is a mean zero noise term. The vector X_i^{1977} proxies operating efficiency, and includes the log of sales, fraction of intangible assets, return on sales, proportion of wages over total costs, as well as nine regional dummies.[10] Zingales's regression indicates that even after accounting for their operating efficiency, highly levered firms are less likely to survive deregulation than their more conservatively financed rivals.

However, perhaps more interesting are the results presented for different segments of the trucking industry, the less-than-truck (LTL) and truckload (TL) segments. This distinction is important and worthy of elaboration. The LTL segment is somewhat of a niche business, providing small hauls for customers with specialized needs. Hubs and distributional networks are important for LTL firms, as are their relationships with customers. Because these assets are difficult to transfer in the event of bankruptcy, financial distress is likely to be quite costly for LTL firms — more so than for TL firms whose main assets are heavy trucks and equipment that are more easily collateralized.

Zingales runs the same survival model for three subgroups, those that obtained (1) less than 30% of their revenues from LTL shipments, (2) between 30% and 70% from LTL, and (3) more than 70% from LTL activity. Interestingly, only in the groups deriving significant revenues from LTL shipments did prior leverage levels negatively affect the probability of surviving the deregulation. Such a disparity could arise for many reasons, including the fact that the TL segments are better candidates for workouts because their assets are more easily redeployed in liquidation.

A second reason is that LTL firms suffered significantly more customer-driven financial distress costs than their TL counterparts. To examine this possibility, Zingales (1998) looks at the prices charged by trucking firms both before and after deregulation. While Zingales

[10] Because leverage is related to profitability, a spurious correlation between leverage and exit may arise if determinants of survival (other than leverage) are not included in the empirical model. Return on sales is intended to control for operating efficiency, as well as size (as the largest firms may be the most efficient). The fraction of intangible assets is included because it potentially measures the monopoly rents enjoyed by a carrier prior to deregulation through its operating certificates. Finally, the proportion of a firm's operating expenses dedicated to benefits and wages provides a measure of the firm's sensitivity to union demands. As previously discussed, the threat of unionization is likely to affect a firm's choice of leverage (Bronars and Deere, 1991) and may also eventually affect its probability of survival. Regional dummies are included to account for potential geographical heterogeneity.

finds that highly leveraged firms began charging lower prices, starting approximately two years after deregulation (1982), this decline is almost exclusively due to price cuts among LTL firms. Because so much of an LTL carrier's value is related to its customer service, Zingales argues that this is evidence that "leveraged carriers discount their services to compensate consumers for the risk associated with the probability of default of the carrier."

Such a distinction between the pricing of TL and LTL firms is important, as other models having little to do with customer concerns can also generate a relation between leverage and pricing. For example, highly leveraged firms may be more vulnerable to predation (Telser, 1966; Bolton and Scharfstein, 1990), or may become more aggressive to meet required interest payments (Brander and Lewis, 1986). Because predation is most effective in situations where some type of capital is destroyed (i.e., where actual deterioration of a firm's business occurs, as opposed to temporary depression of prices), this explanation has considerable appeal. Since entry into the TL segment is relatively easy, it is difficult to imagine that predatory pricing would be particularly effective in this segment.

6.4 Debt and the Firm's Suppliers

Suppliers are often asked to invest resources that are tailored to the needs of a particular customer. For example, a supplier may be required to purchase special equipment, customize its software, or even move its operations to a location closer to an important customer. Each is an example of a *relationship-specific* investment that, by virtue of such specificity, exposes the supplying firm to the fortunes of its important customers. Specifically, if a customer encounters financial distress or declares bankruptcy, the values of any relationship-specific investments from the supplier are reduced.

To induce suppliers to make relationship-specific investments, firms may choose lower debt ratios. This logic underpins an empirical study by Banerjee et al. (2008), who examine how relationship-specificity influences the debt ratios of both the customer and the supplier. For a large sample of manufacturing firms from 1971 to 1997, the authors analyze *Compustat* Item 98, which lists all of a firm's customers that comprise more than 10% of its sales (or is otherwise deemed to be an important customer). By inverting this mapping, they rank *customer* firms by how much they deal with dependent suppliers. The intuition is that for two otherwise identical firms, the one that purchases more of its inputs from dependent suppliers has a greater incentive to maintain a conservative capital structure.

Banerjee, Dasgupta and Kim's main specifications are cross-sectional leverage regressions containing the usual battery of firm characteristics as controls, firm fixed-effects, and variables that capture the nature of the relationship-specificity. Regressions are run separately for both suppliers and customers. In the customer regressions, the interesting variable is the percentage of their purchases that come from dependent suppliers.[11] In the supplier regressions, the analogous measure is simply the fraction of their sales that go to customers it lists as principal in *Compustat* Item 98.

For both customer and supplier market leverage regressions, the coefficients of relationship-specificity variables are significant, and have the expected signs; firms with important bilateral relationships tend to have lower debt ratios. Importantly, both sets of relationships hold only for the durables sector, and are strongest for the smallest firms, which are the most vulnerable during downturns. It should be noted that since the regressions include firm fixed-effects, the relationship-specific variables are identified only through time-series *changes* of each firm's relationship-specificity. That is, holding everything else constant for a given customer firm, in periods when they buy from a more concentrated network of suppliers, they reduce their leverage. The same is true for suppliers.

Kale and Shahrur (2007) also study the supplier–customer relationship, and find that a firm's leverage is lower when its customers and suppliers operate in *industries* that have high R&D intensity.[12]

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[11] For example, suppose that customer A purchases \$3 million worth of goods equally from supplier 1, 2, and 3. If only supplier 1 lists customer A as one of its principal customers in *Compustat* Item 98, then the relevant ratio for customer A is 1/3. Similarly, if both suppliers 1 and 2 had listed customer A in Item 98, the ratio would have been 2/3.

[12] This result also holds when the customer or supplier's R&D is the dependent variable.

In addition, consistent with Fee et al. (2006), which suggests that strategic alliances (SA) and joint ventures (JV) are formed to stimulate relationship-specific investments, Kale and Shahrur (2007) find that a firm's leverage is reduced when it has entered into either SA or TV with its suppliers or customers.

While each of these papers suggest that a firm's relationship with its stakeholders can influence its financing decisions, there are several alternative interpretations of this finding. Perhaps the most obvious is that leverage increases the probability of liquidation — if a major customer fails, the supplying firm is likely to suffer as well. However, theories such as Maksimovic and Titman (1991) suggest that actual liquidation is not necessary. Leverage can induce myopic behavior (e.g., cutting corners on product quality or deviating from a collusive pact), perhaps making highly levered firms less attractive partners for long-term relationships. Finally, it is also possible that leverage is more a consequence than a cause. Specifically, leverage may reflect important aspects about the firm's corporate governance.[13] If entrenched or powerful CEOs can better pursue their preferred strategies by withstanding board or shareholder interference, then suppliers may be more willing to enter into long-term commitments with firms having powerful management. Because we already know that powerful managers prefer less leverage, a relation between low leverage and the investments of one's trading partners would obtain.

6.5 Debt and Competitors

In this section, we focus on how capital structure may influence a firm's ability or willingness to compete with its rivals. Theoretically, the implications of higher debt are not clear cut. Some models (e.g., Brander and Lewis (1986), Maksimovic (1986, 1990)) predict that higher debt ratios cause firms to compete more aggressively. In contrast, in others (Chevalier and Scharfstein (1996), Dasgupta and Titman (1998)) more levered firms compete less aggressively. A final class of models (e.g., Telser (1961), Bolton and Scharfstein (1990)) explores the

[13] For more discussion on the interplay between leverage and governance variables, see the section on managerial entrenchment in Section 4.

possibility that leverage makes a firm vulnerable to predation from its rivals.

Because both the capital structure choice and pricing and output choices are generally viewed as endogenous, to evaluate their relationship existing studies rely on natural experiments involving either the firm's leverage or product market environment. For the former, we focus on a paper by Phillips (1995) that examines four industries that experienced LBOs in the 1980s and on two closely related papers by Chevalier (1995a,b), who explores how LBOs in the supermarket industry influences expansion and pricing decisions. For the latter, we review Chevalier and Scharfstein (1996) and Khanna and Tice (2000, 2005), each of which analyzes shocks to competitive environments, exploring how differences in *ex-ante* capital structure are associated with differential responses and competitive outcomes. All of these studies seek to investigate how debt influences a firm's position in its competitive environment, whether measured by pricing, market share, or the likelihood of surviving.

Phillips (1995) was the first to examine how sharp increases in leverage affect pricing and production decisions. In his study of four industries (fiberglass, tractor trailers, polyethylene, and gypsum) that underwent leverage buyouts, Phillips estimates simultaneous price and quantity models. Most of his results indicate that debt positively influences product prices and negatively affects output (gypsum being the sole exception), consistent with Chevalier and Scharfstein (1996) and Dasgupta and Titman (1998). One the other hand, his findings in the gypsum industry, where the increase in debt lead to stronger competition, is more supportive of models by Brander and Lewis (1986) and Maksimovic (1988) where firms compete by setting quantities (e.g., Cournot competition). Because gypsum is a commodity with relatively low barriers to entry, it is likely that the Cournot assumptions are more applicable. In addition, since overinvestment is likely to be less sustainable in a highly competitive industry, it is less likely that increased leverage will result in reductions in capacity investments.[14]

[14] Kovenock and Phillips (1997) add to Phillips (1995) by examining how leveraged recapitalizations affects individual firm investment and plant closure decisions. In addition,

Chevalier studies leveraged buyouts (LBOs) in grocery store chains, paying attention to both store expansions and pricing. Leverage is, of course, endogenous, being chosen along with a host of other variables including product pricing and expansion/contraction decisions. Any cross-sectional relation obtained from regressing either product market outcome on leverage would thus be susceptible to the criticism that leverage was chosen *in anticipation of* the realizations of the dependent variable. For example, if it were "found" that highly leveraged firms were more likely to close stores, it would be premature to claim that excessive leverage was responsible for the contractions.

In both studies, Chevalier is able to sidestep this and similar endogeneity problems because although grocery stores operate and compete *locally*, their capital structure decisions are made at the *national* level (i.e., the company's headquarters). This means, for example, that the decision to undertake an LBO has little to do with the local product market in any one city where the chain operates. For all intents and purposes, each local grocery store is saddled with a leverage ratio that may or may not coincide with its *locally defined* target leverage ratio, i.e., defined by its local competitive environment. In her own words, "the local-market nature of supermarket competition helps to "clean out" the endogeneity of the LBO in the study of entry, exit and expansion." (Chevalier, 1995a, p. 417).

In her analysis of expansion and contraction decisions, Chevalier (1995a) examines data from 85 Metropolitan Statistical Areas (MSAs) obtained from industry publications. To explain the expansion choice, she runs an ordered probit (+1 for expansion, −1 for retrenchment), including various market controls including changes in population, the Herfindahl Index, and the size of each store, as well as the market share of rival firms that had previously undertaken an LBO. When this model is run only for firms that did not themselves undertake LBOs, she finds that the presence of an LBO in the region tends to soften product market competition. The coefficient estimates of these regressions indicate that if a firm with a 10% market share undertook

Kovenock and Phillips (1997) recognize the potential endogeneity problem in Phillips (1995), and directly control for it through a two-stage approach.

an LBO, it would increase the probability that a nonLBO rival firm would add stores by approximately 6.5%.

As previously mentioned, the main alternative to Chevalier's interpretation is that LBO decisions are endogenous and may have been driven by firm characteristics that are also related to expansion or retraction decisions. For example, perhaps the "weakest" firms were LBO targets. Although the experimental design itself largely mitigates this concern, Chevalier presents evidence that LBO firms did not exhibit significant differences in pre-LBO performance. In particular, comparing accounting data for the 31 publicly traded firms in 1985 reveals that operating margins, market-to-book ratios, and investment rates did not differ substantially between firms that undertook LBOs and those that did not. Chevalier also tests the reactions of stock prices to LBO announcements for their rivals. Finding that a firm's stock price tends to increase following a rival's LBO, Chevalier concludes that the LBO event likely softened rather than strengthened the competitive environment.[15] (However, this evidence on its own is also consistent with "LBO contagion," i.e., where firm A reacts to firm B's LBO because the market interprets firm A as a likely LBO target.)

In a closely related paper, Chevalier (1995b) examines the prices charged by supermarkets in various MSAs, both before and after a firm in the MSA does an LBO. Prices may fall after LBOs, Chevalier argues, if deep-pocketed rivals of the LBO firm cut prices to drive their more financially constrained rivals out of business. On the other hand, prices may rise when one or more firms in a local market undertakes an LBO, consistent with either leverage-induced underinvestment in market share (as discussed later in Chevalier and Scharfstein (1996) and Dasgupta and Titman (1998)) or the reversal of underpricing due to agency problems (Jensen, 1989).[16]

[15] Note also that the positive stock price reactions indicate that the LBOs were largely surprises, making *ex-ante* strategizing in anticipation of the imminent recapitalizations unlikely.

[16] According to Jensen, managers derive utility from large empires, which in the current application, may lead undisciplined agents to inefficiently depress prices to maximize market share rather than profits. To the extent that an LBO aligns incentives of managers and shareholders inefficiently, low prices should rise, reflecting the newfound (and proper) incentives of management.

Her specification includes a host of controls including the price of nongrocery items, employment growth, time dummies, and other potential determinants of grocery prices. Most interesting however, are the variables that capture the financial condition of the firms within the MSA. Chevalier finds that prices go up in MSAs when a firm that competes with other highly leveraged rivals undertakes an LBO itself. In contrast, prices decline when there exists at least one major rival with very little debt in its capital structure.

Chevalier also finds that the coefficient for the market share of the largest *nonLBO* chain in the city is negative for all six specifications, and is significant at the 1% level for the longer time windows. The fact that prices are particularly likely to fall in the presence of a single, large, nonLBO competitor strongly suggests predation. Chevalier completes her analysis by showing that price declines following LBOs accomplish the rivals' presumed goal of driving highly leveraged rivals from the market. With a discrete choice model of exit by LBO firms, Chevalier shows that declines in the grocery price index contributes positively to exit, as would be predicted by a predation explanation.[17]

In an additional paper that examines supermarket pricing, Chevalier and Scharfstein (1996) examine how a firm's reliance on external finance alters its incentive to increase prices during market downturns. They use local-market pricing data from the supermarket industry to test their hypothesis that liquidity constraints cause firms to reduce their investment in market share. In one of their tests, the authors examine supermarket prices for several cities around the time of an oil price shock in 1986 that induced severe downturns in several states including Texas, Louisiana, Oklahoma, Wyoming, and Alaska. Although grocers operating in these states experienced a negative shock, the impact was less severe for national chain stores, whose parents had operations in states relatively insensitive to the oil price spike. The national chain stores in these states could therefore afford to capture market share from their rivals by cutting prices.

[17] When the probit model is examined for the time prior to the LBO, no relationship is observed between prices and firm exit, indicating that relatively long periods of declining prices are not alone sufficient to drive firms from the market.

Examining city-average prices for the six quarters spanning 1985:4–1987:1,[18] the authors find that price declines are most severe in oil-sensitive cities containing a significant national supermarket chain presence. As they argue, the effect of price declines in these cities is quite large. For a given city in an "oil state," an increase of one standard deviation in the fraction of stores owned by national chains from its mean of 0.35 to 0.58 decreases the expected percentage change in the local price index from –0.020 to –0.045.

Using firm-level pricing data from the first quarter of 1991 to the last quarter of 1992, Chevalier and Scharfstein also explore how leverage impacts a firm's pricing, paying particular attention to how the financial position of rival firms influences this decision. As in the city-level tests, whether a store was owned by a firm that undertook an LBO is used as a proxy for being subject to financial constraints. While an LBO dummy may be viewed as endogenous, it is important to remember that the LBO decision is made at the *company* (as opposed to the store) level, such that a given firm's response (or that of its competitors) is not likely to have motivated the recapitalization. In order to test the hypothesis that more financially constrained firms raise prices compared to their less constrained competitors, and that more constrained rivals magnifies this effect, the authors run regressions of the form:

$$\begin{aligned}\Delta\text{Price} = {} & a(\text{LBO}) + b(\text{LBO} \times \Delta\text{EMP}) + c(\text{OLBOSHARE}) \\ & + d(\text{OLBOSHARE} \times \Delta\text{EMP}) + e(\Delta\text{EMP}) \\ & + f(\Delta\text{WAGE}) + \varepsilon \qquad (6.4)\end{aligned}$$

in which LBO represents a dummy if the parent company had undertaken a leveraged buyout, ΔEMP is the percentage change in employment in the city's state during the period, OLBOSHARE is the share of stores in the local market owned by an LBO firm, and ΔWAGE is the percentage change in wages for workers in sales occupations. The dependent variable is the percentage change in prices at a firm's stores in a particular MSA.

[18] The authors use an index of grocery prices, which is a weighted average of prices for each city. The data were provided by the American Chamber of Commerce Researchers Association (ACCRA).

Three main results may be gleaned from this regression. First, LBO firms charge higher prices, as indicated by a significantly positive coefficient on the LBO dummy. Since this may reflect increases in *costs* for LBO firms rather than markups, the fact that the coefficient on the LBO $\times$ ΔEMP interaction term is negative and significant is important. When local markets suffer, as measured by negative employment changes, LBO firms raise prices more than their less financially constrained rivals, which is consistent with the idea that the higher prices are caused by financial constraints rather than higher costs. Also of interest is the coefficient on the local share of LBO firms, OLBOSHARE, which is positive and significant, indicating that leverage causes rivals to increase prices. Furthermore, the interaction term is negative and significant, indicating that slow economic growth magnifies the effect. In a city with low employment growth of 0.5% (one standard deviation below the mean), an increase in OLBOSHARE by one standard deviation from the mean of 14.9% to 30.0% would lead the nonLBO firm to more than double its price increase from 1.4% to 2.9%.

Campello (2003), which builds on Chevalier and Scharfstein (1996), explores how firms' pricing decisions respond to macroeconomic shocks. His specific interest is whether negative macroeconomic shocks generate pricing responses that depend on the capital structures of the firms in the industry. Campello estimates regressions of *industry-level* "markups" over marginal costs,[19] as a function of *GDP* growth, the industry's average leverage, and the interaction of the two. Finding a positive coefficient on the interaction term leads Campello to conclude that "negative shocks to demand prompt firms to raise price-cost margins more (or cut them less) in industries with more externally financed competitors (p. 361)."

He subsequently conducts *firm-level* tests, finding that debt constrains a firm's sales growth, but *only* in industries in which its rivals

[19] Campello of course does not observe marginal costs, but instead follows Bils (1987) in constructing an empirical markup measure. To construct this markup series, Campello gathered industry price data from the Bureau of Labor Statistics (BLS) *Producer Price Indexes*. Data on the number of production workers, the weekly average hours, and the average hourly wage were obtained from the BLS *National Employment, Hours, and Earnings*.

have low leverage. Campello's industry-level evidence is consistent with the idea that shocks that increase leverage reduce a firm's incentive to invest in building market share. However, his firm level evidence on sales growth fails to distinguish between Chevalier and Scharfstein's (1996) and Dasgupta and Titman's models of underinvestment and Telser's (1966) and Bolton and Scharfstein's (1990) models of predation.

Our preceding discussion indicates that macroeconomic changes provide an exogenous source of variation that allows researchers to examine the effect of leverage on competition. An alternative way to examine these issues is to examine how firms respond to exogenous shocks to their competitive environments. Khanna and Tice (2000) examine this issue, by studying the nationwide expansion of the discount retailer Wal-Mart from 1975 to 1996. They focus on how characteristics such as debt, ownership, focus, and profitability lead incumbent firms to react differently to Wal-Mart's expansion into their respective regions.

An important endogeneity concern raised in this study is that Wal-Mart's entry into a particular market may be driven by the inabilities of incumbents to respond. The concern is that perhaps Wal-Mart chooses to expand into regions with weak competitors and that these firms (perhaps because of a history of poor performance) may have high leverage. While it certainly would not be surprising to find that highly leveraged firms respond to Wal-Mart's entry less aggressively, it may be impossible to tell whether debt itself inhibits the incumbent's response, or whether debt is simply correlated with other characteristics that render incumbents less likely to respond aggressively. Khanna and Tice, however, convincingly argue that Wal-Mart's expansion decisions are driven by its own distributional efficiencies rather than by characteristics of its potential competitors, so that for the purpose of this study, the expansion choice can be viewed as exogenous.

To examine how the incumbents react to Wal-Mart's entry the authors estimate ordered probit regressions where the dependent variable is the firm's response, ordered from most aggressive (adding stores, which is assigned a value of $+1$) to least aggressive (reducing the number of stores, assigned a value of -1). Although Khanna and Tice analyze the impact of many firm and market characteristics, we focus primarily on marginal effects of capital structure on the incumbent responses. When the sample is restricted to public incumbent firms, high debt-to-asset ratios are associated with less aggressive capital investments, as measured by expansion and retrenchment decisions. In particular, when all controls are evaluated at their mean values, an increase in the debt ratio of 10% decreases the probability of expansion by 2.7% and increases the probability of retrenchment by 3.5%.[20]

Khanna and Tice also study whether or not an incumbents' prior LBO influences its response to Wal-Mart. Interestingly, they find that LBO firms mount *more* aggressive responses, which contrasts with the Chevalier evidence we described earlier. Khanna and Tice suggest that although this evidence may indicate that "LBO decisions are different from leverage decisions," (p. 750) they encourage a cautious interpretation due to the small number of LBOs in their sample and a potential endogeneity problem. Specifically, it might be the case that firms with more aggressive management were more likely to undertake LBOs.

Such a possibility highlights a central problem in studies of product market competition — leverage ratios are likely to reflect other relevant attributes of firms, such as their management's confidence or operating efficiency. The latter serves as the primary motivation for Khanna and Tice (2005), who study the pricing and exit decisions of discount department stores that are characterized by their leverage ratios and operating efficiency. The authors use recessions as an exogenous source of variation in the competitive environment. Specifically, during bad times, aggressive pricing would be expected to pay off the most in terms of driving weak competitors out of business.

Khanna and Tice (2005) study city-level average prices for discount retailers from 1982 to 1995 under a range of economic conditions. There are two classes of results — one set for low vs high operating efficiency, and another for high vs low debt firms. First, operating efficiency correlates with pricing and exit in ways that standard intuition would suggest. In cities containing mostly inefficient firms, prices are higher, both during recession years and normal times. Furthermore, recessions

[20] In addition, the authors find that firms more "focused" on the discount retailing business (as measured by discount retail sales divided by total firm sales), larger firms, and more profitable firms compete more aggressively with Wal-Mart.

(unsurprisingly) hasten the exit of inefficient firms, although this is *not* accompanied by price cutting. This is important because it suggests that internal weakness rather than aggressive price-cutting by rivals is responsible for the exit of poorly run firms.

In contrast, predation appears to play a central role in the exit of highly leveraged firms during recessions. During nonrecession years, high city-level leverage uniformly predicts higher prices and softer competition. As mentioned earlier in the discussion of Chevalier (1995a,b), higher prices indicates reduced investment in market share in the retail industry. Whether the increased leverage improves efficiency (without debt service, empire building managers may keep prices too low to build large empires) or reduces it (overleveraged firms may be forced to raise prices above that which maximizes firm value) cannot be inferred, as the authors observe only city-level average prices.

However, recession years tell a different story. In markets containing firms with both high and low leverage, economic downturns are correlated with *falling* prices. This is not the case in cities lacking such dispersion in debt ratios, strongly suggesting that well-capitalized firms are making predatory price cuts. Such price cuts appear to accomplish their ostensible purposes of driving competitors out of business. Where only *some* firms are financially distressed, price cuts increase the probability that a highly leveraged firm is forced out of the market during downturns. Importantly, this result does not hold in cities with more homogenous capital structures, where predation is less likely to play a significant role in product market competition.

7

Conclusion

Most of the early empirical literature on capital structure examined the relation between firm characteristics and observed debt ratios. The most robust findings of this line of research is that larger firms with more tangible assets tend to use more debt financing and more profitable firms with high market-to-book ratios and high R&D and selling expenses tend to use less debt financing. Our review of this literature suggests that these results are generally consistent with the idea that debt ratios vary cross-sectionally in ways that depend on differences in the costs and benefits of debt financing. However, this interpretation is not unanimous. In particular, some researchers have argued that these and similar cross-sectional patterns mostly reflect frictions and market conditions that exist at the time when firms raise capital. According to this view, different debt ratios arise from differences in firms' financing and investment histories and their success in internally generating equity capital.

More recent capital structure literature addresses these issues by explicitly examining how a firm's capital structure evolves over time. Such time-series tests are particularly helpful in distinguishing between the opposing viewpoints described above. Specifically, when a firm's investment needs outstrip its internally generated funds, do target capital structures, frictions, or market conditions best predict whether debt or equity is issued? The evidence generates some support for each idea. Changes in capital structure are influenced by both the availability of internally generated capital as well as market conditions, and in addition, there is evidence that firms make choices that move their capital structures toward what can be interpreted as a target debt ratio. Furthermore, there is evidence that firms facing high adjustment costs are more reluctant to close any gaps between their current debt ratios and their targets. However, this literature is fraught with inherent endogeneity and measurement problems, subjecting the results to a number of alternative interpretations.

The final set of studies explores the reverse question: instead of asking what causes leverage ratios to be different, this literature examines how capital structure choices influence corporate decisions. The idea here is that if we can determine how a firm's capital structure affects behavior, then we can more directly determine how capital structure influences firm values. The findings in this line of research seem to strongly support the idea that capital structure affects corporate behavior. However, it is still an open question about whether high leverage tends to make firms make better or worse decisions. For example, firms with higher leverage tend to invest less and are more likely to reduce their work force during recessions. But does this mean that more highly levered firms are forced to forsake positive NPV investments and are too quick to pare down their work force in recessions? Or does it mean that debt provides the discipline that management needs to make tough but value maximizing choices?

Finally, it should be noted that while there is still disagreement in the literature about whether or not the typical firm in the United States has the appropriate capital structure, it is clear that there are a substantial number of firms that look to have too little debt relative to what one would expect from a trade-off of tax benefits and financial distress and bankruptcy costs. For example, Strebulaev and Yang (2007) document that nearly a quarter (23%) of US nonfinancial firms have market leverage ratios less than 5%. The candidate explanations for this observation are likely to come from a combination of the issues described in the latter half of this review; that is, managerial preferences, impediments to capital structure adjustments, and the strategic relationships between the firm and its stakeholders. Perhaps, future research will gain additional insights by considering how these important determinants of capital structure interact.

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