What Are the Determinants of the Capital Structure? Evidence from Switzerland

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1. Introduction

An ongoing debate in corporate finance concerns the question of a firm's optimal capital structure. Specifically, is there a way of dividing a firm's capital into debt and equity so as to maximize the value of the firm? From a practical standpoint, this question is of utmost importance for corporate financial officers, as it has been forcefully demonstrated in survey results by GRAHAM and HARVEY (2001) only recently. Nevertheless, the academic literature has not been very helpful to provide clear guidance on practical issues. In addition, with only a few exceptions, the existing empirical evidence exclusively refers to U. S. data. One exception is the study by RAJAN and ZINGALES (1995), who look at a sample of G-7 countries. They find similar levels of leverage across this group of countries. This is a surprising result, because it has been usually asserted that firms in bank-oriented countries are more levered than in market-oriented countries. They also show that the determinants of the capital structure that have been previously reported for U. S. data are equally important in other G-7 countries.

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The well-established theories of capital structure attempt to explain differences in the *optimal* debt-equity ratio across firms. However, until recently the empirical tests applied a static framework, where the *observed* debt ratio was used as a proxy for the optimal leverage of a firm. For example, TITMAN and WESSELS (1988) for U.S. data and RAJAN and ZINGALES (1995) for international data document that leverage is related to firm-specific characteristics, such as profitability, investment opportunities, tangibility of assets, and earnings volatility.[4] Using observed debt ratios is particularly problematic if adjustment to the optimal capital structure is costly, as suggested by FISCHER, HEINKEL, and ZECHNER (1989). In the presence of adjustment costs, it might be cheaper for firms not to fully adjust to their targets even if they recognize that their existing leverage ratios are not optimal.

The standard static capital structure models cannot capture the dynamic adjustments of leverage ratios. A recent survey by GRAHAM and HARVEY (2001) among U.S. firms documents that managers seek a target debt-equity ratio. But due to random events or other changes, firms may temporarily deviate from their optimal capital structure and then only gradually work back to the optimum. To account for these stylized facts, several studies used a dynamic model approach, where observed and optimal leverage may differ due to the presence of adjustment costs.[5] An important advancement to capture the dynamics of capital structure decisions in an appropriate econometric framework is the analysis by DE MIGUEL and PINDADO (2001). Using Spanish data, they develop a target adjustment model, which allows them to explain a firm's debt in terms of its debt in the previous period and its target debt level. Most importantly, the target debt level is a function of firm characteristics, such as profitability, growth, and tangibility of assets. DE MIGUEL and PINDADO (2001) endogenize the target leverage ratio, which allows them to identify the determinants of the *optimal* capital structure rather than the observed capital structure. They finally arrive at the econometric specification of a dynamic model with predetermined variables, which can be estimated using the dynamic panel estimator suggested by ARELLANO and BOND (1991). Interestingly, their results suggest that Spanish firms face lower adjustment costs than U.S. firms.

In this study we shed light on several capital structure issues from a Swiss perspective. To our knowledge there is only one prominent study by GAUD, JANI,

4 See also FAMA and FRENCH (2001) for a recent study of capital structure decisions using an extensive panel set of U.S. data.

5 For example, see JALILVAND and HARRIS (1984) and SHYAM-SUNDER and MYERS (1999).

Hoesli and Bender (2003). Their paper as well as ours both apply the empirical methodology introduced by De Miguel and Pindado (2001) and test a static as well as a dynamic framework, where the latter accounts for costly and imperfect adjustment. While the sample of firms in the Gaud, Jani, Hoesli and Bender (2003) analysis is somewhat larger than in this study, we report results for alternative definitions of leverage and also adjust leverage for cash balances. This is an important contribution and robustness check. In fact, the results in our dynamic panel estimations reveal that the estimated target adjustment parameter, or speed of adjustment, is sensitive with respect to the definition of leverage. Therefore, any interpretations require utmost care. Furthermore, we think that detailed empirical evidence for European countries is important because the institutional framework differs significantly from the United States. Ramb (1997) and Kremp, Stoess and Gerdesmeier (1999) analyze German and French firms, respectively, while De Miguel and Pinado (2002) use Spanish data. Given that the Swiss stock market is among the largest in Europe, our results fill a gap in the empirical literature.

The remainder is as follows. We start with a brief review of theories about the capital structure in section 2. In empirical applications, however, it is not immediately clear how to measure leverage. Following Rajan and Zingales (1995), we provide several possible definitions of leverage and show summary statistics for our sample in section 3. We also compare the Swiss data with international data. Our analysis proceeds by identifying variables that proxy for different influences hypothesized by well-known capital structure theories in section 4. Finally, in section 5 the ex ante expectations are confronted with actual data. We test both static and dynamic models using a panel of Swiss leverage data. Section 6 concludes.

2. Theories of the Capital Structure

2.1. The Miller-Modigliani Theorem

In their path-breaking paper in 1958 Nobel laureates Merton Miller and Franco Modigliani provided the formal proof of their now-famous M&M irrelevance proposition. They demonstrate that there would be arbitrage opportunities in perfect capital markets if the value of a firm depended on how it is financed. They also argue that if investors and firms can borrow at the same rate, investors can neutralize any capital structure decisions a firm's management may come to (home-made leverage).[6] While the M&M capital structure irrelevance theorem clearly rests on unrealistic assumptions, it can serve as a starting point to search for the factors that effectively influence corporate leverage policies. Alleviating these assumptions, the two most prominent theories of capital structure are the trade-off theory and the pecking order theory.

2.2. The Trade-off Theory

The trade-off theory of the capital structure suggests that a firm's target leverage is driven by three competing forces: (i) taxes, (ii) costs of financial distress (bankruptcy costs), and (iii) agency conflicts. We discuss taxes and bankruptcy cost in this section and postpone agency conflicts until section 2.3.

Taxes: Adding debt to a firm's capital structure lowers its (corporate) tax liability and increases the after-tax cash flow available to the providers of capital. Thus, there is a positive relationship between the (corporate) tax shield and the value of the firm.

Bankruptcy costs: When a firm raises excessive debt to finance its operations, it may default on this debt. However, it is not bankruptcy per se that is the problem. If the bond payments are not met when they become due and the bond defaults, a firm's assets are simply transferred to the bondholders. However, there are deadweight (opportunity) costs that arise in the case of corporate bankruptcy. They come in two forms, direct and indirect deadweight costs.

Direct out-of-pocket expenses for the administration of the bankruptcy process (legal fees and management time) are relatively small compared to the market values of firms. However, there are economies of scale with respect to direct bankruptcy costs. While they seem of less importance for large firms, they can be substantial for small firms.[7] In contrast, indirect bankruptcy costs can be significant for both large and small firms. Once the firm runs into financial distress its investment policy possibly changes, which may result in a reduction of firm value. Most obvious, the firm could decide on shortsighted cutbacks in research and development, maintenance, advertising, and educational expenditures that

6 The underlying rationale for the M&M argument is that the value of the firm is determined by the left-hand side of the firm's balance sheet, i. e., by what is usually referred to its investment policy. The economic substance of the firm is unaffected whether the liability side of the firm's balance sheet is sliced into more or less debt. To increase the value of the firm, it must invest in additional projects with positive net present values.

7 In an early study on railroad companies Warner (1977) estimates the direct bankruptcy costs in the magnitude of 1%. See also Haugen and Senbet (1978) and Andrade and Kaplan (1998).

ultimately result in lower firm values. Besides, bankruptcy hampers conduct with customers, who are usually lost because of both fear of impaired service and loss of trust.

To sum up, the trade-off theory of the capital structure posits that there is an optimal debt-equity ratio. Firms attempt to balance the tax benefits of higher leverage and the greater probability (and the possibly higher associated costs) of financial distress.

2.3. Agency Costs

Jensen and Meckling (1976) define agency costs as the sum of monitoring expenditures by the principal, bonding costs by the agent, and a residual loss. In much of the corporate finance literature it is assumed that agency costs are an important determinant of firms' capital structure (see Harris and Raviv (1991)). Three forms of agency problems have received particular attraction: (i) risk shifting (or asset substitution), (ii) the underinvestment problem, and (iii) the free cash flow hypothesis.

2.3.1. Risk Shifting

The risk shifting or bondholder expropriation hypothesis asserts that stockholders have the incentive to exploit bondholders once debt is issued. Managers, whose ultimate responsibility is to the stockholders, are likely to make investments that maximize stockholder wealth rather than total firm value. In particular, because equity can be viewed as a call option, managers tend to accept risky negative net present value (NPV) projects in which the value decrease consists of a decrease in the value of debt and a smaller increase in the value of equity. This is known as the overinvestment problem.[8]

Obviously, the expropriation potential makes it difficult for firms to raise debt at fair prices. Ex ante bond investors will get their fair compensation. Because bondholders will anticipate stockholders' future behavior, they demand a premium payment they would not require if the firm could plausibly commit not to expropriate bondholders. While bondholders are ex ante equally well off,

8 It is well known from option pricing theory that the sensitivity of the value of an option with respect to volatility (i. e., the option vega) is highest for at-the-money options. This implies that the stockholder-bondholder expropriation conflict is most pronounced for financially distressed firms. Therefore, the asset substitution conflict is often classified as indirect bankruptcy costs.

stockholders face the opportunity costs of not being able to issue debt (and foregoing its other advantages, such as tax savings). This effect, also known as asset substitution, is again an agency cost of debt financing. Given that the expected cost of opportunistic behavior is incorporated into the price of debt, Jensen and Meckling (1976) posit that the firm trades off the agency costs of debt against the benefits of debt. Hence, the ex ante solution to the overinvestment problem is that the optimal capital structure is tilted towards equity.[9]

2.3.2. Underinvestment Problem

The underinvestment problem refers to the tendency of managers to avoid safe positive net present value projects in which the value increase consists of an increase in the value of debt and a smaller decrease in the value of equity. Myers (1977) demonstrates that there is a rational basis for this shortsightedness when stockholders provide the necessary funds, but will not receive any proceeds of a valuable project when the debt comes due. Hence, the firm will refuse to accept good investment opportunities ex post, reducing firm value ex ante.

Brealey and Myers (2000) argue that the underinvestment problem theoretically affects all firms with leverage, but it is again most pronounced for highly leveraged firms in financial distress. The greater the probability of default, the more bondholders gain from value increasing projects. In addition, companies whose value consists primarily of investment opportunities, or growth options, are most likely to suffer from the underinvestment problem.

Similar to the asset substitution problem, the underinvestment problem tilts the capital structure towards equity. Mature firms with high reputation but few profitable investment opportunities, whose value comes mainly from assets-in-place, find it optimal to choose safer projects. In contrast, young firms with many growth opportunities and little reputation may chooses riskier projects. If they survive without default, they will eventually switch to the safe project. Due to their lower costs of debt, mature firms can run higher leverage ratios than firms whose value is derived primarily from growth opportunities.

9 However, using Monte-Carlo simulation, Parrino and Weisbach (1999) argue that the distortions arising from the stockholder-bondholder are far too small to explain the cross-sectional variation in capital structure.

2.3.3. The Free Cash Flow Hypothesis

Easterbrook (1984) and Jensen (1986) argue that for companies which largely consist of assets-in-place and produce stable operating cash flows high leverage can add value by improving managers' financial discipline.[10] Free cash flow is cash flow in excess of that required to fund all projects with positive net present values. Firms with substantial free cash flow face conflicts of interest between stockholders and managers. The problem is how to motivate managers to distribute excess funds rather than investing them below the cost of capital or wasting them on organizational inefficiencies.

Instead of investing into low-return projects, managers of firms with stable free cash flows can pay out cash by increasing dividends or repurchasing stock. However, leverage is a more effective means for addressing the free cash flow problem. This is because contractually obliged payments of interest and principal are a more credible signal than discretionary dividend payments or share repurchases when giving back excess capital to investors. Bondholders can take the firm into bankruptcy court if managers do not maintain their promise to make interest and principal payments. Accordingly, debt reduces the agency cost of free cash flow for mature companies by reducing the cash flow available for spending at the discretion of managers.[11]

2.4. Information Costs and Signaling Effects

The explicit modeling of private information in financial theory has had a tremendous impact on capital structure theory. Two main strands have emerged in the literature on asymmetric information. In the first approach, debt is regarded as a means to signal confidence to a firm's investors. In the second approach, it is argued that the capital structure is designed to mitigate distortions in the investment decisions caused by information asymmetries.

2.4.1. Signaling with Proportion of Debt

In one set of approaches, the choice of capital structure is a signal to outside investors about the information of insiders. Ross (1977) assumes that managers (the insiders) know the true distribution of firm returns, but investors do not. He argues that investors interpret larger levels of leverage as a signal of higher quality.

10 See also Hart and Moore (1995).
11 See Stulz (1990) and Harris and Raviv (1990) for more formal models in this direction.

The intuition behind his argument is that debt and equity differ in an important way that is crucial for signaling insider information. Debt is a contractual obligation to repay interests and the principal. Failure to make these payments can lead to bankruptcy and managers may lose their jobs. In contrast, equity is more forgiving. Although shareholders expect dividends at least to be maintained, managers have more discretion and can cut them back in times of financial distress. Therefore, adding debt to the capital structure can be interpreted as a credible signal of high future cash flows and managers' confidence about their own firm. Lower quality firms will not imitate higher quality firm by issuing more debt because they have higher bankruptcy costs at any level of debt. Accordingly, ROSS (1977) concludes that investors take larger levels of debt as a signal of higher quality and that leverage and profitability are thus positively related.

2.4.2. Pecking Order Theory

MYERS and MAJLUF (1984) suggest that capital structure decisions help to mitigate inefficiencies in a firm's investment program that are caused by information asymmetries. They show that managers use private information to issue risky securities when they are overpriced. It is important to recognize that this results in an interaction between investment and financing decisions. Because market participants cannot separate information about new projects from information about whether the firm is under- or overvalued, equity will be mispriced by market participants. If firms are required to finance new projects by issuing equity, underpricing may be so severe that new investors capture more than the net present value of the new project, which would result in a net loss to existing shareholders. Even a positive net present value project will be rejected, leading to yet another underinvestment problem.

The information costs associated with debt and equity issues has led MYERS (1984) to argue that a firm's capital structure reflects the accumulation of past financial requirements. There is a pecking order of corporate financing: (i) firms prefer internal finance; (ii) if internal finance is not sufficient and firms require external finance, they issue the cheapest security first. Therefore, they start with debt, then possibly use hybrid securities such as convertible bonds, and issue equity only as a last resort.

In contrast to the trade-off theory, there is no well-defined target leverage ratio in the pecking order theory. There are two kinds of equity, internal and external, one is at the top of the pecking order and one at the bottom. Therefore, as argued by BAKER and WURGLER (2000), a firm's leverage ratio reflects its past cumulative requirement for external finance. Most importantly, the pecking order theory can explain why the most profitable firms tend to borrow less; they simply do not need external funds. Less profitable firms issue debt because they do not have sufficient internal funds and because debt has lower flotation and information cost compared to equity. Debt is the first source of external finance according to the pecking order. Equity is issued only as a last resort, when the debt capacity is fully exhausted. Tax benefits of debt are a second-order effect. The debt ratio changes when there is an imbalance between internal funds and real investment opportunities.

3. Data Description

3.1. Sample of Firms

In general, our sample targets all 253 firms in the Swiss Performance Index (SPI). However, we have to make several adjustments. First, the SPI consists of a great number of financial institutions. Because banks and insurance companies are subject to specific rules and regulations according to Swiss law, their leverage is severely affected by exogenous factors unrelated to direct financing activities. Following Rajan and Zingales (1995), we exclude all firms categorized as "Financials" according to the sector classification of Swiss Exchange (SWX) and focus exclusively on non-financial firms. Second, we could not collect the necessary data for some of the smaller firms in the SPI. This leaves us with an unbalanced panel of 124 Swiss firms over the sample period 1991–2001. All data is taken from the Worldscope database.

3.2. Measures of Leverage

Surprisingly, there is no clear-cut definition of leverage in the academic literature. The specific choice depends on the objective of the analysis. Rajan and Zingales (1995) apply four alternative definitions of leverage. Because we think their approach is the cleanest in the literature, we adopt their framework.

The first and broadest definition of leverage is the ratio of total (non-equity) liabilities to total assets, denoted as LVLTA. This can be viewed as a proxy of what is left for shareholders in case of liquidation. However, this measure does not provide a good indication of whether the firm is at risk of default in the near future. In addition, since total liabilities also include items like accounts payable, which are used for transaction purposes rather than for financing, it is likely to overstate the amount of leverage. In addition, this measure of leverage is potentially affected by provisions and reserves, such as pension liabilities.

A second definition of leverage is the ratio of debt (both short term and long term) to total assets, denoted as LVDTA. This measure of leverage only covers debt in a narrower sense (i. e., interest-bearing debt) and excludes provisions. However, it fails to incorporate the fact that there are some assets which are offset by specific non-debt liabilities. For example, an increase in the gross amount of trade credit is reflected in a reduction in this measure of leverage. Because the level of accounts payable and accounts receivable may differ across industries, Rajan and Zingales (1995) suggest to use a measure of leverage unaffected by the gross level of trade credit.

A third definition of leverage is the ratio of debt to net assets, where net assets are total assets less accounts payable and other current liabilities. This measure of leverage is denoted as LVDNA and is unaffected by non-interest-bearing debt and working capital management. However, it is influenced by factors that have nothing to do with financing. For example, assets held against pension liabilities may decrease this measure of leverage. In Switzerland this should not be important, because pension liabilities need not be expensed in the balance sheet. In contrast to most other continental European countries, pension money is managed in separate entities.

Our fourth and final definition of leverage is the ratio of total debt to capital, where capital is defined as total debt plus equity, denoted as LVDC. This measure of leverage looks at the "capital employed" and thus best represents the effects of past financing decisions. It most directly relates to the agency problems associated with debt, as suggested by Jensen and Meckling (1976) and Myers (1977).

An additional issue is whether leverage should be computed as the ratio of the book or the market values of debt and equity. Fama and French (2002) argue that most of the theoretical predictions apply to book leverage. Similarly, Thies and Klock (1992) suggest that book ratios better reflect a management's target debt ratio. The market value of equity is dependent on a number of factors that are out of direct control for the firm. Therefore, using market values may not reflect the underlying alterations within the firm. In fact, corporate treasurers often explicitly claim to use book ratios to avoid "distortions" in their financial planning caused by the volatility of market prices. A similar rational is often heard from rating agencies. From a more pragmatic point of view, the market value of debt is not readily available. However, Bowman (1980) documents a high correlation between market and book values of leverage. It should therefore come as no surprise that most previous literature relates to the book value of leverage. Nevertheless, we also report quasi-market leverage, where the book value of equity is replaced by the market value of equity, but value debt at its book value.

A final adjustment accounts for cash balances. This seems particularly important, because many Swiss firms hold substantial cash and short-term investments. Cash balances need not be inefficient, but may rather be interpreted as "slack" (see Myers (1984)), which can be used to invest in positive net present value projects that come along without approaching the capital market. Alternatively, the firm could use the funds and immediately repay debt or repurchase its own stock. As a firm outsider, it is hard to assess how much cash is needed to run a business. Following Rajan and Zingales (1995), we interpret cash balances as excess liquidity and compute adjusted leverage ratios by subtracting cash and cash equivalents from both the numerator and the denominator of the ratios introduced above.

3.3. Data Description and International Comparison

Table 1 reports summary statistics of the four definitions of unadjusted leverage for our sample over the 1997–2001 period. Table 2 shows the respective adjusted leverage figures. For those firms that exhibit net-cash positions after the theoretical repayment of their debt, the (adjusted) ratio becomes negative. However, since negative leverage ratios cannot occur by definition, we cut the distribution below at zero to report the sample statistics in table 2.[12] Each cell in both figures contains the mean leverage ratio, the median leverage ratio (in brackets), as well as the aggregate leverage ratio in the second line (obtained by summing total liabilities across firms and dividing by the summed assets). Rajan and Zingales (1995) argue that this latter (aggregate) measure offers an upper limit of the amount of leverage in a country, and we report the respective numbers to enable comparisons with their results. To give an idea of the variation in the data, table 1 also reports the standard deviation of leverage (in italics). Given that the distribution of adjusted leverage ratios is truncated at zero, we do not report the respective standard deviations in table 2. We choose the shorter 1997–2001 sample period for this detailed data analysis because we could gather a balanced sample of all 124 firms only for these more recent years. Nevertheless, before we proceed, it seems instructive to look at some stylized facts over a longer period of time. To give a notion of the evolution of leverage over the last decade, figures 1 and 2 display book leverage ratios and market leverage ratios in each year since 1991, respectively. Complete data was not available for all firms over the entire sample period. Rather than computing average leverage ratios with different numbers of firms in the early sample years (which may lead to biased results), figures 1 and 2 refer to a reduced (balanced) sample of 73 firms over the 1991–2001 period.

12 This restriction is abandoned in the regression framework below.

Table 1: Unadjusted Leverage

Mean (Median) Aggregate *Standard deviation*	LVLTA	LVDTA	LVDNA	LVDC
Panel A: Book leverage (in %)				
1997	59.36 (58.89) 65.15 *18.37*	26.59 (24.65) 25.50 *17.11*	32.16 (31.18) 32.73 *19.47*	39.58 (39.98) 42.30 *23.20*
1998	57.38 (59.75) 63.49 *17.55*	25.01 (23.28) 27.81 *15.21*	31.05 (31.79) 34.51 *16.37*	37.11 (38.72) 43.01 *20.80*
1999	55.82 (57.70) 61.74 *16.89*	24.52 (24.91) 26.66 *13.86*	31.01 (30.49) 32.84 *15.43*	36.53 (36.46) 41.22 *18.93*
2000	54.62 (57.91) 59.81 *17.18*	23.64 (23.06) 25.91 *14.52*	29.20 (29.87) 31.67 *16.83*	35.07 (35.13) 39.14 *19.96*
2001	57.17 (59.53) 62.33 *18.23*	26.17 (25.71) 26.59 *15.63*	32.08 (34.43) 35.89 *18.27*	38.41 (40.88) 43.99 *21.67*
Panel B: Market leverage (in %)				
1997	44.71 (44.68) 34.58 *21.59*	20.05 (17.20) 13.53 *15.32*	24.28 (22.50) 15.33 *17.49*	27.88 (25.36) 17.15 *21.47*
1998	42.90 (42.78) 29.68 *21.29*	19.30 (17.14) 13.00 *14.77*	23.59 (20.91) 14.30 *17.30*	26.32 (22.39) 15.57 *20.62*
1999	38.85 (38.40) 27.95 *20.58*	17.81 (14.45) 12.07 *13.77*	21.39 (16.56) 13.19 *16.53*	23.98 (18.79) 14.37 *19.39*
2000	39.07 (38.90) 26.92 *21.29*	17.45 (14.77) 11.66 *14.21*	20.32 (16.98) 12.70 *16.33*	23.48 (18.85) 13.75 *19.77*
2001	47.38 (49.62) 34.61 *21.91*	21.99 (20.99) 16.43 *15.52*	26.19 (24.52) 18.21 *18.00*	30.78 (29.29) 20.08 *21.43*

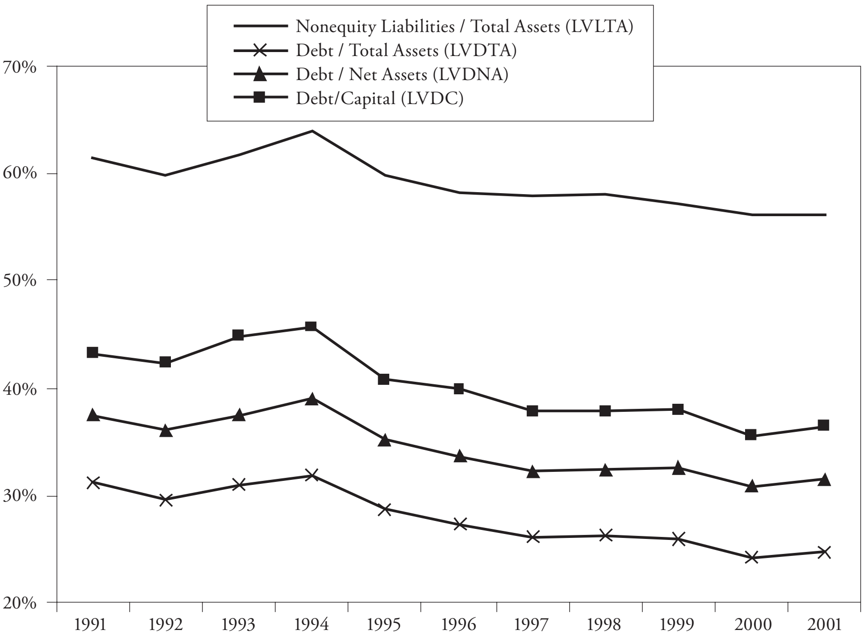
Unadjusted leverage measures are calculated for all 124 non-financial Swiss companies for each year over the 1997–2001 period. Leverage is measured both in book values (panel A) and market values (panel B). LVLTA is the ratio of total (non-equity) liabilities to total assets. LVDTA is the ratio of interest-bearing debt (both short term and long term) to total assets. LVDNA is the ratio of debt to net assets, where net assets are total assets less accounts payable and other current liabilities. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. The first number in each cell denotes the mean leverage ratio, the second number (in brackets) is the median leverage ratio, and the third number beneath is the aggregate leverage ratio, which is obtained by summing total liabilities across firms and dividing by the summed assets. The number in the last line (in italics) denotes the cross-sectional standard deviation of leverage.

Table 2: Adjusted Leverage

Mean (Median) Aggregate	LVLTA	LVDTA	LVDNA	LVDC
Panel A: Book leverage (in %)				
1997	51.29 (52.85) 58.26	18.58 (15.96) 10.76	21.29 (16.01) 14.63	27.85 (25.42) 20.53
1998	49.74 (52.53) 56.35	16.91 (12.61) 13.70	20.18 (16.19) 17.84	24.99 (20.54) 23.71
1999	48.69 (51.77) 54.39	16.85 (14.36) 12.56	20.56 (17.45) 16.21	25.31 (23.11) 21.71
2000	47.53 (51.24) 50.99	16.62 (13.09) 9.67	20.63 (17.26) 12.42	24.70 (23.01) 16.45
2001	49.42 (54.62) 53.53	18.95 (17.14) 12.64	23.14 (23.68) 16.16	28.33 (29.01) 21.28
Panel B: Market leverage (in %)				
1997	38.60 (37.30) 28.30	13.91 (8.24) 5.22	16.59 (8.46) 6.00	19.66 (9.43) 6.80
1998	37.32 (35.99) 23.86	13.32 (6.80) 5.79	15.97 (8.91) 6.43	18.31 (9.46) 7.06
1999	33.65 (33.32) 22.28	12.65 (7.49) 5.14	14.90 (8.94) 5.67	17.30 (9.89) 6.22
2000	30.89 (30.89) 20.48	12.62 (8.25) 3.88	14.68 (9.61) 4.26	17.25 (10.86) 4.66
2001	41.39 (42.66) 26.71	16.21 (10.88) 6.34	19.35 (13.21) 7.12	23.17 (14.77) 7.96

Adjusted leverage measures are calculated for all 124 non-financial companies for each year over the 1997–2001 period. Leverage is measured both in book values (panel A) and market values (panel B). LVLTA is the ratio of total (nonequity) liabilities to total assets. LVDTA is the ratio of interest-bearing debt (both short term and long term) to total assets. LVDNA is the ratio of debt to net assets, where net assets are total assets less accounts payable and other current liabilities. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. All leverage measures are adjusted leverage ratios, which are computed by subtracting cash and cash equivalents from both the numerator and the denominator of the four (unadjusted) leverage ratios. To avoid negative leverage ratios, the distribution is truncated at zero. The first number in each cell denotes the mean leverage ratio, the second number (in brackets) is the median leverage ratio, and the third number beneath is the aggregate leverage ratio, which is obtained by summing total liabilities across firms and dividing by the summed assets.

Figure 1: Evolution of Book Leverage (1991–2001)

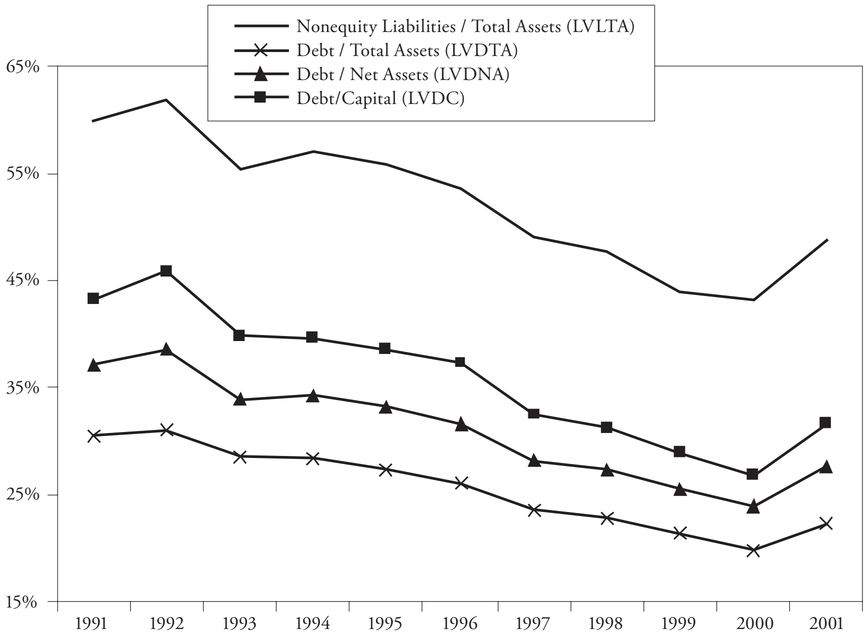


The figure shows the evolution of book leverage for a sample of 73 Swiss firms over the 1991–2001 period. LVLTA is the ratio of total (non-equity) liabilities to total assets. LVDTA is the ratio of interest-bearing debt (both short term and long term) to total assets. LVDNA is the ratio of debt to net assets, where net assets are total assets less accounts payable and other current liabilities. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity.

Looking at figures 1 and 2, two general patterns are noteworthy. First, independent of the exact definition of leverage, book leverage declines. This might be explained by an attempt to increase the marginal debt capacity during the prosperous decade of the 1990s. In a complex version of the pecking order theory, firms are concerned with future as well as current financing costs. In times of high stock market valuations (and low costs of equity financing) they reduce leverage by issuing new shares of stock in an attempt to achieve low risk debt capacity and to avoid financing *future* investments with new equity offerings, or foregoing the investments.[13] Using the definition of leverage as the ratio of non-equity

13 See Baker and Wurgler (2000) for evidence on market timing with respect to capital structure decisions.

Figure 2: Evolution of Market Leverage (1991–2001)



The figure shows the evolution of market leverage for a sample of 73 Swiss firms over the 1991–2001 period. LVLTA is the ratio of total (non-equity) liabilities to total assets. LVDTA is the ratio of interest-bearing debt (both short term and long term) to total assets. LVDNA is the ratio of debt to net assets, where net assets are total assets less accounts payable and other current liabilities. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. All ratios are quasi-market leverage ratios, where the book value of equity is replaced by the market value of equity, but debt is valued at its book value.

liabilities to total assets, book leverage decreases slightly from 58.36% to 56.11%. More pronounced, the ratio of debt to total assets decreases from 29.55% to 24.72%. Second, market leverage has increased only recently. For example, the ratio of debt to capital has increased from 26.78% to 31.53% between 2000 and 2001. Of course, this can be explained by the sharp decline in stock market capitalization, which strengthens our notion that market leverage is not directly under control of the firm.

Taking a closer look at tables 1 and 2, it is interesting to compare our Swiss results with the results reported by Rajan and Zingales (1995) for their sample of G-7 countries.[14] Specifically, given many institutional similarities, German and (to a lesser extent) French firms should provide an appropriate benchmark for Swiss firms.

When the first definition of leverage is used (non-equity liabilities to total assets, LVLTA), they find that Anglo-American firms are considerably less levered than German and French firms. Interestingly, with this definition of leverage, Swiss firms are much more similar to U.S. and U.K. firms, with leverage ratios around 0.55, as opposed to Continental European firms with ratios above 0.70.[15] Using market values does not change the results; Swiss firms are still considerably less levered than German and French firms.

Looking at the second definition of leverage (debt to total assets, LVDTA), Swiss firms are again similar to U.S. companies, with a debt to total asset ratio of approximately 25 percent. This contrasts with the finding by Rajan and Zingales (1995), who report that German firms appear to have much lower levels of leverage under this definition. Part of the low leverage for German firms may come from pension liabilities, which must be expensed under German law.[16] This is not the case in Switzerland (and in Anglo-American countries), where pension contributions are capitalized in special purpose vehicles on the basis of defined contribution plans. Thus, Swiss firms again differ markedly from German firms, but this time the ranking is reversed. Our third definition of leverage, the debt to net asset ratio (LVDNA), reveals a similar picture. Swiss firms exhibit leverage comparable to U.S. firms, while German firms seem to carry significantly lower leverage.

Finally, defining leverage as debt over capital (LVDC), Rajan and Zingales (1995) report that U.S. and German firms have similar leverage around 38 percent. This number is closely replicated by our sample of Swiss firms, both for book and market values. Finally, the aggregate ratios of leverage are also similar to the values in the G-7 area.

When we look at the adjusted measures in table 2, however, our results change dramatically. As a first observation, the amount of leverage decreases substantially. For example, the debt to capital ratio (LVDC) as of 2001 drops from 38 percent to 27 percent in book values, and from 31 percent to 23 percent in market values. More important, contrasting our results with the cross-section of

14 In must be noted that their reported figures refer to balance sheets for the fiscal year 1991, while our numbers are from the later 1997–2001 period.

15 See Rajan and Zingales (1995), table 3, p. 1430.

16 As a general observation, a large fraction of German liabilities seems to be composed of rather dubious provisions for future liabilities. However, they are really more like equity.

G-7 countries, the similarity of Swiss and Anglo-American firms with respect to leverage disappears. In fact, adjusted leverage is comparatively low in Switzerland. Our figures are similar to those reported by Rajan and Zingales (1995) for German firms.[17] The evidence is even stronger for the aggregate ratios of leverage, which are substantially lower (as low as 5 percent in some instances) than those in the G-7 countries. This indicates that Swiss firms are very conservative and hold large cash reserves, which exaggerate non-adjusted leverage ratios.

To sum up, unadjusted leverage ratios of Swiss firms are very similar to the figures reported by Rajan and Zingales (1995) for U. S. firms. Depending on the exact definition of leverage, Swiss figures can differ significantly from the German ones. At first, this is a surprising result, given that the institutional framework is very similar in Switzerland and Germany. However, adjusting for cash balances reveals two effects. First, the amount of Swiss leverage decreases significantly, indicating that Swiss firms hold relatively large amounts of financial slack. Second, adjusted leverage ratios in Switzerland and Germany are very similar.[18]

4. Factors Correlated with Leverage

According to Harris and Raviv (1991), the consensus is that "leverage increases with fixed assets, non-debt tax shields, investment opportunities, and firm size and decreases with volatility, advertising expenditure, the probability of bankruptcy, profitability and uniqueness of the product."[19]

In our empirical analysis we focus on six of these variables: tangibility of assets (the ratio of fixed to total assets), firm size, the market-to-book ratio (as a proxy for investment opportunities), profitability, volatility, uniqueness of the product and non-debt tax shields. In this section we provide a short discussion about each of these variables and their potential influence on capital structure decisions.

17 See Rajan and Zingales (1995), table 3, p. 1431.

18 For a detailed comparison of the institutional settings in the G-7 countries see Rajan and Zingales (1995), pp. 1440 ff. Swiss rules and regulations fall somewhere between Germany and the U. S., with a clear tilt towards the German jurisdiction. For example, one could hypothesize that the relatively low leverage of German and Swiss firms is due to the fact that the bankruptcy laws in both countries emphasize the role of creditors and put less emphasis on the firm as an ongoing concern.

19 See Harris and Raviv (1991), p. 335.

4.1. Tangibility

Previous empirical studies by Titman and Wessels (1988), Rajan and Zingales (1995) and Fama and French (2002) argue that the ratio of fixed to total assets (tangibility) should be an important factor for leverage. The tangibility of assets represents the effect of the collateral value of assets at the firm's gearing level. However, the direction of influence is not a-priori clear.

Galai and Masulis (1976), Jensen and Meckling (1976) and Myers (1977) argue that stockholders of levered firms are prone to overinvest, which gives rise to the classical shareholder-bondholder conflict. However, if debt can be secured against assets, creditors have an improved guarantee of repayment, and the recovery-rate is higher, i. e., assets retain more value in liquidation. Hence, the trade-off theory predicts a positive relationship between leverage and the proportion of tangible assets.

Grossman and Hart (1982) argue that the agency costs of managers consuming more than the optimal level of perquisites are higher for firms with lower levels of assets that can be used as a collateral. Managers of highly levered firms will be less able to consume excessive perquisites, because bondholders more closely monitor such firms. The monitoring costs are generally higher for firms with less collateralizable assets. Firms with less collateralizable assets might thus voluntarily choose higher debt levels to limit consumption of perquisites. This implies a negative relationship between tangibility of assets and leverage.

In our empirical tests we use the ratio of fixed assets to total assets as a proxy for tangibility (TANG). The more direct approach using intangible assets in the nominator cannot be applied due to a lack of data.

4.2. Size

The effect of size on leverage is ambiguous. On the one hand, Warner (1977) and Ang, Chua, and McConnel (1982) document that bankruptcy costs are relatively higher for smaller firms. Similarly, Titman and Wessels (1988) argue that larger firms tend to be more diversified and fail less often. Accordingly, the trade-off theory predicts an inverse relationship between size and the probability of bankruptcy, i. e., a positive relationship between size and leverage. If diversification goes along with more stable cash flows, this prediction is also consistent with the free cash flow theory by Jensen (1986) and Easterbrook (1986). This notion implies that size has a positive impact on the supply of debt.

On the other hand, size can be regarded as a proxy for information asymmetry between firm insiders and the capital markets. Large firms are more closely observed by analysts and should be more capable of issuing informationally more sensitive equity, and thus have lower debt. Accordingly, the pecking order theory of capital structure predicts a negative relationship between leverage and size, with larger firms exhibiting increasing preference for equity relative to debt.

Following Titman and Wessels (1988), our measure of size is the natural logarithm of net sales (SIZE). The logarithmic transformation accounts for the conjecture that small firms are particularly affected by a size effect. Alternatively, one could use the natural logarithm of total assets. However, we think that net sales is a better proxy for size, because many firms attempt to keep their reported size of asset as small as possible, e. g., by using lease contracts.

4.3. Growth Opportunities

Galai and Masulis (1976), Jensen and Meckling (1976) and Myers (1977) argue that when a firm issues debt, managers have an incentive to engage in asset substitution and transfer wealth away from bondholders to shareholders. It is generally acknowledged that the associated agency costs are higher for firms with substantial growth opportunities. Thus, the trade-off model predicts that firms with more investment opportunities have less leverage because they have stronger incentives to avoid underinvestment and asset substitution that can arise from stockholder-bondholder agency conflicts. This prediction is strengthened by Jensen's (1986) free cash flow theory, which predicts that firms with more investment opportunities have less need for the disciplining effect of debt payments to control free cash flow.

Fama and French (2002) explain how the predictions for book leverage carry over to market leverage.[20] The trade-off theory predicts a negative relationship between leverage and investment opportunities. Since the market value grows at least in proportion with investment outlays, the relation between growth opportunities and market leverage is also negative.

Previous empirical results are mixed. For example, Titman and Wessels (1988) find a negative relationship, while Rajan and Zingales (1995) report a positive relationship between leverage and growth. In fact, the simple version of the pecking order theory supports the latter result. Debt typically grows when investment exceeds retained earnings and falls when investment is less than retained earnings. Thus, given profitability, book leverage is predicted to

20 See Fama and French (2002), pp. 10 f.

be higher for firms with more investment opportunities.[21] However, as already discussed in section 3.3, in a more complex version of the model firms are concerned with future as well as current financing costs. Balancing current and future costs, it is possible that firms with large expected growth opportunities maintain low-risk debt capacity to avoid financing future investments with new equity offerings (or even foregoing the investments). Therefore, the more complex version of the pecking order theory predicts that firms with larger expected investments have less current leverage.[22]

Our measure of growth opportunities is the ratio of book-to-market equity (GROW). Simple cash flow valuation models suggest that this is a forward looking measure. Another possibility would be to use research and development expenditures. TITMAN and WESSELS (1988) use past growth rates of total assets. However, we think this is inappropriate, because historical growth is not necessarily linked to future growth (e. g., CHAN, KARCESKI, and LAKONISHOK, 2003).

4.4. Profitability

In the trade-off theory, agency costs, taxes, and bankruptcy costs push more profitable firms towards higher book leverage. First, expected bankruptcy costs decline when profitability increases. Second, the deductability of corporate interest payments induces more profitable firms to finance with debt. Finally, in the agency models of JENSEN and MECKLING (1976), EASTERBROOK (1984), and JENSEN (1986), higher leverage helps to control agency problems by forcing managers to pay out more of the firm's excess cash. The strong commitment to use a larger fraction of pre-interest earnings for debt payments suggests a positive relationship between book leverage and profitability. This notion is also consistent with the signaling hypothesis by ROSS (1977), where higher levels of debt can be used by managers to signal an optimistic future for the firm.

In sharp contrast, in the pecking order model higher earnings should result in less book leverage. Firms prefer raising capital, first from retained earnings, second from debt, and third from issuing new equity. This behavior is due to the costs associated with new equity issues in the presence of information asymmetries. Debt typically grows when investment exceeds retained earnings and falls when investment is less than retained earnings. Accordingly, the pecking order model predicts a negative relationship between book leverage and profitability.

21 Note that there is no prediction for market leverage.

22 It should also be noted that the conflicting results in empirical research may be due to the fact that growth measures tend to be correlated with tangibility.

An important question is whether these predictions for book leverage carry over to market leverage.[23] As put forth above, the trade-off theory predicts that leverage increases with profitability. Since the market value also increases with profitability, this positive relation does not necessarily apply for market leverage. In contrast, the pecking order theory predicts that firms with high profits and few investments have little debt. Since the market value increases with profitability, the negative relationship between book leverage and profitability also holds for market leverage.

Again, the empirical evidence is mixed. For example, Rajan and Zingales (1995) report a negative relationship between leverage and profitability (supporting the pecking order theory), while Jensen, Solberg, and Zorn (1992) find a positive one (supporting the trade-off theory). Following Titman and Wessels (1988), we use two different measures of profitability. Our first measure of profitability is the ratio of operating income over total assets (ROA), the second one is the ratio of operating income over sales (GMN). We refer to the former definition as "return on assets", and to the latter as "gross margin".

4.5. Volatility

The importance of the Myers (1977) type underinvestment problem increases with the volatility of a firm's cash flow. Two issues are particularly noteworthy. First, De Angelo and Masulis (1980) argue that for firms with high variability in their earnings, investors will have little ability to accurately forecast future earnings based on publicly available information. The market will see the firm as a "lemon" and demand a premium to provide debt. This drives up the cost of debt. Second, to lower the chance of issuing new risky equity or being unable to realize profitable investments when cash flows are low, firms with more volatile cash flows tend to maintain low leverage. Accordingly, the pecking order model predicts a negative relationship between leverage and the volatility of a firm's cash flows.[24]

The trade-off model allows for the same prediction, but the reasoning is slightly different. More volatile cash flows increase the probability of default, implying a negative relationship between leverage and volatility of cash flows.

23 See Fama and French (2002), pp. 10 f.

24 In contrast, firms with stable cash flows should suffer from overinvestment problems. Following Easterbrook (1984) and Jensen (1986), these firms supposedly have more leverage, which further strengthens our notion of a negative relationship between leverage and volatility.

Following Bradley, Jarrell, and Kim (1984), in our empirical analysis we measure volatility as the standard deviation of the first difference of a firm's annual earnings, scaled by the average value of the firm's total assets over time (VOLA).

4.6. Non-debt Tax Shield

Firms will exploit the tax deductability of interest to reduce their tax bill. Therefore, firms with other tax shields, such as depreciation deductions, will have less need to exploit the debt tax shield. Ross (1985) argues that if a firm in this position issues excessive debt, it may become "tax-exhausted" in the sense that it is unable to use all its potential tax shields. In other words, debt is "crowded out" and the incentive to use debt financing diminishes as non-debt tax shields increase. Accordingly, in the framework of the trade-off theory, one hypothesizes a negative relationship between leverage and non-debt tax shields.[25]

In contrast, Scott (1977) and Moore (1986) argue that firms with substantial non-debt tax shields should also have considerable collateral assets that can be used to secure debt. Secured debt is less risky than unsecured debt; hence, one could also argue for a positive relationship between leverage and non-debt tax shields.

In fact, the empirical evidence is mixed. For example, Shenoy and Koch (1996) find a negative relationship between leverage and non-debt tax shields, while Gardner and Trcinka (1992) find a positive one. We use total depreciation from the firm's profit and loss account divided by total assets as our empirical measure for non-debt tax shields (TAX1). Alternatively, we also apply the ratio of depreciation over operating profit (TAX2).

4.7. Uniqueness and Industry Classification

In a theoretical model Titman (1984) argues that a firm's capital structure should depend on the uniqueness of its product. If a firm offers unique products or services, its consumers may find it difficult to find alternatives in case of liquidation and, hence, the cost of bankruptcy increases. Accordingly, the trade-off theory predicts a negative relationship between book leverage and uniqueness. We use data for research and development (R&D) expenditures as our measure of uniqueness. Specifically, since more detailed data is not available for Swiss firms,

25 In a similar vein, De Angelo and Masulis (1980) argue that marginal corporate savings from an additional unit of debt decrease with increasing non-debt tax shields. This is because the likelihood of bankruptcy increases with leverage.

we apply a dummy variable that is one if the firm reports research and development expenditures, and zero if not.[26]

Related to this prediction is the observation reported in Harris and Raviv (1991) that a firm's industrial classification is an important determinant of leverage. Reviewing previous empirical results, these "[…] are in broad agreement and show that drugs, instruments, electronics, and food have consistently low leverage while paper, textile mill products, steel, airlines, and cement have consistently high leverage."[27] We apply the industry classification of Swiss Exchange (SWX) and use an additional dummy variable that is one for firms producing machines and equipment, and zero for all other sectors.[28]

Table 3 summarizes the different predictions for the relationship between leverage and our proxy variables for both the trade-off theory and the pecking order theory. Table 4 displays the correlation coefficients between the proxy variables. Specifically, to avoid potential endogeneity problems in the OLS regressions, we use for each firm the mean of a variable over the period from 1997 to 2000. These measures are applied in our simplest cross-sectional regression analysis. Several observations are noteworthy. First, there is evidence that larger firms are more profitable, as indicated by correlation coefficients of 0.23 and 0.39, depending on the definition of profitability. Second, firms with a higher return on assets (ROA) exhibit higher market-to-book ratios (GROW), while firms with higher operating margins (GMN) receive lower valuations. Although the latter coefficient is only significant at the margin, this observation seems nevertheless at odds with intuition. We suspect that different capital intensities among firms and industries could affect the numerator of the market-to-book ratio. Alternatively, severe competition on product markets could offer an explanation. When growth opportunities are high, many firms compete for future market share, thereby pushing down operating margins. These growth firms tend to have little tangible assets, which can also explain the negative correlation between tangibility and growth opportunities. Finally, as could be expected, small firms are more volatile. Volatile firms exhibit higher growth rates, but have little tangible assets and generate lower profits.

26 Note that this variable is also correlated with growth opportunities.

27 See Harris and Raviv (1991), p. 333.

28 This refers to the following SWX sector classifications: "industrial equipment" and "technology, hardware and equipment". The SWX classification groups stocks into 12 different sectors. However, using this more sophisticated sector classification, we have only a very small number of firms in certain sectors. Fix (2001) uses the full set of industry dummy variables and finds no significant industry effects.

Table 3: Testable Hypothesis of Leverage

	Trade-off theory Leverage		*Pecking order theory* Leverage	
	Book value	Market value	Book value	Market value
Tangibility	+			
Size	+		−	
Growth	−	−	+ (−)	
Profitability	+	(?)	−	−
Volatility	−		−	
Non-debt tax shield	−			
Uniqueness	−			

Table 4: Correlation Table of Explanatory Variables

	TANG	SIZE	GROW	ROA	GMN	TAX1	TAX2
SIZE	–0.242[a)]						
GROW	–0.276[a)]	–0.198[a)]					
ROA	0.009	0.233[a)]	0.311[a)]				
GMN	0.166[b)]	0.390[a)]	–0.156[c)]	0.687[a)]			
TAX1	0.306[a)]	0.028	–0.116	0.058	0.112		
TAX2	0.012	–0.016	–0.074	–0.073	0.018	0.700[a)]	
VOLA	–0.274[a)]	–0.286[a)]	0.182[a)]	–0.482[a)]	–0.690[a)]	–0.099	–0.045

The table reports the correlation coefficients between the explanatory variables, using four year averages over the 1997–2000 period for each variable. TANG is defined as the ratio of fixed assets to total assets, SIZE is the natural logarithm of net sales, GROW is the ratio of book-to-market equity, ROA is the "return on assets" (defined as the ratio of operating income over total assets), GMN is the "gross margin" (defined as the ratio of operating income over sales), TAX1 is the ratio of total depreciation over total assets, TAX2 is the ratio of depreciation over operating profit, and VOLA is the standard deviation of the first difference of a firm's annual earnings, scaled by the average value of the firm's total assets over time. a) / b) / c) denote significance at the 1% / 5% / 10% level.

5. Empirical Results

5.1. Cross-sectional Evidence

The basic cross-sectional regression we estimate is:

$$LV_i = a + \sum_j b_j \cdot X_{ij} + \varepsilon_i, \tag{1}$$

where LV_i denotes the leverage ratio of firm i, and X_{ij} is the j-th capital structure proxy of firm i as defined above. To save space, we choose two definitions of leverage to report our results: (i) the ratio of non-equity liabilities to total assets (LVLTA), and (ii) the ratio of debt to capital (LVDC), both as of year-end 2001.[29] To account for slow adjustment and to avoid a possible problem of regressor endogeneity, all regressors are four year averages (1997–2000) of the corresponding variables.[30] When unadjusted leverage is used as the dependent variable, coefficients can be estimated with ordinary least square (OLS), using White's (1980) heteroscedasticity consistent variance-covariance matrix estimator. However, in the case of adjusted leverage, some values of leverage become negative. To eliminate outliers, we truncate the sample at –1 and estimate the coefficients using a censored Tobit model.[31] Table 5 reports the ordinary least square results for unadjusted leverage, table 6 the censored Tobit results for adjusted leverage. The size and signs of the estimation coefficients are very similar across the different regression specifications. We discuss each of them briefly.

Tangibility is almost always positively correlated with leverage. The regression coefficient on TANG is significant in about half of all regressions. This supports the prediction of the trade-off theory that the debt-capacity increases with the proportion of tangible assets on the balance sheet. However, perhaps more important than the mere statistical significance is the economic significance of this relation. This can be quantified by the size of the changes in leverage ratios that are associated with changes in the ratio of fixed assets to total assets. As an illustration, take the adjusted market value ratio of non-equity liabilities over total

29 The results for the other two definitions are very similar.

30 We do not require that data for the regressor variables is available over the entire four year period. In particular, for some of the smaller firms data is not regularly available in the Worldscope database. Where possible, we filled data gaps from other sources. In all other cases, averages are computed with available data.

31 See also Rajan and Zingales (1995) and Barclay, Smith, and Watts (1995) for this procedure.

Table 5: OLS Regressions

	Book leverage				*Market leverage*			
	LVLTA		LVDC		LVLTA		LVDC	
TANG	–0.046	–0.052	0.200	0.162	0.001	–0.009	0.251	0.223
	(0.103)	(0.112)	(0.119)$^{c)}$	(0.128)	(0.106)	(0.117)	(0.123)$^{b)}$	(0.133)$^{c)}$
SIZE	0.019	0.024	0.020	0.023	–0.001	0.000	0.001	0.002
	(0.012)	(0.013)$^{c)}$	(0.013)	(0.014)$^{c)}$	(0.012)	(0.013)	(0.011)	(0.012)
GROW	–0.028	–0.041	–0.032	–0.039	–0.081	–0.099	–0.059	–0.068
	(0.012)$^{b)}$	(0.011)$^{a)}$	(0.012)$^{a)}$	(0.011)$^{a)}$	(0.014)$^{a)}$	(0.014)$^{a)}$	(0.014)$^{a)}$	(0.013)$^{a)}$
ROA	–0.654		–0.409		–0.933		–0.543	
	(0.278)$^{b)}$		(0.336)		(0.242)$^{a)}$		(0.260)$^{b)}$	
GMN		–0.013		–0.009		–0.008		–0.006
		(0.005)$^{b)}$		(0.006)		(0.005)$^{c)}$		(0.004)
TAX1	0.249		–0.445		0.432		–0.051	
	(0.454)		(0.583)		(0.495)		(0.556)	
TAX2		0.002		0.000		0.005		0.003
		(0.002)		(0.002)		(0.002)$^{b)}$		(0.003)
VOLA	–0.322	–0.353	–0.302	–0.371	–0.669	–0.439	–0.370	–0.273
	(0.275)	(0.296)	(0.324)	(0.354)	(0.226)$^{a)}$	(0.276)	(0.252)	(0.272)
Adj. R^2	0.147	0.140	0.137	0.126	0.466	0.421	0.314	0.290

The table reports the ordinary least square regression results of equation (1), where the dependent variables are alternative (unadjusted) leverage ratios for a sample of 124 Swiss firms. Leverage ratios are measured as of year-end 2001. LVLTA is the ratio of total (non-equity) liabilities to total assets. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. Leverage is measured both in book values and market values. The independent variables are proxies for the trade-off theory and the pecking order theory. TANG is defined as the ratio of fixed assets to total assets, SIZE is the natural logarithm of net sales, GROW is the ratio of book-to-market equity, ROA is the "return on assets" (defined as the ratio of operating income over total assets), GMN is the "gross margin" (defined as the ratio of operating income over sales), TAX1 is the ratio of total depreciation over total assets, TAX2 is the ratio of depreciation over operating profit, and VOLA is the standard deviation of the first difference of a firm's annual earnings, scaled by the average value of the firm's total assets over time. All explanatory variables are four-year averages over the 1997–2000 period. The regressions contain two additional dummy variables: (i) an industry dummy variable, which is one for firms producing machines and equipment, and zero for all other sectors (using the classification of Swiss Exchange), and (ii) a dummy variable, which is one for firms that report research and development expenditures, and zero if not. All estimates are heteroscedasticity-consistent using White's (1980) covariance matrix. Standard errors are reported in brackets. a) / b) / c) denote significance at the 1% / 5% / 10% level.

Table 6: Censored Tobit Regressions

	Book leverage				*Market leverage*			
	LVLTA		LVDC		LVLTA		LVDC	
TANG	0.093 (0.177)	0.176 (0.116)	0.399 (0.230)[c]	0.454 (0.227)	0.205 (0.157)	0.273 (0.152)[c]	0.573 (0.185)[a]	0.609 (0.182)[a]
SIZE	0.018 (0.020)	0.039 (0.019)[b]	–0.007 (0.026)	0.009 (0.026)	0.008 (0.018)	0.023 (0.018)	0.010 (0.021)	0.023 (0.021)
GROW	–0.061 (0.024)[b]	–0.074 (0.021)[a]	–0.085 (0.032)[a]	–0.108 (0.028)[a]	–0.073 (0.021)[a]	–0.085 (0.019)[a]	–0.012 (0.025)	–0.031 (0.022)
ROA	–0.789 (0.512)		–1.146 (0.693)[c]		–0.712 (0.456)		–1.026 (0.559)[c]	
GMN		–0.045 (0.011)[a]		–0.038 (0.015)[b]		–0.029 (0.010)[a]		–0.029 (0.012)[b]
TAX1	1.055 (1.231)		0.369 (1.567)		1.176 (1.095)		–0.517 (1.274)	
TAX2		0.004 (0.006)		0.002 (0.008)		0.008 (0.006)[a]		0.004 (0.007)
VOLA	–1.122 (0.484)[b]	–1.931 (0.499)[a]	–2.008 (0.645)[a]	–2.485 (0.689)[a]	–0.935 (0.431)[b]	–1.353 (0.456)[a]	–1.026 (0.511)[b]	–1.297 (0.539)[b]
Adj. R^2	0.157	0.236	0.241	0.245	0.232	0.263	0.149	0.150

The table reports the censored Tobit regression results of equation (1), where the dependent variables are alternative adjusted leverage ratios for a sample of 124 Swiss firms. Leverage ratios are measured as of year-end 2001; they are adjusted for cash balances and truncated at –1. LVLTA is the ratio of total (non-equity) liabilities to total assets. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. Leverage is measured both in book values and market values. The independent variables are proxies for the trade-off theory and the pecking order theory. TANG is defined as the ratio of fixed assets to total assets, SIZE is the natural logarithm of net sales, GROW is the ratio of book-to-market equity, ROA is the "return on assets" (defined as the ratio of operating income over total assets), GMN is the "gross margin" (defined as the ratio of operating income over sales), TAX1 is the ratio of total depreciation over total assets, TAX2 is the ratio of depreciation over operating profit, and VOLA is the standard deviation of the first difference of a firm's annual earnings, scaled by the average value of the firm's total assets over time. All explanatory variables are four-year averages over the 1997–2000 period. The regressions contain two additional dummy variables: (i) an industry dummy variable, which is one for firms producing machines and equipment, and zero for all other sectors (using the classification of Swiss Exchange), and (ii) a dummy variable, which is one for firms that report research and development expenditures, and zero if not. All coefficients are estimated a censored Tobit model. Standard errors are reported in brackets. a) / b) / c) denote significance at the 1% / 5% / 10% level.

assets (LVLTA). The estimated coefficient is 0.205 (see table 6), and with this definition the average leverage ratio is 41.4 percent (see table 2). As one moves from the bottom 10th percentile of the tangibility proxy (0.12) to the 90th percentile (0.66), the predicted leverage ratio decreases by 11 percentage points.[32] This decrease accounts for roughly 27 percent of the average ratio of 47 percent, which is by all means an economically large fraction.

Size is positively related to leverage, indicating that size is a proxy for low probability of default, as suggested by the trade-off theory. However, the estimated coefficients are generally insignificant. This is in contrast to the results in Rajan and Zingales (1995). For Germany, where firms tend to be liquidated more easily than in the Anglo-Saxon countries, they find that large firms have substantially less debt than small firms. As argued above, Swiss company law is very similar to the German regulation. Therefore, we interpret our results for Switzerland as size being a proxy for low expected costs of financial distress, where small firms in Switzerland are especially wary of debt. However, it must be noted that both the statistical and the economic significance of the size proxy is only modest.

Among all variables, we find the strongest and most reliable relationship between investment opportunities and leverage. Specifically, companies with high market-to-book ratios have significantly lower leverage than companies with low market-to-book ratios. This result is consistent with both the trade-off theory and the extended version of the pecking order theory. Again, more important than the mere statistical significance is the economic significance of this relation. Similar computations as those illustrated above (using again the adjusted market value ratio of non-equity liabilities over total assets; LVLTA) indicate that a move from the bottom 10th percentile of market-to-book ratios (0.92) to the 90th percentile (3.51) leads to a decrease in the predicted leverage ratio by 19 percentage points, which accounts for more than 45 percent of the average ratio.

Profitability is negatively correlated with leverage, both for book and market leverage. This result reliably supports the predictions of the pecking order theory. In addition to the statistical significance, the economic significance of profitability on leverage is also noteworthy. Again, take our example of the market value ratio of non-equity liabilities over total assets (LVLTA). The move from the bottom 10th percentile (2.4%) of return on assets (ROA) to the 90th percentile (14.5%) leads to a decrease in predicted leverage by 11 percentage points, which explains 21 percent of the average ratio of 47 percent.

32 The constant coefficient in this specification is 0.312. Therefore, we have predicted leverage ratios of 44.7 ($= 0.312 + 0.205 \cdot 0.66$) percent and 33.7 ($= 0.312 + 0.205 \cdot 0.12$) percent.

As expected, the relationship between leverage and volatility (VOLA) is negative. This supports both the trade-off theory (more volatile cash flows increase the probability of default) and the pecking order theory (issuing equity is more costly for firms with volatile cash flows). Finally, our proxies for non-debt tax shields (TAX) are generally insignificant. Only in one regression specification the estimated coefficient is significant, but the sign is opposite to what the trade-off theory suggests.

All regressions have been estimated including two additional dummy variables: (i) an industry dummy, and (ii) an R&D dummy. We do not report their coefficients to save space. The industry dummy is never significant. The R&D dummy is significant in only two of our regression specifications, but their signs are opposite to what we hypothesized, i. e., firms with reported R&D expenditures tend to have higher (and not lower) leverage.

Overall, our Swiss results are similar to those reported by Barclay, Smith, and Watts (1995) and Shyam-Sunder, and Myers (1999) for the United States and Rajan and Zingales (1995) for the G-7 countries. Our factors explain between 13 and 47 percent of the cross-sectional variation in leverage. In general, the explanatory power seems somewhat higher for the market leverage regressions. The fact that our results are similar to those in previous research strengthens the notion that the observed correlations between leverage and the capital structure proxies are not completely spurious. Nevertheless, in what follows we perform several robustness tests and extended analysis.

5.2. Pooled Regressions

As noted by Rajan and Zingales (1995), it is possible that some of the partial correlations in tables 5 and 6 are the result of an omitted variables bias, i. e., the explanatory variables are correlated with firm-specific omitted variables. Given the parsimony of our ad-hoc model, it is important to explore this issue in more detail. One way to handle the omitted variables problem is to estimate pooled regressions, where each company in each year is treated as an independent variable. Unfortunately, data availability is again a limiting issue in the Swiss case. We run pooled regressions for the six years from 1996 to 2001. Because complete data for the explanatory variables is not available for all our 124 firms in each year, we had to exclude another 34 firms to estimate a balanced panel.[33] This leaves us with 90 firms and 540 firm-year observations in our reduced

33 Most important, several of the firms in our sample became only listed after 1996. In untabulated regressions we also test an unbalanced panel for the longer 1991–2001 period. The

sample. In spite of this reduction in sample size, we still have to exclude two of our regressors. First, we omit both proxies for non-debt tax-shields (TAX1 and TAX2) due to insufficient data. Second, given its construction principles, we cannot use the volatility proxy (VOLA).[34] Finally, to save space, we only report the results for our first profitability proxy, the return on assets (ROA). The results for the second proxy, the gross margin (GMN), are similar (although less pronounced).

The results of a fixed effects model (i. e., with dummy variables for each firm) are shown in table 7. The fixed effects specification preserves the time series variation in leverage, but ignores most of the cross-sectional differences among firms. There is one caveat to mention. As has been shown above, leverage is sticky. A firm with higher-than-predicted leverage in one year is likely to have higher-than-predicted leverage in the next year. However, this stickiness in financial policy may lead to inflated *t*-statistics.[35] Therefore, we add a dummy variable for each year to estimate a combined time and entity fixed effects regression model. The additional dummies control for variables that are constant across entities (firms) but evolve over time. The combined time and firm fixed effects model eliminates a possible omitted variables bias arising both from unobserved variables that are constant over time and from unobserved variables that are constant across firms. We do not report the results from this combined model because they are very similar to those in table 7.

Our pooled regression results are stable and similar to those in Gaud, Jani, Hoesli, and Bender (2003). All capital structure proxies maintain the same sign as reported in our OLS regressions above. Nevertheless, several observations are noteworthy. First, the significance of the market-to-book ratio (GROW), which has been the most important variable in tables 5 and 6, is much less pronounced in the fixed effects regressions. Second, the coefficients of the ratio of fixed assets over total assets (TANG) are positive and highly significant in all but one specifications. In general, the coefficients are much larger now, e. g., around 0.5 for unadjusted leverage. Third, the importance of our size proxy (SIZE) for leverage is also much more pronounced; it is positive and significant throughout all

number of observation grows from 540 in the balanced panel to 822. However, the results are similar to those in table 7. We use this enlarged data set in section 5.3 to test a dynamic panel model.

34 To include a time-varying proxy for volatility, we needed data before 1996. However, this is not available for many firms in the Worldscope database.

35 In contrast, the *t*-statistics in the cross-sectional regressions in tables 5 and 6 "overcontrol" for this problem and thus might be too conservative.

Table 7: Fixed Effects Regressions

	Unadjusted leverage				*Adjusted leverage*			
	Book leverage		Market leverage		Book leverage		Market leverage	
	LVLTA	LVDC	LVLTA	LVDC	LVLTA	LVDC	LVLTA	LVDC
$TANG_{it}$	0.445 (0.055)[a)]	0.546 (0.084)[a)]	0.462 (0.063)[a)]	0.510 (0.069)[a)]	1.292 (0.121)[a)]	1.478 (0.218)[a)]	1.060 (0.098)[a)]	1.388 (0.144)[a)]
$SIZE_{it}$	0.068 (0.009)[a)]	0.056 (0.013)[a)]	0.053 (0.009)[a)]	0.043 (0.011)[a)]	0.125 (0.019)[a)]	0.110 (0.034)[a)]	0.097 (0.015)[a)]	0.120 (0.023)[b)]
$GROW_{it}$	–0.003 (0.004)	0.001 (0.006)	–0.029 (0.004)[a)]	–0.010 (0.005)[b)]	–0.007 (0.009)	–0.002 (0.016)	–0.014 (0.007)[c)]	0.025 (0.011)[b)]
ROA_{it}	–0.301 (0.065)[a)]	–0.405 (0.099)[a)]	–0.472 (0.071)[a)]	–0.458 (0.082)[a)]	0.185 (0.142)[a)]	–0.722 (0.257)[a)]	–0.258 (0.115)[b)]	–0.277 (0.169)[c)]
R^2 within	0.211	0.124	0.300	0.185	0.257	0.113	0.254	0.194
R^2 between	0.088	0.166	0.290	0.249	0.128	0.255	0.176	0.170
R^2 overall	0.096	0.147	0.289	0.236	0.129	0.200	0.173	0.160
Wald test	29.86 (4)	15.75 (4)	47.35 (4)	25.23 (4)	35.58 (4)	13.96 (4)	38.00 (4)	26.75 (4)
Hausman test	51.38 (4)	11.42 (4)	102.97 (4)	19.42 (4)	96.72 (4)	12.96 (4)	89.15 (4)	21.56 (4)
n	540	540	540	540	540	540	540	540

The table reports the fixed effects regression results of equation (1), using an unbalanced panel of 90 Swiss firms over the 1996–2001 period. The dependent variables are alternative leverage ratios. LVLTA is the ratio of total (non-equity) liabilities to total assets. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. Leverage is measured both in book values and market values. Adjusted leverage ratios are corrected for cash balances and truncated at –1. The independent variables are proxies for the trade-off theory and the pecking order theory. TANG is defined as the ratio of fixed assets to total assets, SIZE is the natural logarithm of net sales, GROW is the ratio of book-to-market equity, and ROA is the "return on assets" (defined as the ratio of operating income over total assets). Standard errors are reported in brackets. The Wald test is a test for the joint significance of all coefficients, and the Hausman test is a test for the null hypothesis that the coefficients from fixed effects estimation and random effects estimation are identical. For both test statistics the numbers in brackets denote the degrees of freedom. n is the number of firm-year observations. a) / b) / c) denote significance at the 1% / 5% / 10% level.

regressions. Fourth, we report a Wald test for the joint significance of all coefficients. The null hypothesis of no significance can safely be rejected in all specifications at the 1% level. Finally, we also test a random effects model and report a Hausman test for the null hypothesis that the difference in coefficients is not systematic. The null hypothesis is soundly rejected in all specifications, which is generally interpreted as evidence for fixed effects.

In untabulated regressions we also replicate the procedure suggested by Fama and French (2002). They argue that panel regressions ignore both the cross-correlation problem and the bias in the standard errors of regression slopes that arise because the residuals are correlated across years. Conventional standard errors might be understated, hence, the criteria for associated *t*-values should be higher than the usual 2.0 to infer reliability. In the spirit of Fama and McBeth (1973), Fama and French (2002) use the average slopes from year-by-year cross-sectional regressions to study the determinants of leverage, and use the time-series standard deviation errors of the average slopes to draw inference.[36] They assume that the standard errors of the average slopes should be inflated by a factor 2.5, hence, *t*-values should exceed 5.0 instead of 2.0. We replicate this procedure and find significant coefficients when the traditional statistical criteria are applied. Even when the corrected *t*-values are used, several of the coefficients remain significant. This is surprising because our sample is short and, hence, the standard deviation of annual coefficients is only divided by $\sqrt{6}$.

5.3. Is There a Target Debt Ratio?

The recent survey study by Graham and Harvey (2001) reveals that 37% of the responding U. S. firms have a flexible target, and 34% have a somewhat tight target leverage ratio. This can be interpreted as being consistent with the static trade-off theory, which explicitly suggests that managers seek an optimal target debt-equity ratio. Random events lead to deviations away from it, and firms then have to work gradually back to the optimum. Thus, if the optimum is stable, one expects to see mean-reverting behavior.

Shyam-Sunder and Myers (1999) argue that the existence of a target debt ratio does not invalidate the pecking order theory. Using simulation experiments, they forcefully show that the pecking order theory also generates mean-reverting

36 As Fama and French (2001) emphasize, the advantage of this approach is that the year-by-year variation in the slopes, which determines the standard errors of the average slopes, includes estimation error due to the correlation of the residuals across firms. The standard errors are also robust with respect to heteroscedasticity because there is no correction for a sample mean.

debt ratios. Two effects can explain this result. First, capital investments are lumpy and positively serially correlated. Second, internally generated cash flows vary over the business cycle. If a firm finances by the pecking order, debt 'trends up' in deficit years and falls in surplus years. Pecking order debt ratios will mean-revert, and the target-adjustment model will "explain" a firm's financing strategy.

We start with a simple form of the target adjustment model, which has been tested by Jalilvand and Harris (1984) and more recently by Shyam-Sunder and Myers (1999). Changes in leverage are explained by deviations of the current ratio from the target. The empirical specification is:

$$\Delta LV_{it} = \alpha \cdot \left(LV_{it}^{*} - LV_{it-1}\right) + e_{it}, \qquad (2),$$

where $\Delta LV_{it} = LV_{it} - LV_{it-1}$ and LV_{it}^{*} is the target debt level of firm i at time t. We assume that the target-adjustment coefficient α is a sample-wide constant. If transaction costs are zero, i. e., $\alpha = 1$, then $LV_{it} = LV_{it}^{*}$, and firms automatically adjust their debt level instantaneously to their target. In contrast, if $\alpha = 0$, then $LV_{it} = LV_{it-1}$, which implies that transaction costs are so high that no firm adjusts its debt level. The null hypothesis under the trade-off theory is that $\alpha > 0$, indicating adjustment towards the target. Following Fischer, Heinkel, and Zechner (1989), we also expect that $\alpha < 1$, i. e., positive adjustment is costly. Firms adjust their debt level in a way that is inversely proportional to the transaction costs.

A problem when estimating the model in equation (2) is that the target, denoted as LV_{it}^{*}, is unobservable. A common approach is to use the historical mean of the debt ratio for each firm as a proxy for optimal leverage. Alternative specifications include a rolling target for each firm, using only historical information, and an adjustment process with lags of more than one year.[37] In this paper we follow the approach originally suggested by De Miguel and Pindado (2001) and model the target debt level as endogenous. This methodology was also adopted by Gaud, Jani, Hoesli, and Bender (2003). First, use equation (2) to back out the actual debt level:

$$LV_{it} = \alpha LV_{it}^{*} + (1-\alpha) LV_{it-1}. \qquad (3)$$

37 See Jalilvand and Harris (1984) and the approach in Fama and French (2002).

Second, assume that the target debt level, LV_{it}^{*}, is a linear function of the proxy variables, as specified in the regression analysis in section 5.1. Denote the *j*-th ($j = 1, \ldots, n$) proxy variable (including a constant) of firm *i* at time *t* as X_{ijt} and plug into equation (3) to get:

$$LV_{it} = \alpha\beta_1 + (1-\alpha)LV_{it-1} + \alpha\sum_{j=2}^{n}\beta_j X_{ijt} + d_t + \eta_i + v_{it}, \tag{4}$$

where d_t is a time-specific effect, η_i is a firm-specific effect, and v_{it} is a white-noise disturbance. Panel data allows us to estimate the model in equation (4), thereby studying the dynamic nature of capital structure decisions. In fact, this model is preferable to previous specifications. Most important, it no longer relies on target debt levels that have been determined externally. However, fixed or random effects models may yield biased and inconsistent estimators. In particular, in the presence of lagged leverage as a right-hand side variable the error term will be correlated with the error term. A possible solution is to apply the dynamic panel data estimator, originally suggested by ARELLANO and BOND (1991). First differencing equation (4) removes the firm-effect, η_i, and produces an equation that can be estimated using instrumental variables. Using instrumental variables also accounts for potential endogeneity problems, i. e., the explanatory variables may be determined simultaneously with the debt ratio. ARELLANO and BOND (1991) show that the levels of all right-hand side variables lagged twice (or more) are valid instruments.

We test several specifications concerning the endogeneity of the explanatory variables, but only report the results of the model assuming that all variables are endogenous.[38] The Arrelano-Bond one-step Generalized Method of Moments (GMM) estimator is used for inference on coefficients. They are adjusted for heteroscedasticity, and it can be shown that they are consistent if there is no second order serial correlation in the differenced residuals. We report a test-statistic (m_2) for the null hypothesis of no second order serial correlation.[39] We also report the results of two Wald tests: (i) for the joint significance of the time dummies (Wald 1), and (ii) for the joint significance of all regressor variables (Wald 2). Following the recommendation by Arellano and Bond (1991), their two-step GMM estimator is applied for inference on model specification. Specifically, with respect to the validity of the chosen instruments, we conduct a Sargan test

38 Technically, this assumes that $E[X_{it}\varepsilon_{is}] \leq 0$ for $s < t$ but $E[X_{it}\varepsilon_{is}] > 0$ for all $s \geq t$.

39 Note that the presence of first order serial correlation does not imply inconsistent estimates.

for the null hypothesis that the overidentifying restrictions are valid (goodness-of-fit). We use the second lags of all variables (in levels) as instruments. Note that the Sargan test rejects too often in the presence of heteroscedasticity.

Estimation results for the dynamic panel model are shown in table 8. Again, the sample contains 90 Swiss firms. To better assess capital structure adjustments over time, we construct an unbalanced panel consisting of the same firms with data from 1991 to 2001. This increases the number of firm-year observations from 540 in the balanced panel (for the 1997–2000 period) to 822 (and 672 after differencing). We are primarily interested in the estimates of $(1-\alpha)$ and observe that they differ significantly across regression specifications. For our first definition of leverage (LVLTA), the reported coefficients are 0.202 for book values and 0.282 for market values. This is very similar in magnitude to the coefficients reported in De Miguel and Pindado (2001) for Spanish data, but much smaller than those presented by Gaud, Jani, Hoesli, and Bender (2003) for their sample of Swiss firms.[40] In contrast, for our fourth definition of leverage (LCDC), the estimate for $(1-\alpha)$ is insignificant for book values and a significant 0.653 for market values. This latter coefficient is now similar in magnitude to those presented in Gaud, Jani, Hoesli, and Bender (2003). They use only one definition of leverage and conclude that the adjustment process is slow in Switzerland. Our analysis, however, indicates that the results are sensitive to the exact definition of leverage. Therefore, all interpretations require utmost care.

Recall that the parameter α is inversely proportional to transaction costs, indicating that these costs may not be too high for Swiss firms. De Miguel and Pindado (2001) argue that their results for Spanish firms can be explained by the relatively low level of development of the Spanish bond market, which forces firms towards more private debt. Bank financing has much lower transaction costs, allowing firms to adjust their actual debt level to the target level faster than firms in Anglo-American countries. Given the institutional environment, this explanation could also be applied to our Swiss sample. However, there are two caveats to mention. First, in contrast to Spain, Switzerland did not experience a booming economy in the 1990s, and in general internal funds were sufficient to finance capital expenditures, e.g., Hellwig (1998). On the other hand, Gaud, Jani, Hoesli, and Bender (2003) argue that the accompanying easy credit policy of Swiss banks during the last decade might well have induced some firms to borrow to finance new investments. These firms may often end up with leverage levels above the target. While this argument seems perfectly plausible on theoretical grounds, we

40 Shyam-Sunder and Myers (1999) find values for α between 0.3 and 0.4 for U.S. data.

Table 8: Dynamic Panel Estimation

	Book leverage		Market leverage	
	LVLTA	LVDC	LVLTA	LVDC
LV_{it-1}	0.202 (0.098)[b)]	–0.033 (0.088)	0.280 (0.096)[a)]	0.653 (0.096)[a)]
$TANG_{it}$	0.538 (0.201)[a)]	0.734 (0.381)[c)]	0.134 (0.239)	0.156 (0.254)
$SIZE_{it}$	0.019 (0.020)	0.050 (0.075)	–0.058 (0.014)[a)]	0.017 (0.017)
$GROW_{it}$	–0.002 (0.006)	0.028 (0.031)	0.008 (0.006)	0.017 (0.007)[c)]
ROA_{it}	–0.156 (0.100)[c)]	–0.319 (0.379)	–0.582 (0.110)[a)]	–0.293 (0.140)[b)]
Wald 1	20.42 (8)	19.01 (8)	68.31 (8)	83.15 (8)
Wald 2	63.97 (13)	47.03 (13)	174.53 (13)	154.95 (13)
Sargan	75.97 (80)	78.61 (80)	80.90 (80)	78.85 (80)
m_2	–2.01	–0.92	–1.07	–0.76
n	672	672	672	672

The table reports the Arrelano-Bond Generalized Method of Moments (GMM) regression results of the dynamic adjustment model in equation (4), using an unbalanced panel of 90 Swiss firms over the 1991–2001 period. The dependent variables are alternative leverage ratios. LVLTA is the ratio of total (nonequity) liabilities to total assets. LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. Leverage is measured both in book values and market values. The independent variables are proxies for the trade-off theory and the pecking order theory. TANG is defined as the ratio of fixed assets to total assets, SIZE is the natural logarithm of net sales, GROW is the ratio of book-to-market equity, and ROA is the "return on assets" (defined as the ratio of operating income over total assets). Standard errors are reported in brackets. The second lags of all variables are used as instruments in the GMM estimation. Two Wald tests are reported: (i) Wald 1 is a test for the joint significance of the included time dummies, and (ii) Wald 2 is a test for the joint significance of all regressor variables. The Sargan test is a test for the null hypothesis that the model's overidentifying restrictions are valid (goodness-of-fit). m_2 is the test statistics for the null hypothesis of no second order serial correlation in the residuals (otherwise the estimates are inconsistent). n is the number of firm-year observations after differencing. a)/b)/c) denotes significance at the 1%/5%/10% level.

find no clear-cut empirical evidence that the interest rates on bank loans were low enough to outweigh the costs of being in disequilibrium. Second, the booming stock market during the 1990s is a purely mechanical reason why some firms may find themselves with leverage below the target (see figure 2). This may explain the high estimated coefficient on LV_{t-1} (and, hence, the slow adjustment speed) in the last column of table 8, where leverage is defined as the ratio of total debt to capital at quasi-market values. Nevertheless, given that our results are sensitive to the definition of leverage and both large and small adjust parameters are reported in our dynamic panel setup, we are hesitant to draw final conclusions.

With respect to the other coefficient estimates, most have the expected sign. In general, therefore, the interpretations apply as discussed above, but statistical significance is much less pronounced. The first Wald test (Wald 1) tests the null hypothesis that the time dummy variables are zero, while the second Wald test (Wald 2) tests the null hypothesis that all coefficients are jointly zero. Both null hypotheses are soundly rejected in all specifications.[41]

To check for potential misspecification of the models, we use two test statistics. First, the m_2 test statistic follows a standard normal distribution under the null hypothesis of no second-order serial correlation on the first-difference residuals. In general, the null hypothesis of no autocorrelation cannot be rejected at conventional significance levels. Second, the Sargan test for the overidentifying restrictions is χ^2-distributed. We cannot reject the dynamic model's goodness-of-fit in any of our regression specifications.

6. Conclusion

In this article we test several predictions on leverage using data from a representative sample of Swiss firms. The race between the trade-off theory and the pecking order theory is undecided; in fact, on many issues there is no conflict. The shared predictions are confirmed in our tests. Most important, firms with more investment opportunities apply less leverage, which supports both the trade-off model and a complex version of the pecking order model. Confirming the pecking order model but contradicting the trade-off model, more profitable firms use less leverage. We also find that leverage is closely related to tangibility of assets and the volatility of a firm's earnings. Using a simple target adjustment model, we report evidence that firms adjust to long-term financial targets. As shown by

41 Numbers in brackets denote the degrees of freedom.

Shyam-Sunder and Myers (1999), this can well be consistent with a pecking order of financing activities. Our results are robust to several alternative estimation techniques, but the magnitude of the adjustment parameter (or the speed of adjustment) depends on the exact definition of leverage.

From a broader perspective, leverage of Swiss public firms is comparatively low. This is an interesting observation, given that it is commonly argued that continental European firms tend to be highly levered. While our results depend on the underlying definition of leverage, we conclude that leverage in Switzerland is similar to what has been previously reported by Rajan and Zingales (1995) for Germany, but somewhat lower than in Anglo-American countries. One important reason is that Swiss firms hold large cash positions, which is reflected in our adjusted leverage measures. Finally, we also observe that leverage has been slightly decreasing during the last decade.

One important shortcoming of the approach presented in this paper is the assumption that the adjustment coefficient in the dynamic setup is constant across firms and over time. It would clearly be interesting to endogenize both the target leverage ratio and the adjustment coefficient and to explore the impact of firm-specific characteristics as well as macroeconomic variables on the speed of adjustment. The respective literature is slowly evolving, e. g., Lööf (2000), but it still suffers from important econometric deficiencies. We leave this question for further research.

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SUMMARY

We test leverage predictions of the trade-off and pecking order models using Swiss data. At an aggregate level, leverage of Swiss firms is comparatively low, but the results depend crucially on the exact definition of leverage. Confirming the pecking order model but contradicting the trade-off model, more profitable firms use less leverage. Firms with more investment opportunities apply less leverage, which supports both the trade-off model and a complex version of the pecking order model. Leverage is also closely related to tangibility of assets and the volatility of a firm's earnings. Estimating a dynamic panel model with adjustment costs, we find that Swiss firms tend to maintain target leverage ratios, but the results with respect to the speed of adjustment again depend on the definition of leverage. Our results are robust to several alternative estimation techniques.

ZUSAMMENFASSUNG

In dieser Studie wird die Relevanz der Trade-Off-Theorie und der Pecking-Order-Theorie zur optimalen Kapitalstruktur für Unternehmen am Schweizer Kapitalmarkt empirisch untersucht. Im Einklang mit der Trade-Off-Theorie ist zunächst zu beobachten, dass profitablere Unternehmen tendenziell wenig Fremdkapital einsetzen. Auch Unternehmen mit hohen Wachstumserwartungen zeichnen sich durch eine geringe Verschuldung aus. Diese Beobachtung unterstützt sowohl die Trade-Off-Theorie als auch eine erweiterte Form der Pecking-Order-Theorie. Zudem ist der Verschuldungsgrad bei den Unternehmen signifikant geringer, bei denen das Verhältnis aus Anlagevermögen zum Gesamtvermögen niedrig ist und bei denen die Gewinne im Zeitablauf grösseren Schwankungen unterliegen. Die Schätzung eines dynamischen Panel-Modells mit Anpassungskosten deutet darauf hin, dass Schweizer Unternehmen einen Zielverschuldungsgrad verfolgen. Die Anpassungsgeschwindigkeit, um diesen „optimalen Verschuldungsgrad“ zu realisieren, ist jedoch stark von der gewählten Definition des Verschuldungsgrades abhängig. Die empirischen Ergebnisse sind robust hinsichtlich verschiedener Schätzverfahren. Insgesamt ist jedoch zu beobachten, dass der Verschuldungsgrad schweizerischer Unternehmen im internationalen Vergleich eher gering ist.

RÉSUMÉ

Le but de cette analyse est d'évaluer l'importance des théories du « trade-off » et du « pecking-order » pour la structure optimale du capital sur le marché financier suisse. En accord avec la théorie du « trade-off » il faut remarquer que les entreprises plus profitables emploient moins de capital d'emprunt. Ceci est aussi vrai pour des entreprises avec une haute attente de croissance. Ces observations soutiennent la théorie du « trade-off », mais aussi une théorie généralisée du « pecking-order ». En outre le degré d'emprunt est significant plus bas pour des entreprises qui ont une relation basse entre les actif immobilisés et la totalité des actifs et qui ont des profits très volatiles. L'estimation d'un modèle dynamique à base de coûts d'adaptation suggère que les entreprises suisses s'orientent à un certain degré d'endettement. La vitesse d'adaptation à ce « degré optimal d'endettement » dépend cependant de la définition exacte du degré d'endettement. Les résultats empiriques sont robustes à l'égard de la méthode d'estimation. Finalement il convient de remarquer que le degré d'endettement des entreprises suisses est plutôt faible en comparaison avec ceux à l'étranger.