The International Zero-Leverage Phenomenon

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This version: January 2012

Abstract

Extreme debt conservatism is an international phenomenon that has increased over time. While only 5% of our G7 sample firms pursued a zero-leverage policy in 1989, this fraction increased to roughly 14% by 2010. We find that a large proportion of this upward trend has been generated by firms that went public in more recent sample years. The zero-leverage phenomenon is driven by this vintage effect, together with a change in industry composition toward industries where low leverage ratios are more common and a higher propensity to adopt a zero-leverage policy due to increased asset risk. Dividing firms into financially constrained and unconstrained firms, we find that only a small number of very profitable firms with high payout ratios deliberately pursue a zero-leverage policy. In contrast, most zero-leverage firms are constrained by debt capacity. They tend to be smaller, riskier, and less profitable, and they are the most active equity issuers. Constrained zero-leverage firms accumulate more cash than all other firms in our sample, presumably to maintain some degree of financial flexibility. Finally, country-specific variables contribute to explain the differences in the percentage of zero-leverage firms across our G7 sample. Countries with a capital-market-oriented financial system, a common law origin, high creditor protection, and a classical tax system exhibit the highest percentage of zero-leverage firms.

Keywords: Capital structure, zero-leverage, debt conservatism, financial constraints, financial flexibility

JEL classification codes: G32

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* We thank the participants at a research seminar at the University of Hannover, the 2011 Financial Management Association (FMA) Europe conference in Porto, the 2011 Swiss Finance Association (SGF) conference in Zurich, the 2011 Symposium for Banking, Finance and Insurance in Karlsruhe, and the 2012 WHU Campus for Finance conference for helpful comments.

1. Introduction

Major Standard & Poor's 500 firms, such as Google, Apple, Texas Instruments, Bed Bath & Beyond or Urban Outfitters, all have something in common: they are debt-free. This observation is an example for the puzzling development in corporate finance that the proportion of zero-leverage firms has increased over time in all G7 countries. Only 5.17% of our G7 sample firms renounced the use of debt in 1989. By 2010, the proportion of zero-leverage firms rose to 13.64%. Even more surprising, zero-leverage firms are not only confined to small growth firms, but they are sometimes among the largest firms in their industries. Modigliani and Miller (1958) provide a proof of their now-famous M&M proposition that capital structure is irrelevant for the valuation of a firm. Since then, numerous theoretical and empirical studies have analyzed the financing and capital structure decisions of firms. Alleviating the assumptions of the M&M irrelevance proposition, two prevalent theories of capital structure are the trade-off theory and the pecking order theory. Both theories advocate the use of debt either due to tax benefits or lower asymmetric information costs compared to equity. Graham and Harvey's (2001) survey among US firms further emphasizes that the choice of an optimal debt-equity ratio is a major concern for financial decision makers. As noted by Frank and Goyal (2008), the literature is still undecided as to which theory better describes firms' financing decisions. Even more troubling, neither the static trade-off theory nor the pecking order theory is able to explain the extreme debt conservatism of the firms in our sample.

Most empirical studies focus on identifying the determinants of capital structure (Titman and Wessels, 1988; Rajan and Zingales, 1995; Frank and Goyal, 2009) or testing standard theories of capital structure (Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003; Bessler et al., 2011). Recent studies by Strebulaev and Yang (2006), Byoun et al. (2008), and Dang (2009) analyze zero-leverage firms, leaving extreme debt conservatism an unexplained mystery. Zero-leverage firms are smaller and accumulate substantial cash reserves, and they exhibit a high market-to-book ratio as well as a high payout ratio. In fact, it is hard to reconcile these contradicting firm characteristics with one of the major capital structure theories. Not all capital structure theories predict an optimal leverage ratio, but none of them is able to explain extreme debt conservatism. Based on the static trade-off theory, Leland (1994) forecasts an average debt ratio of approximately 60%. Recent simulation studies for the dynamic trade-off theory based on contingent claim analysis derive minimum leverage ratios as low as 10% (Morellec, 2003; Ju et al., 2005). Hennessy and Whited (2005) also assume a dynamic framework; they suggest that firms become debt-free in order to prepare for large capital expenditures in the near future or to exploit future

investment opportunities. Considering capital structure adjustment and adverse selection costs, firms maintain financial flexibility by following a zero-leverage policy. In contrast to the different variants of the trade-off theory, the pecking order theory does not imply a well-defined target leverage. Myers (1984) argues that a firm's capital structure reflects the accumulation of past financial requirements. When information asymmetry is temporarily low, firms with sufficient internal funds have less incentive to use external financing (Autore and Kovacs, 2009; Bessler et al., 2011). However, even a dynamic pecking order theory cannot explain why firms with little or no debt tend to rely heavily on equity and do not exhaust all internal funds (including large cash balances) prior to obtaining external financing.

In their early paper, Minton and Wruck (2001) focus on the persistence of a low-leverage policy. They report that 70% of the firms pursuing a low-leverage policy use it temporarily, with more than 50% of the firms dropping it within five years. Strebulaev and Yang (2006) are the first to focus explicitly on zero-leverage firms, showing that the trend to adopt a zero-leverage policy has increased significantly over the last twenty years. The proportion of zero-leverage US firms increased from 8% in 1990 to almost 20% in 2004. Zero-leverage firms are smaller and pay higher dividends than their size- and industry-matched peers. In order to address potential agency problems of free cash flow, Strebulaev and Yang (2006) focus on dividend paying zero-leverage firms. They conclude that the standard capital structure theories fail to explain the puzzling zero-leverage policy of US firms. The authors argue that asymmetric information between managers and investors could potentially explain the zero-leverage puzzle. A high market-to-book ratio of zero-leverage firms may induce managers to believe that their equity is overvalued. Their own estimated value of the firm is lower than the valuation through the capital markets, creating an imbalance in the relative pricing of equity to debt. In the long-run, one would expect that mean reversion leads to a correction in equity valuation. However, Strebulaev and Yang (2006) cannot find support for this hypothesis, and their results depend on the specification of the benchmark that is used to measure the abnormal returns.

Dang (2009) reports that roughly 10% of all UK firms pursue a zero-leverage policy. Again, zero-leverage firms tend to be smaller, younger, and less profitable, but they have a higher payout ratio than their matching firms. Moreover, these firms hold substantial cash reserves and rely on equity financing. Dang (2009) further argues that zero-leverage firms attempt to mitigate underinvestment problems by following a conservative debt policy. Extreme debt conservatism could be consistent with the dynamic trade-off theory because firms with a very large deviation from the target leverage are more likely to abandon a zero-leverage policy.

Byoun et al. (2008) documents that zero-leverage firms are smaller and have fewer tangible assets, higher cash reserves, and fewer credit ratings than their matching firms. Zero-leverage firms pay higher dividends, arguably in an attempt to reduce the adverse selection costs due to agency problems in order to acquire equity at more favourable terms. As a potential explanation for the zero-leverage phenomenon, Byoun et al. (2008) show that firms with high market valuations rely on external equity in order to take advantage of overvalued stock prices ("market timing") and are likely to become debt-free. Maybe more important, they document that borrowing constraints (e.g., as measured by the existence of a credit rating) contribute to extreme debt conservatism. In a related study, Faulkender and Petersen (2006) document that firms that are unconstrained by debt capacity carry significantly more leverage than firms without access to the public debt market. They measure debt constraints based on the probability of a firm to obtain a bond rating. Even after controlling for factors that determine capital structure choices as well as for the possible endogenity of having a bond rating, firms with a rating use 35% more debt than firms without a rating. Most recently, Marchica and Mura (2010) analyse low leverage policies as an intertemporal capital structure choice. Following a longer period of low leverage, firms have higher capital expenditures and higher abnormal investments. The authors document that new investments are financed through the issuance of new debt. Moreover, they report a measurable impact of financial flexibility in the form of untapped reserves of borrowing power. Long-run performance tests uncover that financial flexible firms invest in more profitable project than their size- and industry-matched peers.

While the recent literature on zero-leverage firms exclusively focuses on US or UK firms, in our study we use a comprehensive sample of G7 firms and document that the increasing number of zero-leverage firms is an international phenomenon. We find that a large proportion of this upward trend has been generated by firms that went public in the more recent sample year. The zero-leverage phenomenon is driven by this vintage effect, together with a change in industry composition toward sectors where extreme debt conservatism is more commonly adopted. Zero-leverage firms are hard to reconcile with the standard capital structure theories, and the standard capital structure variables are unable to explain why so many firms renounce the use of debt. Nevertheless, firm characteristics that are related to asymmetric information and asset risk partly explain firms' debt conservatism. Moreover, dividing zero-leverage firms into financially constrained and unconstrained firms, we show that only a small number of very profitable firms with high payout ratios deliberately pursue a zero-leverage policy. In contrast, most zero-leverage firms are constrained by debt capacity. They tend to be smaller, riskier, and less profitable, and they are the most active equity issuers. Constrained zero-leverage firms accumulate more cash

than all other firms in our sample, presumably to maintain some degree of financial flexibility. Finally, country-specific variables contribute to explain differences in the percentage of zero-leverage firms across our G7 sample. Countries with a capital-market-oriented financial system, a common law origin, high creditor protection, and a classical tax system exhibit the highest percentage of zero-leverage firms.

The remainder of this study is structured as follows. Section 2 provides descriptive statistics and documents stylized facts about the international zero-leverage phenomenon. Section 3.1 starts by testing if standard capital structure variables are able to explain the strong increase in the percentage of zero-leverage firms. Section 3.2 takes a more detailed look at firm fundamentals. We conclude that asymmetric information and asset risk play an important role in the decision to follow a zero-leverage policy. Section 3.3 divides zero-leverage firms into debt constrained and unconstrained zero-leverage firms and refers to the concept of financial flexibility. Section 3.4 analyses the cross-country differences in leverage and links the proportion of zero-leverage firms to institutional determinants. Section 3.5 performs robustness checks to verify our results. Finally, section 4 concludes and provides an outlook for further research.

2. Data description and stylized facts

2.1. Definition of variables and descriptive statistics

In order to examine firms that follow a zero-leverage policy, we collect balance sheet and market data of listed firms in the G7 countries that are covered in the Compustat Global database over the period from 1989 to 2010. The sample consists of active and inactive publicly traded industrial firms and therefore avoids a survivorship bias. However, the Compustat Global database tends to cover larger firms, and hence our data is potentially biased along size. We use yearly data because for most countries quarterly accounting data is not available. Given the specific nature of their businesses, financial firms and utilities (SIC 6000-6999 and 4900-4949) are omitted from the sample (Rajan and Zingales, 1995). Firms without a code for a country or an industrial sector in the Compustat Global database are also excluded from our sample. Moreover, in order to avoid misleading results, firms with a non-consolidated balance sheet are dropped. In this most basic specification, the sample consists of 15,190 fully consolidated firms (9,122 active and 6,068 inactive) with 233,146 firm-year observations from the G7 countries.

As expected, there is a big difference in the number of firms included in our data set for the different countries. In countries with a bank-oriented financial system, i.e., Germany (GER), France (FRA), and Italy (ITA), we observe a strong increase in listed firms over the sample period. The

Compustat Global database includes only 206 firms for the Continental European countries in the year 1989, whereas by the year 2010 the number of firms increased to 1,090. The main reason for this strong increase during our sample period is the sharply increasing number of IPO firms (Giudici and Roosenboom, 2004). The number of Japanese firms (JAP) in our sample also increased strongly from 1,444 firms in 1989 to 2,640 firms in 2010. In contrast, the number of firms in the United States (US), Canada (CAN), and the United Kingdom (UK) increased relatively at a lower rate from 2,628 in 1989 to 3,439 in 2010. Given that the Compustat Global database only includes listed firms, the number of firms included in our sample not only varies due to country size but also because of the proportion of listed to unlisted firms (Rajan and Zingales, 1995). Appendix 1 and 2 show an overview of all firm characteristics used in our empirical analyses together with their construction principles. Following Frank and Goyal (2003), we recode the firm characteristics deferred taxes, purchase of treasury shares, and preferred stock to zero if firm-year observations are missing. We further exclude firm year observations with missing information on total assets and market value. All variables are winsorized at the 1% and the 99% tails in order to reduce outliers. Our final panel includes 14,531 industrial firms from the G7 countries with a total of 166,757 firm-year observations. In order to identify zero-leverage observations, it is imperative to have an appropriate definition of corporate leverage. In the literature different definitions of leverage have been suggested (Rajan and Zingales, 1995; Frank and Goyal, 2008). As shown in appendix 1, we define book leverage as the ratio of the sum of short- and long-term liabilities to total assets. Where necessary, market leverage includes the market value of equity, but we use the book values of debt. Following Strebulaev and Yang (2006), we define zero-leverage observations as firm year observations with no book or market leverage.

Table 1 provides descriptive statistics for all variables used in our empirical analyses. As expected, the median market leverage (14.06%) is lower than the book-leverage (19.42%) in the full G7 sample. Comparing the countries in the G7, Italy exhibits the highest median book leverage (25.04%), followed by Japan (23.18%), France (20.51%), Canada (19.85%), and the US (18.61%). Germany and the UK exhibit the lowest book leverage ratios, with 15.83% and 14.38%, respectively. Our results are qualitatively similar to those in Rajan and Zingales (1995), and they provide a first indication for the proportion of zero-leverage in the different countries. The differences in the book leverage ratios already indicate that country-specific regulations play an important role in a firms' capital structure. We will further investigate the impact of country-specific differences on the decision to follow a zero-leverage policy in section 3.4.

[Insert table 1 here]

2.2. Stylized facts about the international zero-leverage phenomenon

The significant number of zero-leverage firms and the sharp increase in the percentage of firms without debt on their balance sheet is an international phenomenon. Figure 1 depicts and table 2 shows the empirical distribution of zero-leverage firms over time. During our sample period from 1989 to 2010, on average 10.02% of all firm-year observations exhibit zero-leverage. A country-specific analysis shows significant differences between the countries in the G7. While about 15% of all firm-year observations in the Anglo-Saxon countries exhibit zero-leverage this value decreases sharply to 9.59% and 6.23% in Germany and Japan and is the lowest in Italy and France (2.29% and 1.49%). This result already indicates that the percentage of zero-leverage firms tend to be higher in countries with a capital-market-oriented financial system than a bank-based financial system (see section 3.4). Moreover, both table 2 and figure 1 document a strong increase in the percentage of zero-leverage firms over time. Using all firm-year observations, only 5.17% of the firms are classified as zero-leverage in 1989, but this value increased to 13.64% by 2010. Our results for the Anglo-Saxon countries closely resemble those in Strebulaev and Yang (2006) and Dang (2009) for the US and the UK, respectively.

[Insert table 2 and figure 1 here]

In order to examine whether firm size is an important indicator for zero-leverage firms, we divide all observations by their 30 and 70 percentile in the variable size and examine the cross-sectional variation in the percentage of zero-leverage firms. Figure 2 depicts the yearly evolution of the average zero-leverage ratio for each size group. The zero-leverage phenomenon is not confined to small firms; in fact, there is an upward trend in every size group. As expected, small firms are more likely to renounce the use of debt. However, the number of zero-leverage firms also increased substantially among medium-sized firms. The largest firms exhibit an increase as well, but the percentage of zero-leverage firms attained about 5% in recent years, compared to 15-20% for medium-sized firms, and 30-40% for small firms. This evidence on firm size is consistent with several capital structure theories, especially with motives that are related to agency costs and asymmetric information (see section 3.2).

[Insert figure 2 here]

We further examine if the increase in the percentage of zero-leverage firms can be explained by the listing time of our sample firms. Fama and French (2001) report a strong increase in new stock exchange listings at the end of the last century. They argue that the change in the character-

istics of new listings was attributable to a decline in the cost of equity that allowed firms with remote cash flows expectation to issue public equity. Following Custódio et al. (2011), we test if a new listing vintage effect is able to explain the large increase in the number of firms which renounce the use of debt. Specifically, we define six listing groups according to a firm's IPO date. The first group includes all firms listed before 1989; the second group includes all firms listed between 1989 and 1993; the third group between 1994 and 2000; the fourth group between 2001 and 2003; the fifth group between 2004 and 2007; and the final group all the firms listed after 2007. The groups roughly represent high and low economic circles.[1]

Figure 3 reports the yearly evolution of the percentage of zero-leverage firms for the six different listing groups. We document that firms in the more recently listed groups have a significantly higher percentage of zero-leverage firms. While the zero-leverage ratio in the pre-1989 listing group exhibits almost no variation over time, each vintage group starts with a higher percentage of zero-leverage firms. Moreover, the zero-leverage ratio in the more recent listing groups is strongly increasing over time. Although the percentage of zero-leverage firms has been decreasing in the most recent years in all vintage groups, the ordering of the different groups did not change. This evidence implies that the upward trend in the number of zero-leverage firms is generated by firms in more recently listed groups, i.e., by new IPO firms that enter the sample.

[Insert figure 3 here]

In addition, we investigate whether our findings for firms' public listing are directly related to their age. We measure firm age as the difference between the actual year and the firms' IPO date. The IPO date is a merged variable from the Compustat Global and the Thomson 1 databases. We classify a firm as a new-listing if it was listed in the prior three-year period, and as established if the firm is older than three years.[2] In the cross-section, we observe that new listings use have a higher percentage of zero-leverage firms. Figure 4 visualizes our findings; in fact, there is an increase in the fraction of zero-leverage firm for both old and new listings. While the increase is larger for new listings, there is also a positive trend for older listed firms.

[Insert figure 4 here]

All in all, our findings suggest that changes in the sample composition explain a large part of the increase in the percentage of zero-leverage firms. However, as we do not find that newly listed

[1] In unreported results, we use different (fixed-length) listing periods with similar outcomes.

[2] Alternatively, we also use a 5-year period in the secondary market to classify IPO firms, and the results remain qualitatively unchanged.

firms in each vintage year start debt free and then initiate using debt as they mature, the increase in the percentage of zero-leverage firms is not fully captured by the listing vintage and firm age. Therefore, we examine if changes in the overall industry composition can explain the higher percentage of zero-leverage firms in the more recent listing groups. For example, high-technology firms exhibit higher information symmetry and carry less debt, and hence an increase in newly listed high technology firms in the more recent years could explain the vintage effect. Furthermore, riskier firms are more debt constrained and exhibit a higher percentage of zero-leverage firms. If riskier industries have increased in size because of newly listed firms, this could also cause an increase in zero-leverage firms. Following Strebulaev and Yang (2006), we classify our sample using the 10-industry classification scheme used by Fama and French (1997).[3] We identify industrial sectors using their four-digit SIC codes. The table in appendix 3 shows the distribution of zero-leverage firms across major industrial sectors. Zero-leverage firms are not limited to certain industries. However, similar to the findings in Strebulaev and Yang (2006) and Dang (2009), it is noticeable that zero-leverage firms are concentrated in the healthcare sector (18.39% and 26.46%) and the technology sector (21.03% and 31.19%). The high concentration of zero-leverage firms in the technology, healthcare, and telecommunication sectors can be explained by the observation that they exhibit higher growth opportunities and a lower fraction of fixed assets to total assets (which could serve as collateral). This notion is supported by the growth and asset tangibility measures for these sectors compared with other industries (not reported).

Figure 5 documents the yearly percentage of zero-leverage firms and the value-weighted average, using 1989 market capitalization weights, across industries in each year. The lines start to diverge in 1993, when the actual zero-leverage ratio increases more than the zero-leverage ratio using 1989 weights. The difference increases to more than 4.5 percentage points in 2000. Nevertheless, there are strongly increasing percentages of zero-leverage firms in both groups. If industry effects were to fully capture the zero-leverage phenomenon, the line in figure 5 with the 1989 market capitalization weights should not exhibit a strong upward trend. Therefore, we conclude that the zero-leverage phenomenon is not purely driven by new firms shifting to industries where extreme conservatism is more commonly adopted.

[Insert figure 5 here]

[3] See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_10_ind_port.html. If SIC codes are not available in Compustat, we use the GICS (Global Industry Classifications Standard) codes to assign a firm to an industry.

Overall, these stylized facts provide several (incomplete) explanations for the strong increase of zero-leverage firms over time. The differences in size, the vintage effect, and the anticipated change in industry structure are able to partly explain the unexpected increase in the number of zero-leverage firms. Nevertheless, the zero-leverage ratio is also increasing in the older vintage groups and in the sample with the 1989 industry composition. These results clearly emphasize that there are still unexplained parts of the puzzle. In the remainder, we therefore analyse the impact of changing firm-level characteristic and country-specific differences on the international zero-leverage phenomenon.

3. Empirical analysis

3.1 Standard capital structure variables and the zero-leverage phenomenon

The proportion of zero-leverage firms has substantially increased over the last two decades. In this section, we quantify the roles of changing firm characteristics and an increasing propensity to adopt a zero-leverage policy in explaining the zero-leverage phenomenon. In order to quantify the impact of changing firm characteristics on the percentage of zero-leverage firms, we adopt the approach in Fama and French (2001), Bates et al. (2009), and Denis and Osobov (2008). In a first step, we use a logistic regression to estimate the probability that firms exhibit zero-leverage during a 1989-1993 base period. Our explanatory variables are the standard capital structure variables that have already been proven to have a significant impact firms' leverage ratios (Rajan and Zingales, 1995; Frank and Goyal, 2009).[4] The dependent binary variable is 1 of the firm adopts a zero-leverage policy, and 0 otherwise. In a second step, we calculate the probability for each firm to follow a zero-leverage policy based on these characteristics in each year (after 1993) using the average annual coefficients from the base period. The expected percentage of zero-leverage firms is obtained by averaging the individual probabilities across firms in each year and multiplying the result by one hundred. Since the probabilities associated with firm characteristics are fixed at their base period values, variation in the expected percentage of zero-leverage firms after 1993 is due to the changing firm characteristics. The difference between the expected percentage and the actual percentage of zero-leverage firms measures the firms' propensity to follow a zero-leverage policy. An increase in the propensity to have zero-leverage implies a negative difference between the expected and the actual percentage of zero-leverage firms.

Table 3 reports the results of our out-of-sample logistic regression. Changes in the propensity to pursue a zero-leverage policy can be measured as the difference between the expected and the

[4] These standard capital structure variables are profitability, market-to-book ratio, size, and asset tangibility (see appendix 1 for the definition of these variables).

actual proportion of zero-leverage firms. Controlling for the changes in firm characteristics, changes in the unexpected proportion of zero-leverage firms reflect changes in the propensity to follow extreme debt conservatism. At the beginning of the forecasting period, the difference between the actual and the expected percentage is fairly small, indicating that the coefficients obtained from the base period are relatively good predictors for the expected percentage of zero-leverage firms. The actual percentage of zero-leverage firms is higher than the expected percentage, and the difference increases over time. This result suggests that there is an increasing propensity to follow a zero-leverage policy in the G7 countries.

[Insert table 3 here]

An interesting observation is that the expected values barely change over time, indicating that the firm characteristics do not allow for more zero-leverage observations. However, the actual zero-leverage ratio is significantly increasing over time. Applying the coefficients from the base period regression on firm characteristics in any given year over the window from 1993 to 2010 systematically underestimates the actual fraction of firms without debt. As traditional variables of capital structure (profitability, market-to-book ratios, size, and tangibility) are not responsible for the higher percentage of zero-leverage firms, there must be other variables to consider when explaining the zero-leverage phenomenon. Therefore, in what follows we take a broader look at firm fundamentals in order to identify variables and related capital structure theories that are able to better explain the increase in the percentage of zero-leverage firms.

3.2 A more comprehensive look at firm fundamentals

In order to examine the increase in the percentage of firms that follow a zero-leverage policy, we examine these percentages over time and for different subsamples. Table 4 reports the evolution of the zero-leverage fraction for a large set of firm characteristics in 3-year subsamples. Moreover, we divide each variable into groups using the 30th and 70th percentiles of the corresponding firm characteristics. We also test whether there is a significant time trend in the different subsamples and report the coefficient and the significance level of this time trend.

[Insert figure 4 here]

Agency Costs. Lower leverage potentially minimizes the agency costs of debt, such as underinvestment (Myers, 1977) and asset substitution (Leland and Toft, 1996). Dang (2009) examines zero-leverage firms in the UK and concludes that they tend to be smaller, younger, and less profitable, but boast a higher payout ratio than their matching firms. Moreover, these firms hold sub-

stantial cash reserves and rely heavily on equity financing. Accordingly, Dang (2009) argues that zero-leverage firms attempt to mitigate underinvestment problems by following a conservative debt policy. If zero-leverage firms attempt to mitigate underinvestment problems by following a conservative debt policy, we expect them to have high growth option, high payouts, low corporate governance mechanisms, and to rely heavily on external equity financing in order to retain their growth options.

We use the market-to-book ratio and asset growth as proxies for growth opportunities. Panel A of table 4 documents the percentage of zero-leverage firms in each group of these growth proxies over time. Although, all time trends are positive and significant, high market-to-book firms exhibit the highest proportion of zero-leverage firms with 19.26%, on average. The results for asset growth are inconsistent. High asset growth firms exhibit a higher proportion of zero-leverage firms (11.71%) than small asset growth firms (10.76%). However, the difference is marginal, and hence our results for growth opportunities are ambiguous.

The variable payout is also related to agency problems. By definition, zero-leverage firms do not have interest and amortization payments, and therefore dividend payments are the only way to smooth their earnings. Consequently, zero-leverage firms that do not pay dividends are prone to the free cash-flow problem (Jensen 1986). In addition, firms that do not pay dividends are more likely to be financially constrained and less likely to carry much debt. Examining a dummy variable that takes the value 1 if a firm pays dividends in year t (and 0 otherwise), table 4 documents that the percentage of non-dividend paying zero-leverage firms is considerably higher. The coefficient on the time trend variable for non-paying zero-leverage firms is also pointing to a strongly increasing trend in the number of these firms. However, if we only consider dividend-paying firms, table 4 shows that high and small payout firms have higher zero-leverage ratios (16.49% and 13.97%) than medium payout firms (5.97%). Accordingly, zero-leverage firms only partially substitute dividend payments for leverage as a large proportion of zero-leverage firms does not pay dividends or pays very low dividends

In addition, we test whether managerial agency costs explain the proportion of zero-leverage firms by looking at groups of firms based on corporate governance characteristics. Harford et al. (2006) suggest that firms with better corporate governance, i.e., firms with more independent boards, hold less debt. Devos et al. (2008) examine corporate governance structures of zero-leverage firms. They find little support for the notion that zero-leverage firms exhibit weak corporate governance mechanisms. Most important, changes in corporate governance mechanisms do not trigger debt issuances. We use a broad definition of governance from the World Bank

(Kaufmann et al., 2009). In this country-level index, governance is defined as the traditions and institutions by which authority in a country is exercised. Our governance index is the average of six components (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption) for each of the G7 countries from 1996-2009. The results in Panel C of table 4 indicate that the percentage of zero-leverage firms strongly increases for firms in countries with the lowest corporate governance practices. While the time trend is highly significant, that for high governance firms is insignificant. Therefore, zero-leverage firms seem to be more common in countries with poor corporate governance mechanisms, supporting the notion that zero-leverage firms suffer from higher agency costs.

Finally, the hypotheses that zero-leverage firms rely heavily on external equity financing can be confirmed by the results in panel A of table 4. On average, the percentage of zero-leverage firms is the highest in the sample of large equity issuers (19.10%) and also significantly increases over time (from 10.13% to 23.91%). Zero-leverage firms rely heavily on external equity financing in order to retain their growth options. All in all, the descriptive analysis in table 4 mainly provides some evidence for the role of agency problems to explain the increase of zero-leverage firms. The firms' corporate governance environment, their dividend payout behaviour, as well as their equity issuances point to the existence of agency problems.

Asymmetric information. The high percentage of zero-leverage firms among small firms indicates that asymmetric information may contribute to the zero-leverage phenomenon. The pecking order and static trade-off theories predict different influences of asymmetric information on leverage. The pecking order theory predicts that due to adverse selection costs firms prefer internal funds to external funds and debt to equity. Myers and Majluf (1984) argue that if managers know more than outside investors about the value of the firm, the market penalizes the issuance of equity. In contrast, the trade-off theory predicts a lower ratio of leverage under high asymmetric information. When asymmetric information is high, the costs of financial distress are higher and thus firms choose a lower leverage level.

We use tangibility as a first proxy for the degree of asymmetric information between insight and outsight investors. As shown in panel A of table 4, zero-leverage firms exhibit lower asset tangibility, and hence they have fewer fixed assets in their capital structure. A high proportion of fixed assets to total assets can serve as collateral (Fama and French, 2002), which in turn leads to lower costs of financial distress. In contrast, a firm is perceived as risky if asset tangibility is low. Consistent with this notion, zero-leverage firms exhibit higher stock return volatility, again

indicating that they are perceived as riskier. The table indicates a significantly increasing percentage of zero-leverage firms in the low tangibility and high volatility group. Firms with a lower proportion of tangible assets and a higher return volatility use less debt and contribute more to the upward trend in the percentage of zero-leverage firms than medium and high tangible firms.

Firms with high R&D expenses are expected to have a higher degree of asymmetric information. We classify firms whose R&D-to-assets ratio is above the 70th percentile in a given years as high R&D firms, and those whose R&D-to-assets ratio is below the 30th percentile as low R&D firms. In fact, the change in the mean zero-leverage fraction is dramatically different between the low and high R&D group over the 1989-2010 period. While the average zero-leverage fraction over the whole sample period is 7.65% for low and 7.75% for medium R&D firms, the high R&D group exhibits an average percentage of zero-leverage firms of 24.16%. Supporting the asymmetric information hypothesis, the percentage of zero-leverage firms increases from 11.86% in 1989-1990 to 29.76% in 2009-2010 for more R&D-intensive firms, while for less R&D-intensive firms the mean only increases by about 5 percentage points.

Firms with a poor or no credit rating at all are expected to have a higher degree of information asymmetry. We use the variable rating probability to proxy the degree of asymmetric information and expect firms with a low rating probability to suffer from a high degree of asymmetric information, and hence possess a higher fraction of zero-leverage firms.[5] In fact, the average percentage of zero-leverage firms is almost six times larger for firms with a low rating probability (18.34%) than for firms with a high rating probability (3.15%). Furthermore, the percentage of zero-leverage firms in the low rating probability group is strongly increasing over time, while the zero-leverage ratios in the large rating probability group are almost stable.

Overall, we find cross-sectional variation in zero-leverage firms consistent with the asymmetric information hypothesis. The time-trend in the fraction of zero-leverage firms in groups of firms with high information asymmetry suggests that these firms play a key role in explaining the international zero-leverage phenomenon. Our findings also suggest that a high percentage of zero-leverage firms may not deliberately choose extreme debt conservatism, as financial constraints force them to renounce the use of debt. This issue will be examined in section 3.3 below.

Signaling. In a next step, we test whether the decision to follow a zero-leverage policy is used by managers to provide a credible signal for outside investors. With information asymmetry, Ross (1977) argues that investors take larger levels of debt as a signal of higher quality and that profit-

[5] The construction of the rating probability variable is explained in detail in section 3.3.

ability and leverage are positively related. A different way to measure this signal is through abnormal earnings. According to Barclay and Smith (1995), firms with higher abnormal earnings have more secured debt in their capital structure to control for the underinvestment problem.

As zero-leverage firms have no debt in their capital structure, one would expect them to exhibit low abnormal earnings. Abnormal earnings are defined as the ratio of the difference between the income before extraordinary items in time t and t-1 over the firms' market value. The corresponding results in panel A of table 4 are not consistent with the signaling hypothesis. The mean percentage of zero-leverage firms is 11.19% in the group of low abnormal earning firms and 13.38% in the group of high abnormal earning firms. Profitability is our second proxy to test the signaling hypothesis. The mean percentage of zero-leverage firms is 14.73% in the group of low profitability firms, and 13.11% in the group of high profitability firms. This observation is again inconsistent with the notion that leverage and profitability are positively related and that investors take larger levels of debt as a signal of high quality. Taken together, both signaling variables are unable to provide consistent results, and hence we conclude that the decision to follow a zero-leverage policy is not driven by signaling considerations.

Risk. As we are analysing zero-leverage firms, it is legitimate to proxy a firm's business risk by its stock return volatility. In fact, without debt the return on equity equals the firm's asset return, and hence the stock return volatility equals the asset volatility (business risk). Presumably, with increasing business risk, the leverage ratio will decrease. Accordingly, one explanation for the strong increase of zero-leverage firms over time is an increase in business risk. Panel A of table 4 reveals that there is roughly the same percentage of zero-leverage firms in every return volatility subsample (low: 4.95%, medium: 4.50%, high: 6.13%) at the beginning of our sample period. And although there is a significant increase in volatility over time in all three subsamples, the strongest increase occurs in the subsample of high volatility firms, ranging from 6.13% in the 1989-90 period to 17.19% in the 2009-10 period. In order to further strengthen this notion, figure 6 shows the median stock return volatility of zero-leverage firms during the six different vintage periods (defined in section 2.2 above). The median volatility significantly increases after the second vintage period (i.e., when a firm was publicly listed after 1994). Accordingly, we conclude that the observation that asset return volatility (hence firms' business risks) has increased over time contributes to explain the observed increase in the percentage of zero-leverage firms over time and in the different vintage periods.

[Insert figure 6 here]

Target-leverage deviation. The static trade-off theory suggests that the optimal capital structure is obtained by offsetting the costs against the benefits of debt. According to this theory, a zero-leverage policy cannot be optimal. The dynamic version of the trade-off theory suggests that – in the presence of adjustment costs – firms deviate from their target leverage and only gradually adjust their capital structure back to the target leverage. One would expect that zero-leverage firms deviate strongly from their target leverage.[6] In fact, our findings suggest that a zero-leverage policy is at least partly consistent with the dynamic trade-off theory. Panel A of table 4 reveals that the average fraction of zero-leverage firms is 32.48% in the group of firms having a high target leverage deviation (TargetBLdev). Compared to the results of Dang (2009) for UK firms, in our G7 sample the target leverage deviations of zero-leverage firms are even more pronounced. In fact, while the small target leverage deviation of debt firms is potentially consistent with predictions of the dynamic trade-off theory (Morellec, 2003; Ju et al., 2005; Hennessy and Whited, 2005), the extreme target leverage deviations of zero-leverage firms cannot be explained by any variant of the trade-off theory.

Taxes. The tax system is another factor that determines capital structure choices (de Jong et al., 2008; Fan et al., 2010). Given that tax deductions are primarily generated by interest payments, it is not surprising that most of the zero-leverage firms exhibit high tax payments in table 4. In contrast, one could expect that zero-leverage firms have a higher non-debt tax shield. However, even their non-debt tax shield is smaller compared to debt firms. This behavior is hard to explain because any non-debt tax shield is the only possibility for zero-leverage firms to reduce their tax obligations. Consequently, zero-leverage firms pay significantly more taxes than debt firms.

In order to examine all firm characteristics together in a multivariate setup, we run a logistic regression in order to study which firm characteristics determine the decision to adopt or abandon a zero-leverage policy. In this logistic model, the dependent binary variable takes the value of 1 if firm i pursues a zero-leverage strategy in year t, and 0 otherwise. All explanatory variables are lagged by one period, and we control for industry effects by including 2-digit SIC code dummies. The results of the logistic regressions are presented in column 1 of table 5. Comparable to the findings in Dang (2009), the explanatory power of the logistic regression models is 25.83%. Similar to the results from our univariate analysis, size decreases and the market-to-book ratio

[6] Our specification of the target leverage is shown in appendix 2. We use standard capital structure variables as determinants of firm leverage, i.e., tangibility, size, market-to-book ratio, profitability, and non-debt tax shield (Rajan and Zingales, 1995; Frank and Goyal, 2009). The target leverage is computed using all sample observations, and the target leverage deviation is constructed by subtracting the actual leverage from this target leverage. Accordingly, under-levered (over-levered) firms have a positive (negative) deviation from their target leverage.

increases the probability of firms to adopt an extremely conservative debt policy. Also consistent with our univariate results, the coefficient on tangibility is significantly negative, and the coefficient on volatility is significantly positive. The coefficient on the payout dummy variable, indicating whether the firm is paying or non-paying, is significantly negative. This observation emphasizes that there are two different kinds of zero-leverage firms: non-paying and high paying zero-leverage firms. However, if zero-leverage firms are payers, the regression coefficient indicates that a higher payout ratio increases the probability of pursuing a zero-leverage policy (see section 3.3). Consistent with the positive payout coefficient, zero-leverage firms exhibit significantly higher equity issuances than debt firms, and hence they heavily rely on equity issuances as their only source of external financing. Presumably, zero-leverage firms pay high dividends in order to send a signal of quality and to establish a good reputation for them in the capital markets (Byoun et al, 2008). Moreover, the probability of a firm to adopt a zero-leverage policy is higher when it pays more taxes and has a smaller tax shield. As zero-leverage firms carry no debt, they have no deduction from interest payments on their tax obligations. Contradicting, yet confirming our univariate analysis, zero-leverage firms tend to have significantly lower non-debt tax shields than debt firms. The coefficient on profitability is generally positive, supporting the pecking order theory. However, our analysis in section 3.3 below reveals that there are two different groups of zero-leverage firms: one with a high and one with a low profitability ratio.

[Insert table 5 here]

Taken together, our analysis suggests that there are more than the standard capital structure variables to consider when exploring why firms adopt a zero-leverage policy. We show that firms with a higher degree of information asymmetry and higher business risk account for a large part of the increase in the proportion of zero-leverage firms. In contrast, signalling reasons and agency costs of debt do not contribute to explain this international zero-leverage phenomenon. Overall, the characteristics of zero-leverage firms are hard to reconcile with a single capital structure framework. Therefore, we proceed by grouping our sample according to debt constraints.

3.3 The impact of financial constraints and financial flexibility

Financial constraints. The analysis of firm-level characteristics is unable to unambiguously link the zero-leverage phenomenon to standard capital structure theories. Strebulaev and Yang (2006) hypothesize that there are two types of zero-leverage firms: (i) high-growth firms and (ii) cash cows. A novel approach to better understand the incompatible characteristics of zero-leverage firms is to distinguish between firms that deliberately choose to purse a zero-leverage policy and

firms that have no other option than renouncing the use of debt. Zero-leverage firms that have no other option are either unable to issue debt or have no access to external financing at all. In order to sort out different types of zero-leverage firms, we use two measures for financial constraints: (i) debt capacity and (ii) size.[7] Debt capacity is usually defined as a "sufficiently high" debt ratio so that the costs of financial distress curtail further debt issues (Shyam-Sunder and Myers 1999; Chirinko and Singha 2000). Based on Bolton and Freixas' (2000) extended pecking order model of financing instruments, Lemmon and Zender (2010) argue that a firm's ability to issue public (rated) debt indicates a large debt capacity. Faulkender and Petersen (2006) suggest that firms issue less debt and finance themselves through equity issuances when their access to debt markets is restricted. Specifically, one would expect that firms with a bond rating have easier access to debt markets than firms without a rating, and hence these firms exhibit higher leverage. According to Lemmon and Zender (2010), observing that constrained firms without a credit rating use less debt and more equity can be consistent with the pecking order theory. In fact, their main result is that if external funds are required, debt appears to be preferred to equity if there are no concerns about debt capacity. Denis and Sibilkov (2010) also use the existence of a bond rating as one of their measure for whether a firm faces financial constraints.

Lemmon and Zender (2010) argue that while the presence (or absence) of rated debt provides an indication of the extent to which a firm has access to relatively low-cost borrowing on the public bond market and suggests a relatively large (or small) debt capacity, the use of the actual presence or absence of a bond rating as a measure of debt capacity is problematic. Firms without bond ratings might have chosen to rely on equity financing for reasons outside of the pecking order despite having the capacity to issue rated debt. To identify such firms as being constrained by concerns over their debt capacity would lead to biased results. In order to minimize potential biases, we follow Lemmon and Zender (2010) by using a predictive model of whether a firm has a bond rating in a given year as the primary indication for the extent of a given firm's debt capacity. In order to calculate a firm's rating probability, we follow Lemmon and Zender (2010) by using a predictive model of whether a firm has a bond rating in a given year as the primary indication for its debt capacity. We implement a logistic regression approach on the level of country groups over the 1989-2010 time period to assess whether a firm is likely able to access the debt markets. The dependent binary variable in the logistic model takes a value of 1 if firm i in year t has a long-term credit rating and 0 otherwise. Global rating data is taken from the RatingXpress

[7] Firms classified as debt constrained tend to be small (and vice versa). In fact, all results are similar for both approaches, and we only report those with debt capacity as our measure for financial constraint.

historical rating files from Standard and Poors (S&P).[8] The predicting firm characteristics are firm size, profitability, asset tangibility, market-to-book ratio, age, R&D, volatility, and industry dummy variables for all 2-digit SIC codes in the sample.[9] All independent variables are lagged by one period and described in table 1. The results of our predictive model are presented in appendix 4. For the US subsample, the estimated coefficients exhibit the same signs as in Lemmon and Zender (2010) as well as Faulkender and Petersen (2006). In order to divide the sample into constrained and unconstrained firms, we insert the estimated coefficients into the logistic regression model and compute estimated probabilities that a given firm could obtain a bond rating in each year during the 1989-2010 sample period. The levels of these probabilities are assumed to indicate the debt capacity of a given firm. A high probability firm (above the median) is considered as unconstrained, and a low probability firm (below the median) as constrained.[10] Furthermore, we construct a constrained-unconstrained dummy variable (the variable takes a value of 1 if the rating probability is above the median, and zero otherwise) and include it in the logistic regression model in table 5. As expected, the probability of a firm to follow a zero-leverage policy increases when the firm is debt constrained (as indicated by the dummy variable).

Table 6 compares the mean characteristics of constrained and unconstrained zero-leverage firms among each other and with all other sample firms. For each firm characteristic, we compute the mean across all three subsamples, i.e., non-zero-leverage firms, constrained zero-leverage firms, and unconstrained zero-leverage firms, and test whether there are differences in means (based on a two-sample t-test). The number of observations in the different subsamples document that there are more constrained than unconstrained zero-leverage firms. This observation indicates that zero-leverage is not so much a deliberate strategy. In fact, most zero-leverage firms are characterized as financially constrained, and hence they have no other options than renouncing the use of debt. In addition, the univariate results in table 4 reveal that zero-leverage firms hold substantial cash reserves. A more detailed analysis of zero-leverage firms in table 6 indicates that constrained zero-leverage firms hold significantly higher cash reserves than unconstrained zero-

[8] In contrast to Compustat US, Compustat Global does not include rating information. Therefore, we use the RatingXpress historical rating files from S&P to determine whether a firm possesses a long-term credit rating. Starting in 1920, these files contain all historical ratings for all rating levels (entities, maturities, and issues) and rating types (long- and short-term, local, and foreign currency). According to Faulkender and Peterson (2006), the probability of misclassifying a firm (which has not been rated by S&P but by another rating agency, such as Moody's or Fitch) becomes smaller using this methodology. The coverage of the RatingXpress historical files differs among the G7 countries: 34% of the firms in US, UK, and Canada, 14% in Germany, France, and Italy, and 9% in Japan.

[9] In contrast to Lemmon and Zender (2010), we follow Faulkender and Petersen (2006) and exclude leverage as an explanatory variable because we sort firms into zero-leverage and non-zero-leverage firms.

[10] Our results (not reported) remain qualitatively unchanged when we use a 30/70 percentile sorting.

leverage firms and all other debt firms in our sample. This observation supports the notion that constrained zero-leverage firms have a lower debt capacity, and hence they accumulate much higher cash reserves to avoid being forced to reject positive NPV projects. As constrained firms suffer from more pronounced information asymmetries, this finding is also consistent with the arguments in Opler et al. (1999) and Drobetz et al. (2010) that firms with higher adverse selection costs hold more cash due to a precautionary motive. Almeida et al. (2011) hypothesize that constrained firms hold more cash than unconstrained firms; they suggest that concerns about future financing abilities are a major determinant of cash holdings. Finally, Denis and Sibilkov (2010) report that the value of cash increases with the degree of financing constraints.

[Insert table 6 here]

An observation that is hard to explain in our univariate analysis is that zero-leverage firms are less profitable, but at the same time they exhibit a higher payout ratio than non-zero-leverage firms. These incompatible findings can be reconciled by distinguishing between constrained and unconstrained zero-leverage firms. The results in table 6 indicate that constrained zero-leverage firms are less profitable than debt firms. In contrast, unconstrained zero-leverage firm tend to be the most profitable ones (even more profitable than all other firms in our sample). Supporting this notion, unconstrained zero-leverage firms boast the highest cash flow, whereas constrained zero-leverage firms suffer from the lowest cash flow. Accordingly, a relatively small subsample of highly profitable zero-leverage firms seems to exist that deliberately choose an extremely conservative debt strategy. These financially unconstrained firms are more profitable, pay more dividends, exhibit higher cash flows, and are older and bigger than their constrained zero-leverage peers. Moreover, unconstrained zero-leverage firms exhibit significantly lower growth opportunities (market-to-book ratio) compared to their constrained zero-leverage peers. Therefore, agency costs of free cash flow seem to be a main rational for the high payout ratios of unconstrained zero-leverage firms. This result is supported by the observation that unconstrained zero-leverage firms exhibit the lowest amount of equity issuances of all sample firms. Given their profitability together with their high cash holdings, they simply have no need to raise external equity. In contrast, constrained zero-leverage firms are the most active equity issuers of all sample firms, supporting Lemmon and Zender's (2010) notion that concerns over debt capacity largely explain the use of new external equity financing. Accompanying their high equity issuance activities, constrained zero-leverage firms prefer payouts as a means to signal good quality. Moreover, zero-leverage firms have a zero tax shield, and hence by definition debt firms must have lower tax payments than constrained and unconstrained zero-leverage firms. Also in line with expectations,

constrained zero-leverage firms exhibit higher stock return volatility than unconstrained zero-leverage and non-zero-leverage firms.

Overall, there seem to be two different types of firms that follow a zero-leverage policy. First, the bulk of zero-leverage firms in our sample is financially constrained and has no other option than renouncing the use of debt. These firms are smaller, younger, and riskier; they are also the most active equity issuers of all firms in our sample. In addition, constrained zero-leverage firms are characterized by higher growth opportunities, but lower profitability, lower cash flows, and lower payout ratios. The observation that they also have higher cash reserves is also in line with Simutin's (2010) finding that high excess cash firms invest considerably more in the future. He interprets this evidence as consistent with the notion that excess cash holdings proxy for risky growth options. Second, there is a very small subsample of firms that deliberately choose to pursue a zero-leverage policy. These financially unconstrained firms are more profitable, pay higher dividends, have higher cash flows, and are older and bigger than their constrained zero-leverage peers. While the first group is debt constrained and simply unable to raise debt, this second group is unconstrained and would in principle have access to the markets for debt. Apple and Google are two prominent examples for firms that are assigned into this latter group of zero-leverage firms during our sample period.

Financial flexibility. Separating zero-leverage firms into constrained and unconstrained firms explains a large part of the inconsistent results from our univariate analyses. However, constrained and unconstrained zero-leverage firms exhibit significantly lower capital expenditures, which is in sharp contrast to their higher market-to-book ratios. Financial flexibility is a closely related concept and refers to a firm's ability to respond in a timely and value-maximizing manner to unexpected changes in a firm's cash flows or investment opportunity set. Marchica and Mura (2010) argue that low-leverage firms try to maintain financial flexibility by having low capital expenditures and start to issue debt as soon as they are able to exploit their growth opportunities. Further, Graham and Harvey's (2001) survey results indicate that financial flexibility is the most important determinant of corporate capital structure.

Byoun (2011) argues that financial flexibility can be the "missing link" in existing capital structure theories. He documents that developing firms that are in the phase of building up financial flexibility have low leverage ratios. Growth firms that are in the phase of utilizing financial flexibility to fund growth opportunities have high leverage ratios, and mature firms that are in the phase of recharging financial flexibility carry moderate leverage. Given that they often adopt a zero-leverage policy, our focus is on developing firms. According to Byoun (2011), developing

firms are small, with large cash holdings, low capital expenditures, and a low rating probability. Furthermore, developing firms prefer using equity. In fact, as shown in panel A in table 4, zero-leverage firms actively issue new equity. The average zero-leverage fraction in the large equity issuance group is 19.10%, while the medium and small equity issuance groups exhibit an average zero-leverage faction of 9.57% and 9.92%. Simutin (2010) reports a positive relationship between excess cash holdings and future stock returns, which he interprets as consistent with the idea that excess cash holdings proxy for risky growth options. The marginal value of cash is very high for developing firms that have uncertain future investment opportunities while having low internal funds and facing greater financing constraints (Byoun 2011). Therefore, firms with more growth opportunities hold more cash in order to maintain financial flexibility. The cash variable in panel A of table 4 confirms this notion. The average zero-leverage percentage in the group of large cash holders is 25.71%, while there are only zero-leverage fractions of 8.14% and 2.28% in the medium and low cash holding groups, respectively. In addition, the zero-leverage ratio significantly increases over the sample period from 11.59% to 33.65%

Hennessy and Whited (2005) suggest that firms become debt-free in order to prepare for large capital expenditures in the near future or to exploit future investment opportunities. Consequently developing firms maintain low capital expenditures to make use of future investment opportunities. Panel A in table 4 indicates that the average zero-leverage fraction is very high in the group of low capital expenditure firms (15.79%). In addition the percentage of zero-leverage firms is significantly increasing over time from 10.19% in the 1989-90 group to 19.95% in the 2009-10 sample period group.

Almeida et al. (2011) as well as Faulkender and Petersen (2006) use credit ratings as a measure of financial constraints or accessibility to debt capital. Accordingly, we also consider the rating probability as a proxy for the demand for financial flexibility. The results in table 4 document that the average zero-leverage fraction is highest in the group of low rating probability. In addition, the ratio is significantly increasing over time from 9.13% to 23.28%. Furthermore, DeAngelo et al. (2010, 2011) argue that firms with low retained earnings tend to be in the capital infusion stage. Accordingly, firms with low retained earnings are likely to be developing firms with high need for financial flexibility. Panel A in table 4 confirms the notion that the highest percentage of zero-leverage firms is contained in the group with low retained earnings; their zero-leverage fraction has significantly increased from 4.57% to 19.39% over the sample period.

So far, our results point to a relationship between zero-leverage firms and financial flexibility. In order to further validate this hypothesis, we analyse the evolution of the variables cash holdings

and equity issue, which are two major determinants for financial flexibility. We are particularly interested in what happens to these variables in the five years after going public. If a firm simultaneously maintains high equity issuances and cash ratios, this can be interpreted as a demand for financial flexibility. Figure 7 shows the cash holdings and equity issuances of zero- and non-zero-leverage firms. The sample is divided based on the median sum of capital expenditures and R&D expenses (labelled CapexRD), which results in four cases to distinguish: high CapexRD ZL, low CapexRD ZL, high CapexRD NZL, and low CapexRD NZL. Dividing the sample by this new CapexRD variable allows us to interpret the evolution of cash holdings and equity issuances conditional on their capital expenditures. Presumably, firms with high equity issuances, high cash ratios, and high capital and R&D expenditures are those that most seek to maintain financial flexibility.

[Insert figure 7 here]

Panel A of figure 7 illustrates the evolution of the variable cash holdings in the five years post IPO. The cash ratio of all firms is slightly decreasing subsequent to going public. However, there is a large difference across the CapexRD groups. High CapexRD zero-leverage firms boast the highest cash ratios in our sample. Moreover, high CapexRD non-zero-leverage firms also have higher cash levels than low CapexRD non-zero-leverage. However, the levels for both zero-leverage groups are significantly higher than for non-zero-leverage firms, presumably implying that zero-leverage firms attempt to maintain financial flexibility. Panel B further supports this notion; zero-leverage firms maintain their high cash levels by issuing equity. High CapexRD zero-leverage firms seem most active in their demand for financial flexibility. As they hold significantly higher cash ratios and issue significantly more equity than all the other firms in our sample, they are able to maintain the highest level of capital and R&D expenditures.

3.4 Country-specific analysis

In this section, we analyze the international zero-leverage phenomenon at a country-level. We start in section 3.4.1 with a description of the institutional determinants of zero-leverage firms and the results from our extended logistic regression model. Section 3.4.2 examines the influence of different bankruptcy codes.

3.4.1 Institutional determinants of zero-leverage firms

Most of the empirical literature focuses on the determinants of capital structure for US firms, and there is only scant literature for countries outside the US. Rajan and Zingales (1995) examine the

capital structure across G7 countries and document that country-specific factors are important determinants of the amount of leverage. McClure et al. (1999) also document that capital structures are different across the G7 countries and report lower leverage ratios in the Anglo-Saxon countries compared to all other countries. Booth et al. (2001) compare the capital structure in developed and emerging countries and conclude that to a large extent different leverage ratios can be explained by institutional differences.[11] Most recently, Fan et al. (2010) show that a country's legal origin, its tax system, the level of corruption, and the preferences of capital suppliers explain a significant portion of the variation in leverage across developed and developing countries.

One would expect that the financial system is a strong determinant of capital structure and has a large impact on firms' financing decisions. Grossly speaking, the financial systems in the G7 countries can be divided into bank-oriented and capital-market-oriented financial systems. Traditionally, Continental Europe and Japan are classified as bank-oriented financial systems, whereas the United States, Canada, and the United Kingdom are assumed to have a capital-market-oriented financial system (Allen and Gale, 2001). As argued by Bessler et al. (2011), the financial system in Continental Europe and Japan has undergone significant changes in recent years, moving towards a more Anglo-Saxon corporate governance environment. Nevertheless, despite the increased importance of capital markets in the bank-oriented financial systems of Continental Europe and Japan, indirect financing is still relatively less important than in the capital-market-oriented financial systems. Petersen and Rajan (2002) and Djankov et al. (2007) argue that the most important aspect of corporate lending is information. When lenders know more about borrowers, their credit history, or other lenders to the firm, they are less concerned about the "lemons problem" and hence extend more credit. Relationship lending in bank-based countries implies that banks have a privileged access to information, and hence banks are natural monitors and reduce information asymmetries (Leland and Pyle, 1977). The asymmetric information problem will be less pronounced, and we expect lower leverage and a higher fraction of zero-leverage firms in countries with a capital-market-oriented financial system compared to countries with a bank-based financial system.

La Porta et al. (1998) suggest that a country's legal origin determines the extent to which external finance is available. They argue that the common law system provides better external investor protection than the civil law system, resulting in higher security values (La Porta et al., 2002).

[11] Other studies that look at the determinants of capital structure in different countries are Demirgüc-Kunt and Maksimovic (1999) and de Jong et al. (2008).

Presumably, weaker legal systems and weaker public enforcement of laws are associated with less external equity, and hence – all else equal – this suggests that firms from common law countries will use more outside equity. Fan et al. (2010) document that a country's legal system explains a significant proportion of the variation in leverage, with common law systems being associated with lower debt ratios. Following this notion, we assume that common law countries tend to have a higher proportion of zero-leverage firms than civil law countries.

The bankruptcy code is another country-specific variable one would expect to influence capital structure decisions. Already Harris and Raviv (1993) argue that the bankruptcy law should be viewed as an essential component of a debt contract, as the principles of a country's bankruptcy law play an important role in determining the leverage ratio that creditors are willing to accept. There are substantial variations in the insolvency procedures across the G7 countries (Djankov et al. 2007). The "Creditor Protection Score" (CPS) from La Porta et al. (1998) incorporates four different aspects of creditor protection in bankruptcy.[12] The scores indicate that the UK and Germany have a high creditor protection, while the scores of France, Japan, and the US point to the most equity-friendly bankruptcy codes. In equity-friendly countries there is an explicit bankruptcy code that specifies and limits the rights and claims of creditors and strongly facilitates the reorganization of the ongoing business. In contrast, in debt-friendly countries with no bankruptcy codes or only weakly enforced codes, creditors hastily claim the collateral by liquidating distressed firms without seeking reorganization (Davydenko and Franks, 2008). Accordingly, Fan et al. (2010) hypothesize that the existence of an explicit bankruptcy code is associated with higher debt ratios. Acharya et al. (2010) also document that capital structure decisions heavily depend on the bankruptcy law in a firm's country of origin. All else equal, we expect countries with high creditor protection (such as the UK and Germany) to have more zero-leverage firms than countries with low creditor protection (such as the US and France).

Given the tax deductibility of interest payments, the tax system is presumably another crucial country-specific factor that determines capital structure choices (de Jong et al., 2008; Fan et al., 2010). Roughly, there are two different tax systems in the G7 countries: (i) the classical tax system and (ii) the dividend imputation tax system. Under the classical tax system dividend payments are taxed at both corporate and personal levels, whereas interest payments are tax-

[12] The four aspects in the CPS are: no automatic stay on assets, rights of secured creditors, restrictions for going into reorganization and management control in reorganization. A value of one is added to the score when a country's laws and regulations provide each of these aspects to secured lenders. The CPS ranges from 0 to 4, where 0 indicates very low and 4 very high creditor protection.

deductible corporate expenses. This tax system exists in the US, Japan and the UK (post-2000).[13] In contrast, the goal of different forms of a dividend imputation tax system is to tax corporate profits only once. In countries that work with a dividend imputation tax system firms can deduct interest payments, but the domestic shareholders of a corporation receive a tax credit for the taxes paid by the corporation. During our sample period, this system was in place in Canada, France, Germany, Italy, and the UK (pre-2001). The proportion of corporate tax available as a tax credit under an imputation system varies from country to country. However, given larger tax benefits of leverage, we expect less zero-leverage firms in countries with a classical tax system. All other things equal, the proportion of zero-leverage firms should be higher in France, Germany, Italy, and the UK (pre-2001).

Panel C of table 4 confirms our hypothesis about the zero-leverage ratios that evoke from the different institutional determinates. Countries with capital-market-oriented financial systems, common law origin, high creditor protection, and a classical tax system exhibit the highest percentage of zero-leverage firms. The time trend for theses country-specific variables with high average zero-leverage fractions further have a strongly significant time trend. In fact, the difference between the zero-leverage ratios in the large, medium and high group of the country-specific variables is very small for the 88-90 sample period and strongly increases over time.

In order to further examine the impact of country-level variables on the decision to follow a zero-leverage policy, we again use a logistic regression approach. The results are shown in column 2 in table 5. In the model the dependent variable is a binary variable that takes the value of 1 if firm i in year t exhibits zero-leverage (and 0 otherwise). Similar to Fan et al. (2010), we use measures for the financial system, the legal origin, creditor protection, the tax system, GDP per capita growth, the inflation rate, and domestic savings as explanatory variables in our logistic regression[14]. Appendix 1 provides detailed definitions of these country-level variables.

[13] The United Kingdom changed from a dividend imputation to a classical tax system in 2001.

[14] The financial system variable is a dummy variable that equals 1 if the country's financial system is market-based (US, CAN, and UK), and 0 if it is bank-based (DEU, FRA, ITA, and JPN). The legal origin is a dummy variable that is 1 for countries with a common law system (US, CAN, and UK) and 0 for countries with civil law systems (DEU, FRA, ITA, and JPN). We omit the legal origin dummy variable from because for a G7 sample it is perfectly correlated with the financial system dummy variable. Following Djankov et al. (2007), the bankruptcy code variable is a dummy variable that equals 1 if the country has a high creditor protection and therefore a high creditor protection score (UK and DEU), and 0 if the country has a low creditor protection score (US, CAN, and FRA). The tax system variable is a dummy variable that equals 1 if the country works with a dividend imputation tax system (DEU, FRA, ITA, JPN, and UK before 2001), and 0 if the country has a classical tax system (US, JPN, and UK after 2000) during our sample period.

The results in column 2 of table 5 are based on the full G7 sample and provide strongly significant results for all country-specific variables. The estimated coefficient on the financial system dummy is significantly positive, indicating that the probability of a firm following a zero-leverage policy is higher in countries with a market-based rather than a bank-based financial system. Given perfect correlation between the two dummy variables, this result also supports our notion that common law countries tend to have a higher proportion of zero-leverage firms than civil law countries. Moreover, the probability of firms following a zero-leverage policy is higher in countries with a high creditor protection (the UK and Germany), as indicated by the positive and significant coefficient on the bankruptcy code dummy. In these countries a distressed firm is more likely to be liquidated, and hence the proportion of zero-leverage firms tends to be higher (controlling for firm-level influences).

The influence of the tax system is negative, implying that the probability of a firm following a zero-leverage policy is higher in countries with a classical tax system. This finding does not support our hypothesis. Given that tax benefits from leverage are positive in countries with a classical tax system, we expect the proportion of zero-leverage firms to be higher in countries with a dividend imputation tax system. One possible explanation is that the financial system and the legal origin are stronger determinants of the proportion of zero-leverage firms than the tax regime. The tax dummy is zero for the US, Japan, and the UK (post 2000), and both the US and the UK are prone for a high proportion of zero-leverage firms due to their market-based financial system and their civil law origin. Another explanation is that international firms are able to shift their leverage into countries with the most favourable tax regime, and hence the tax code in the country of origin is not restrictive for their choice of leverage.

The estimated coefficients on the country-specific variables GDP per capita growth and inflation are negative. The likelihood of a firm being classified as zero-leverage is negatively related to both variables, supporting the result of Djankov et al. (2007) that firms are more likely to carry higher leverage ratios in countries with a better legal environment and more stable and healthier economic conditions. The variable deposit, defined as a country's ratio of liquid liability (M3) to GDP, measures the degree of financial intermediation in a country. This variable is a measure for financial depth, which equals the overall size of the formal financial intermediary system (Beck et al., 2000). Booth et al. (2001) document a positive relation between deposits and leverage. We further uncover a positive relationship between the likelihood of a firm being classified as zero-leverage and the relative size of the deposits in the country of origin. An alternative measure for the supply of funds available to financial intermediaries is the level of domestic savings, which

we measure as the ratio of gross domestic saving to GDP. Gross domestic savings are defined as the sum of public and private savings. The probability of a firm following a zero-leverage policy is higher in countries with low domestic savings.

All in all, in addition to firm-level characteristics, country-specific variables are important in explaining the different proportion of zero-leverage observations in the different G7 countries. As the financial system and different bankruptcy codes seem most important for explaining the zero-leverage phenomenon, we will investigate the impact of the bankruptcy code in more detail.

3.4.2 The impact of bankruptcy codes on zero-leverage: A non-parametric analysis

In order to supplement our country-specific analysis of the impact of bankruptcy procedures on the proportion of zero-leverage firms, in this section we apply a non-parametric test. Fan et al. (2010) document that the existence of an explicit bankruptcy code is associated with higher debt ratios. Similarly, in their early study Rajan and Zingales (1995) report that the UK and Germany – two countries with debt-friendly bankruptcy codes compared to the US – are much less leveraged than US firms. However, other G7 countries whose bankruptcy codes are not as equity-friendly as the US code exhibit as much or more leverage than the US in their study. Therefore, Acharya et al. (2010) argue that "hard" bankruptcy codes that strongly favour creditors do not by themselves lead to a lower use of debt. Based on a theoretical model, they identify the liquidation value as a related and crucial component of leverage, with the difference in leverage between equity- and debt-friendly countries being a decreasing function of the anticipated liquidation value of the firm's assets. Intuitively speaking, shareholders chose the capital structure to "unwind" the negative effects of distress. If the deadweight losses from distress are high, the firm will choose to carry low leverage. A low liquidation value makes continuation more likely to be optimal and increases the severity of deadweight losses from excessive liquidations. Therefore, one would generally expect that an equity-friendly system will use more leverage than a debt-friendly system. However, as the liquidation value increases, continuation becomes less likely to be optimal and the deadweight losses from excessive continuation increase. These opposing effects lead to a declining difference in leverage between the equity- and debt-friendly codes as the liquidation value increases. At very high liquidation values, the difference can eventually turn negative; liquidation is more likely to be optimal, leading to lower deadweight losses and even higher leverage under a debt-friendly code. Acharya et al. (2010) find support for this hypothesis using a sample of US and UK firms. We adapt their non-parametric test to see if this hypothesis also holds for the proportion of zero-leverage firms. One would expect that firms with low liquidation values in countries with high creditor protection will be more likely to follow a

zero-leverage policy than in countries with equity-friendly bankruptcy procedures. In contrast, firms with high liquidation values in countries with high creditor protection will be less likely to pursue a zero-leverage policy than in countries with low creditor protection.

We use two different measures for the liquidation value of a firm's assets. The first measure is asset specificity. Prior literature suggests that the specificity of a firm's assets is important in determining a firm's liquidation value in the case of bankruptcy (Shleifer and Vishny, 1992; Almeida and Campello, 2007). If a firm owns highly specific assets, for example machinery and equipment that cannot be transposed outside the industry, they are likely to suffer from "fire-sale" discounts in liquidation auctions. Accordingly, firms with high asset specificity have lower liquidation values and proxy the liquidation value in an inverse way. Following Garlappi et al. (2008), we use the Herfindahl index on sales to measure asset specificity. This index captures the degree of industry concentration and is defined as:

$$H_j := \sum_{i=1}^{I_j} s_{i,j}^2,$$

where $s_{i,j}$ denotes the sales of firm i as a proportion of total sales in industry j, and I_j is the number of firms in that industry.[15] The index is constructed on an industry-level for every year during the period from 1989 to 2010. Our second measure for the liquidation value is intangibles. This firm-level variable is defined as the fraction of total assets which is intangible and therefore not easily transferable to other firms.

In our non-parametric test, we follow Acharya et al. (2010) and pool all firms in the sample in a given year and sort the firms into five quintile portfolios based on the proxy for liquidation value. Quintile 5 (Q5) represents the highest degree of the proxy (lowest liquidation value) and quintile 1 (Q1) the lowest degree of the proxy (highest liquidation value). Each quintile is then broken up into countries with high and low creditor protection. Firms are re-grouped into quintiles at the beginning of each year. The countries in our sample are broken up according to their creditor protection score (CPS) in appendix 5, implying that the UK and Germany exhibit very high creditor protection, while the US, Canada, and France grant very low creditor protection.[16] Table 7 presents the results. The left part uses asset-specificity as a proxy for liquidation value,

[15] Sales refers to data item #12 (unscaled) from Compustat Global (see table 1 and appendix 1). Alternatively, we use the asset tangibility measure introduced by Berger et al. (1996) and recently used by Almeida and Campello (2007) and Garlappi et al. (2008). They take the proceeds from discontinued operations to evaluate the expected asset liquidation value. Our results (not tabulated) remain qualitatively unchanged.

[16] We exclude Italian and Japanese firms from this non-parametric test because their bankruptcy codes cannot be definitely assigned to an equity- or debt-friendly regime.

and the right part uses intangibles as an alternative measure. For each measure of liquidation value the "difference of differences" is presented in each year during the 1989-2010 period.

[Insert table 7 here]

Our results, using the percentage of zero-leverage firms in each year rather than the mean book leverage, are consistent with the findings of Acharya et al. (2010). Under their hypothesis, the difference in leverage between countries with high creditor protection (the UK and Germany) and low creditor protection (the US, Canada, and France) should be higher for higher quintiles (with their lower liquidation values). If we take the difference in the proportion of zero-leverage firms in the highest quintile (Q5) and subtract from this the difference in the proportion of zero-leverage the lowest quintile (Q1), this "difference of differences" should be negative. In fact, it is negative in all sample years, and the mean values for both liquidation value proxies (-7.13% and 7.52%) are statistically significant. As expected, the difference in the proportion of zero-leverage firms between countries with low and high creditor protection is lower for higher quintiles (with their low liquidation values).

As in Acharya et al. (2010), leverage is higher in equity-friendly countries for low liquidation values (Q5), and it is higher for debt friendly-countries for high liquidation values (Q1). The reverse pattern should be observable for the proportion of zero-leverage firms. Our results confirm this notion. The proportion of zero-leverage firms tends to be lower in equity-friendly countries for low liquidation values (Q5). In contrast, the proportion of zero-leverage firms tends to be higher in debt friendly-countries for high liquidation values (Q1).

3.5 Robustness check

In this section, we examine the robustness of our results. We show that three important components contribute to the increasing zero-leverage phenomenon: First, section 2 reveals that vintage years are able to explain a large portion of the strong increase of zero-leverage firms over time. Second, in section 3.1-3.3 we identify firm characteristics and the underlying theories that partly explain the existence of zero-leverage firms, as standard capital theories do not allow for zero debt. We document that zero-leverage firms are either financially constrained and are simply not able to acquire debt. Alternatively, they are seeking financial flexibility and therefore deliberately do not carry debt. Finally, section 3.4 identifies the country-specific component of the zero-leverage phenomenon. All G7 countries exhibit an increasing percentage of zero-leverage firms, however, there are large cross-country differences. We identify the financial system and the bankruptcy system as the most important causes for extreme debt conservatism.

In column 3 of table 5 we include all three variable groups into one logistic regression model. Compared to the specification in column 1, the pseudo R^2 increases by two percentage points when all variables are included. All variables maintain their direction of influence and their statistical significance. Most important, the newly included vintage dummies exhibit increasing coefficients, indicating that the probability of a firm having zero-leverage is higher for higher vintage periods, which confirms our findings from figure 3.

We further validate our results by applying a stepwise regression approach in order to identify the variables that have the most relative importance for the decision to follow a zero-leverage policy. We apply a forward selection model, e.g., we start with an empty model and include variables with respect to their explanatory power for the model. Terms with $p < 0.001$ are eligible for addition. The results of this stepwise logistic regression are presented in column 4 of table 5. According to this model, the variables are included in the following ordering: tangibility, size, cash, payout, taxes, financial system, rating probability dummy, profitability, bankruptcy code, vintage dummies, capital expenditures, asset growth, retained earnings, domestic savings, non-debt-tax shield and market-to-book ratio. This ordering confirms our earlier reasoning in section 3.1. The standard capital structure variables load significantly on the decision whether or not to follow a zero-leverage policy. However, these variables are only a subset of all variables that are important for the decision to adopt extreme conservatism. Accordingly, except for the variable taxes, all include variables are directly related to our three strands of information described in the previous sections. Furthermore, it is not surprising that the tax variable is a good predictor. By definition, zero-leverage firms pay more taxes as they have no interest payments from debt to reduce their tax payments. Another noteworthy result is that not all listing vintage dummies are included in the "optimal" model. In fact, only the later vintage groups have a significant impact on the decision to follow a zero-leverage policy.

4. Conclusion

This study examines the question why a surprisingly large number of firms decide to adopt an extremely conservative debt policy. The choice of zero-leverage cannot be explained using standard capital structure theories. In contrast to prior US and UK studies, we examine the zero-leverage phenomenon using a comprehensive sample of firms from the G7 countries. In fact, extreme debt conservatism is a cross-country observation that has strongly increased during our sample period. While only about 5% of all firms in our sample followed a zero-leverage policy in 1989, this fraction increased to roughly 14% by 2010. The vintage effect and the anticipated change in industry structure are able to explain a large part of the strong increase in the number

of zero-leverage firms. Analysing a large set of leverage-related firm fundamentals, we document that asymmetric information and increased business (asset) risk contribute to explain the high percentage of zero-leverage firms. Without differentiating for financial constraints, theories related to signalling or agency costs deliver inconsistent results. A logistic regression using all firm fundamentals documents that zero-leverage firms exhibit higher cash reserves, higher market-to-book ratios, less capital expenditures, and fewer tangible assets than non-zero-leverage firms. Moreover, zero-leverage firms tend to be smaller and riskier than non-zero-leverage.

While some aspects of the zero-leverage phenomenon can be reconciled using the standard capital structure theories, it is impossible to come up with a fully satisfactory explanation for extreme debt conservatism. A novel approach in our paper to better understand the incompatible characteristics of zero-leverage firms is to distinguish between firms that deliberately choose to purse a zero-leverage policy and firms that have no other option than renouncing the use of debt because they have no access to the debt market. We use Lemmon and Zender's (2010) debt capacity and size as two proxies for financial constraints. Our results suggest that there are two different types of zero-leverage firms. First, most zero-leverage firms are financially constrained and have no other option than behaving extremely debt-conservative. These firms are smaller, younger, and riskier. Constrained zero-leverage firms are characterized by higher growth opportunities but lower profitability. In order to retain their growth opportunities, they issue more equity and hold more cash than all other firms in our sample. Nevertheless, constrained zero-leverage firms are not profitable enough to make high payouts to their shareholders. Second, we identify a small number of firms that deliberately choose to follow a zero-leverage policy. These financially unconstrained zero-leverage firms are more profitable, pay more dividends, have a higher cash flow, and are older and bigger than their constrained zero-leverage peers. Furthermore, we document that firms following zero-leverage policy have a desire to maintain financial flexibility. Sorting firms by the median sum of capital expenditures and R&D expenses (CapexRD), we report that zero-leverage firms with CapexRD above the median exhibit the highest cash and equity issuance ratios in our sample.

Differences in institutional characteristics also contribute to explain the different proportion of zero-leverage firms in each country. The fraction of zero-leverage firms tends to be highest in countries with a capital-market-oriented financial system, a common law origin, high creditor protection, and a classical tax system (such as the UK) and lowest in countries with a bank-oriented financial system, a civil law origin, low creditor protection, and a dividend imputation tax system (such as France).

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Figure 1: Distribution of zero-leverage firms over time

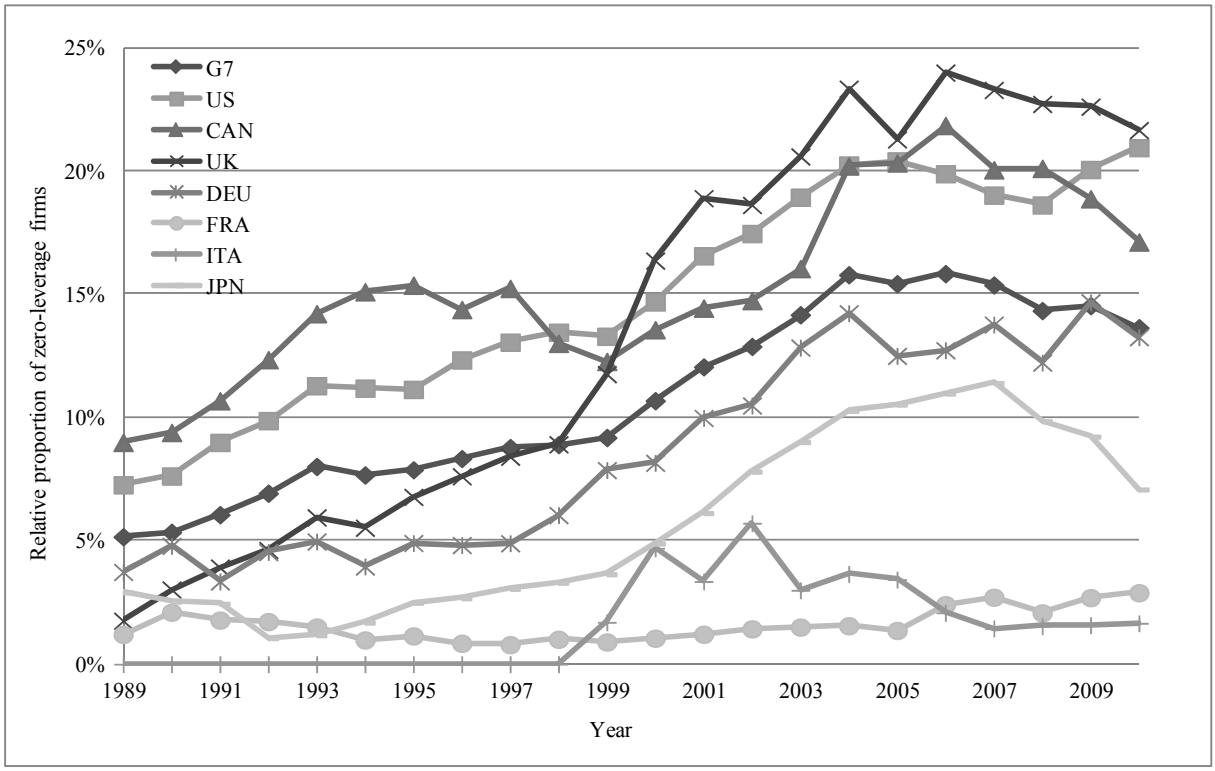


Figure 2: Percentage of zero-leverage firms by size group

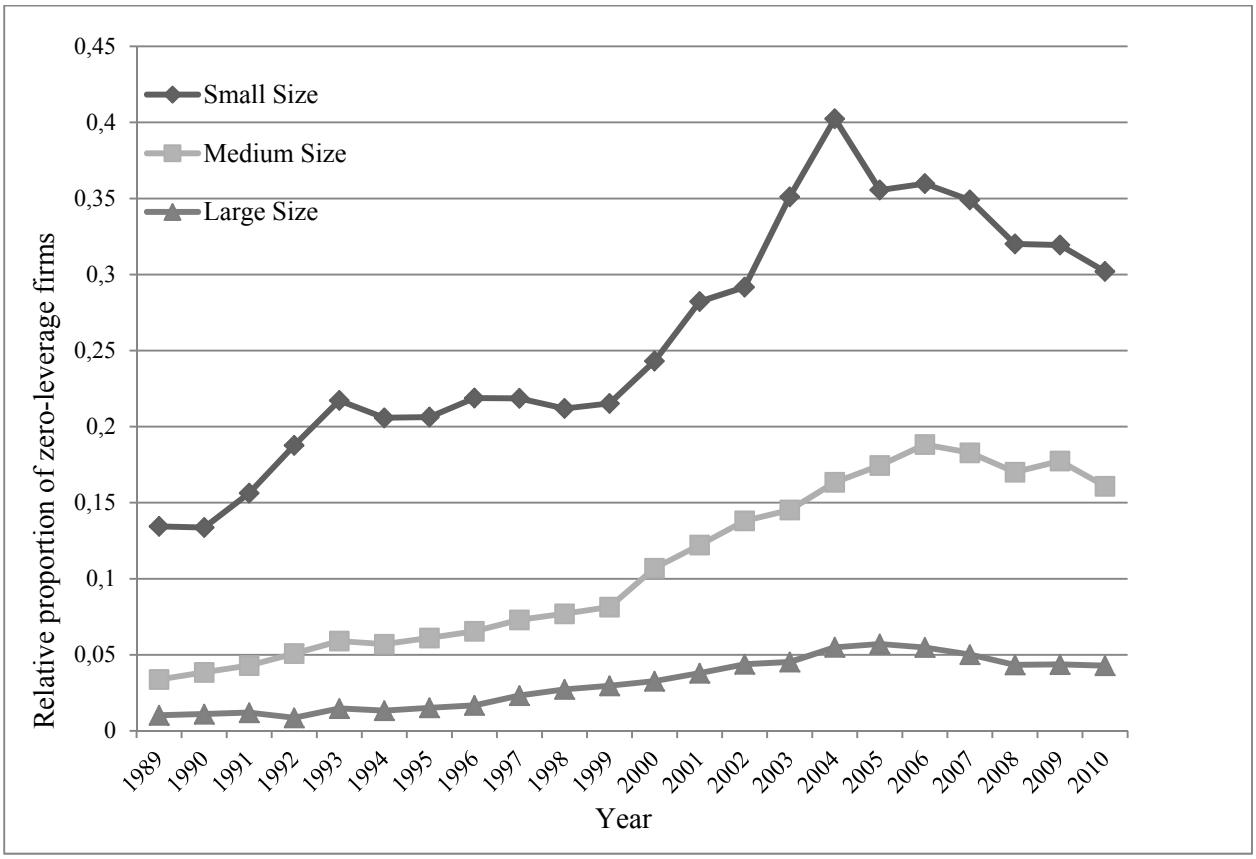


Figure 3: Percentage of zero-leverage firms by listing period

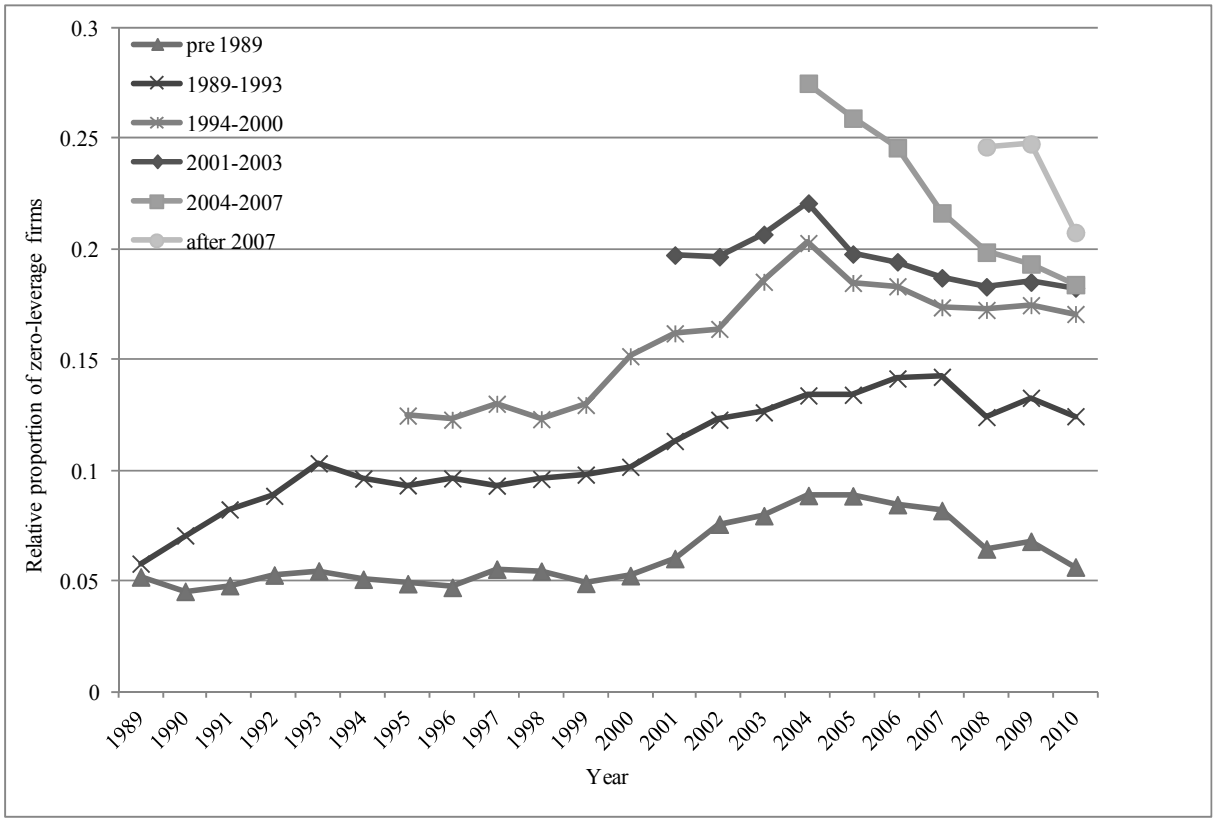


Figure 4: Percentage of zero-leverage firms by age group

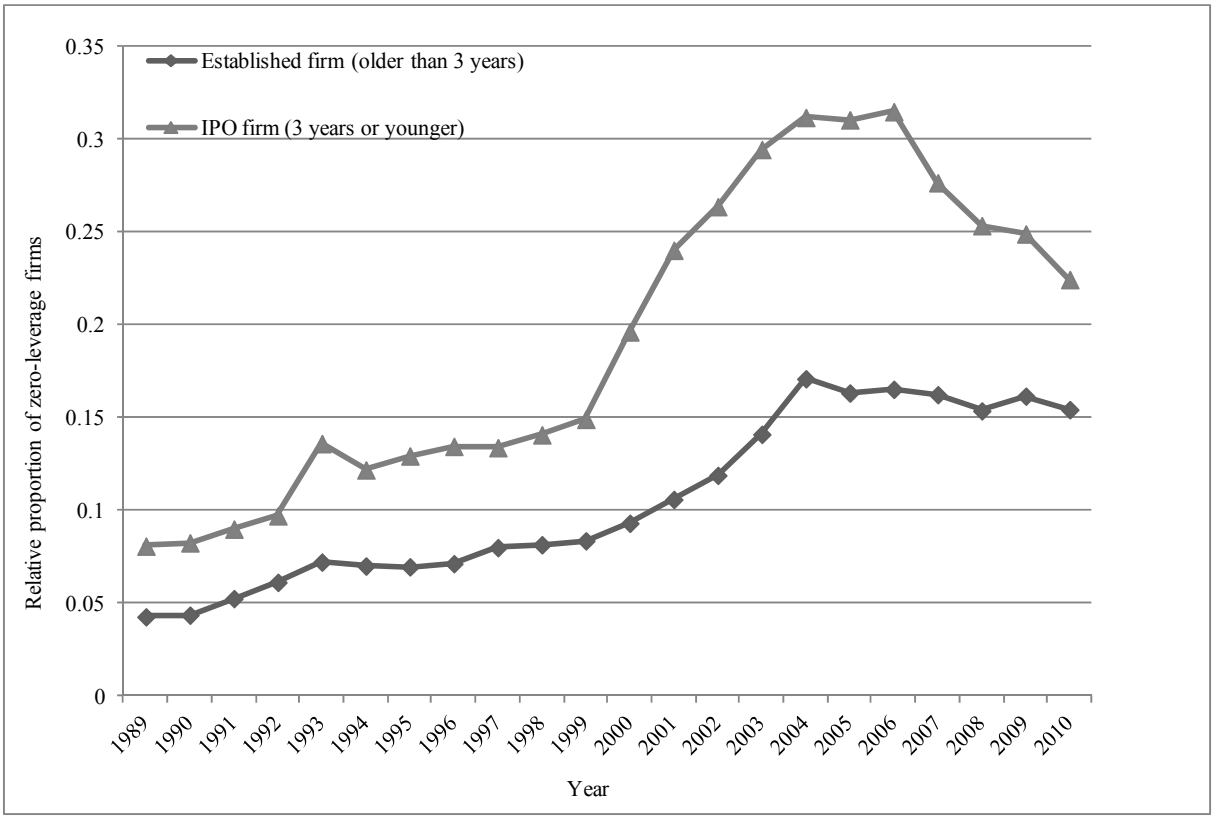


Figure 5: Percentage of zero-leverage firms and changing industry composition

Figure 6: Evolution of Volatility in the different vintage periods

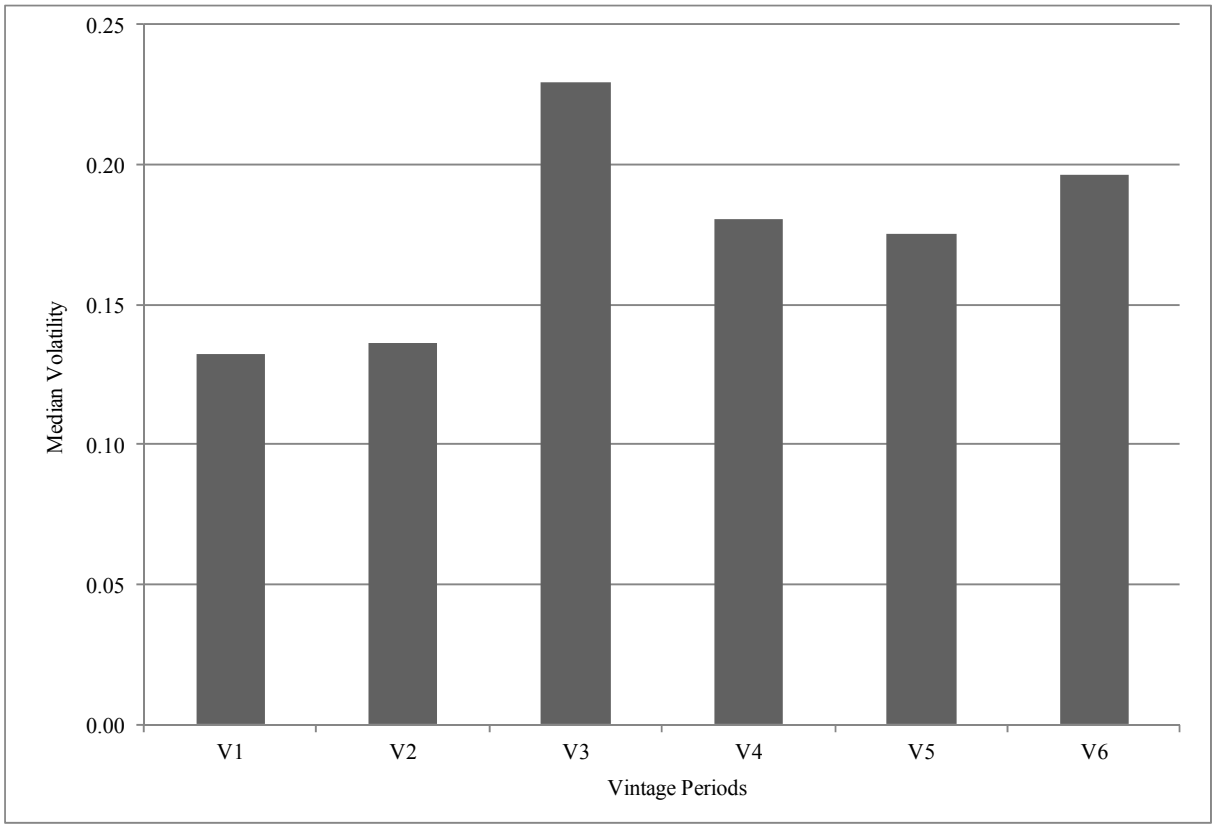
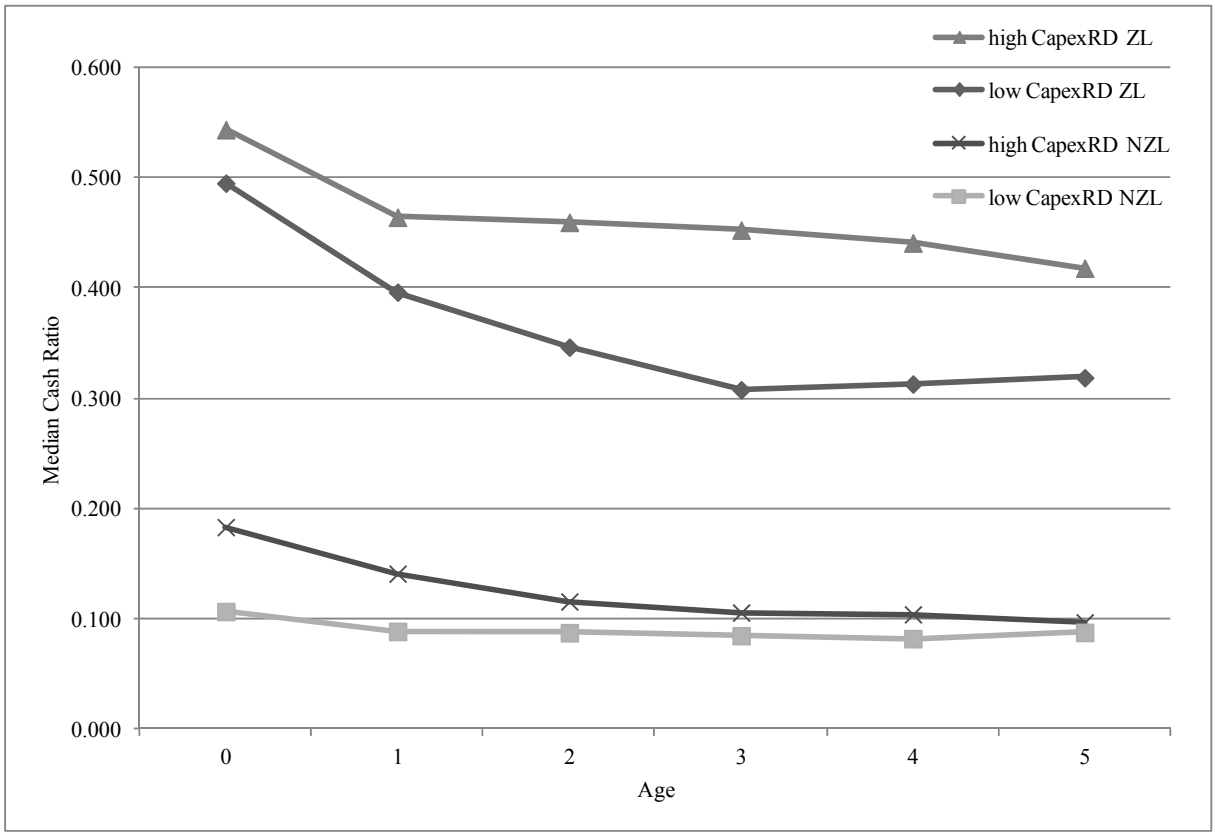


Figure 7: Evolution of Cash and Equity Issue after IPO for high and low CapexRD

Panel A: Evolution of Cash



Panel B: Evolution of Equity Issue

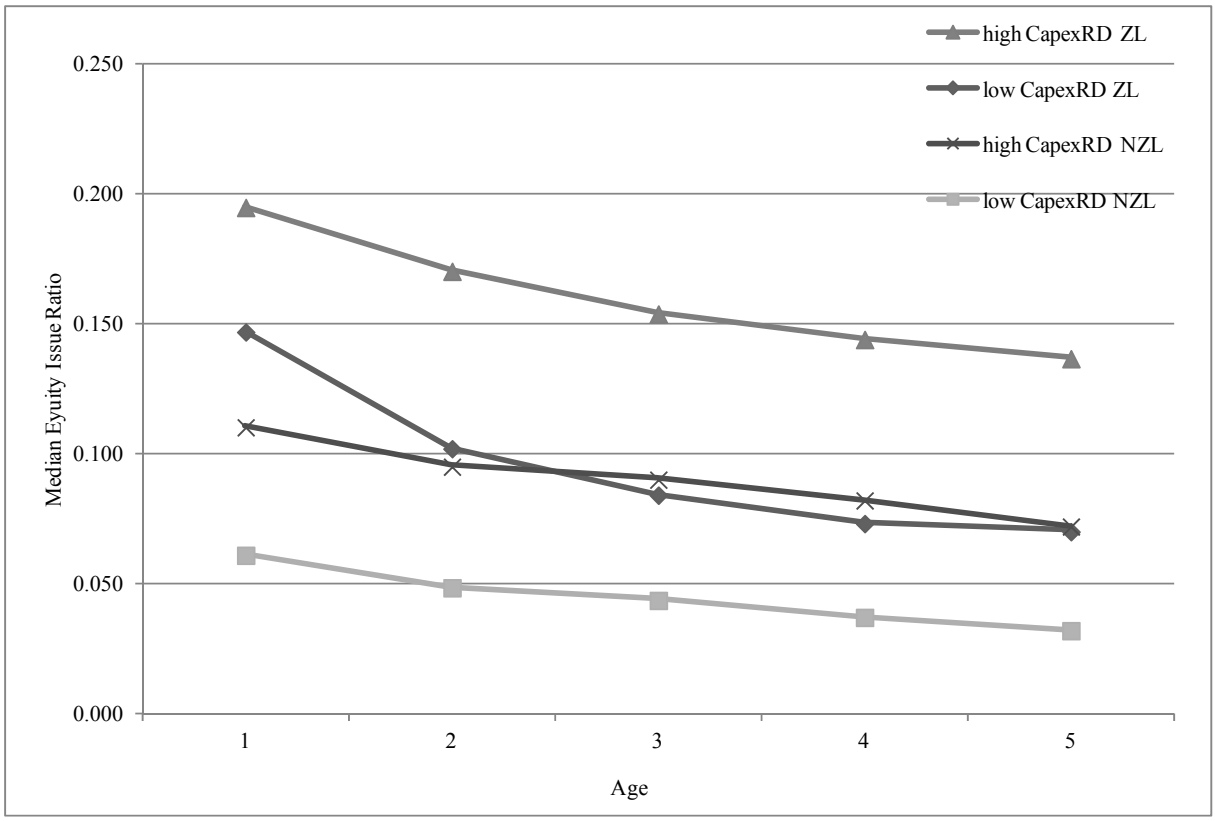


Table 1: Descriptive statistics

	G7						US			CAN			UK			DEU			FRA			ITA			JPN		
Variable	Mean (%)	SD (%)	Median (%)	Min	Max	N	Mean (%)	Median (%)	N	Mean (%)	Median (%)	N	Mean (%)	Median (%)	N	Mean (%)	Median (%)	N	Mean (%)	Median (%)	N	Mean (%)	Median (%)	N	Mean (%)	Median (%)	N
Book leverage	22.67	20.58	19.42	0.05	0.35	165,999	23.00	18.61	64,154	21.85	19.85	9,489	17.53	14.39	22,465	19.45	15.84	8,552	22.20	20.51	8,441	25.05	25.05	2,641	25.19	23.18	50,257
Market leverage	18.35	17.51	14.07	0.03	0.29	165,986	16.76	11.12	64,149	17.57	13.40	9,487	13.32	9.51	22,464	16.41	12.18	8,551	18.39	15.85	8,437	21.67	20.06	2,641	22.93	20.26	50,257
Size	567.53	187.58	559.97	4.43	6.86	166,166	572.33	565.85	64,155	551.21	549.80	9,489	475.40	457.89	22,515	535.82	510.79	8,558	559.24	525.29	8,442	630.97	609.17	2,641	609.14	593.52	50,366
Age	1328.92	1443.62	800.00	3.00	16.00	143,723	791.40	700.00	47,542	622.47	500.00	6,333	571.32	500.00	19,800	627.18	500.00	8,542	627.08	500.00	8,458	588.27	500.00	2,642	2497.77	2300.00	50,406
Market-to-book	172.73	141.21	127.35	0.99	1.86	166,152	210.53	151.29	64,150	186.63	135.54	9,487	184.90	139.27	22,514	158.78	122.71	8,557	153.32	122.20	8,437	138.45	115.49	2,641	123.93	106.28	50,366
Asset growth	13.01	99.48	5.70	-0.06	0.18	151,524	15.64	5.92	58,957	30.09	9.88	8,604	16.42	6.04	19,864	8.92	4.13	7,657	11.41	6.42	7,517	25.36	5.13	2,352	5.39	4.83	46,573
Payout	2.19	4.52	0.60	0.00	0.02	120,549	2.77	0.46	57,880	1.86	0.09	8,918	2.22	1.12	18,886	1.55	0.38	6,754	1.49	0.79	6,947	1.44	0.68	2,352	1.12	0.64	18,812
Equity issue	6.44	17.43	0.23	0.00	0.02	119,846	6.93	0.52	62,574	9.37	0.61	9,278	8.70	0.13	20,322	4.42	0.00	6,718	2.58	0.00	6,952	2.31	0.00	2,330	1.87	0.00	11,672
Tangibility	28.65	21.64	24.48	0.11	0.41	166,063	27.46	21.20	64,060	47.05	45.82	9,487	28.67	23.54	22,511	23.63	21.07	8,558	18.33	14.38	8,440	24.04	20.24	2,641	29.50	28.13	50,366
Volatility	14.02	9.71	11.34	0.08	0.17	163,781	15.96	13.11	63,322	14.76	11.89	9,369	14.24	11.15	22,140	14.46	10.76	8,393	13.27	10.28	8,287	12.01	9.92	2,601	11.46	10.06	49,669
R&D	3.07	8.24	0.00	0.00	0.02	166,166	5.55	0.24	64,155	2.65	0.00	9,489	2.12	0.00	22,515	1.84	0.00	8,558	1.22	0.00	8,442	0.44	0.00	2,641	1.08	0.08	50,366
Rating probability	14.18	22.09	3.83	0.01	0.16	140,596	19.02	6.02	51,100	15.70	4.83	8,121	11.17	2.06	18,689	13.50	3.10	7,407	17.02	3.66	7,279	20.10	8.61	2,299	9.09	3.17	45,701
Abnormal earnings	0.38	19.71	0.01	0.00	0.00	137,979	0.36	0.01	58,807	-0.19	0.03	8,531	0.39	0.03	19,456	0.26	0.02	7,580	2.15	0.01	7,452	0.88	0.01	2,339	0.13	0.01	33,814
Profitability	2.62	18.33	5.31	0.01	0.10	165,644	1.98	7.30	64,030	0.60	5.50	9,419	1.21	6.82	22,334	1.72	4.90	8,539	4.86	5.91	8,416	3.30	4.28	2,637	4.20	3.82	50,269
Cash flow	2.45	21.11	6.42	0.02	0.11	152,340	1.26	7.67	63,892	2.00	7.39	9,397	1.40	7.58	22,010	4.44	7.27	8,485	5.42	6.86	8,369	4.59	5.70	2,631	3.97	4.58	37,556
TargetBLdev	0.39	19.93	3.84	-0.11	0.15	152,071	-0.03	4.52	63,798	4.41	7.11	9,382	3.95	6.87	21,965	2.14	5.75	8,478	-2.20	-0.51	8,369	-2.73	-2.03	2,631	-1.60	1.07	37,448
Taxes	1.98	2.97	1.48	0.00	0.03	165,643	2.21	1.61	64,050	1.59	0.88	9,431	1.79	1.50	22,305	2.00	1.33	8,538	1.81	1.45	8,415	1.87	1.43	2,637	1.88	1.48	50,267
NonDebtTS	4.47	3.89	3.69	0.02	0.06	152,341	4.88	4.07	63,892	5.31	4.41	9,397	4.48	3.62	22,010	6.14	4.82	8,485	4.53	3.78	8,369	4.40	3.90	2,631	3.16	2.77	37,557
Cash	17.26	18.67	11.12	0.04	0.23	166,161	19.19	9.42	64,154	13.95	5.19	9,485	15.80	8.74	22,515	15.18	8.30	8,558	14.40	9.87	8,442	12.06	7.84	2,641	17.17	14.18	50,366
Capital expenditure	5.59	6.52	3.63	0.02	0.07	141,840	6.11	4.14	63,380	11.00	6.64	9,248	5.51	3.59	20,537	5.53	3.88	6,680	4.96	3.53	7,007	4.26	2.92	2,334	3.35	2.39	32,654
Retained earnings	-18.27	175.57	11.66	-0.01	0.29	165,202	-45.64	12.13	63,282	-36.67	6.96	9,415	-29.54	10.74	22,513	-8.98	1.79	8,556	-1.11	0.00	8,429	2.29	0.67	2,641	19.07	17.93	50,366
Specificity	0.19	0.18	0.12	0.00	0.00	165,525	0.17	0.12	63,762	0.27	0.19	9,434	0.22	0.16	22,517	0.18	0.09	8,554	0.19	0.11	8,405	0.20	0.16	2,637	0.17	0.11	50,216
Intangibles	9.26	15.61	1.39	0.00	0.11	158,174	12.98	5.42	56,997	8.07	0.34	9,179	14.40	1.73	22,098	10.93	4.14	8,495	15.12	9.81	8,416	12.86	6.36	2,630	1.56	0.48	50,359
Country-level governance	113.47	27.17	117.58	1.04	1.31	119,937	125.28	126.92	43,351	160.17	161.59	6,478	61.58	60.38	17,500	150.74	149.52	6,951	122.45	121.72	7,021	74.91	80.07	2,232	109.57	112.19	36,404
Deposits	118.03	61.68	77.87	0.67	1.93	166,757	67.83	67.21	64,328	95.80	78.05	9,533	108.50	107.56	22,793	93.96	98.33	8,579	69.27	67.63	8,476	62.58	59.12	2,642	205.81	203.16	50,406
GDP per capita growth	147.84	205.45	192.45	0.59	2.71	166,757	165.08	195.58	64,328	151.54	176.20	9,533	166.80	208.66	22,793	136.72	145.24	8,579	112.22	131.18	8,476	34.87	74.08	2,642	130.35	149.34	50,406
Inflation rate	140.28	175.18	184.51	0.12	2.56	166,757	229.43	216.36	64,328	219.62	225.91	9,533	285.97	278.81	22,793	112.31	100.83	8,579	166.07	160.51	8,476	267.86	262.34	2,642	-60.63	-89.89	50,406
Domestic savings	1994.94	564.51	1801.97	15.36	24.48	166,757	1548.93	1588.81	64,328	2280.22	2362.90	9,533	1524.28	1519.50	22,793	2267.85	2225.11	8,579	1994.96	1983.82	8,476	2113.88	2163.04	2,642	2670.34	2536.85	50,406

Table 2: Distribution of zero-leverage firms over time

This table summarizes the distribution of zero-leverage firms over time by showing the numbers and percentages of firms that pursue a zero-leverage (ZL) policy. A firm is classified as zero-leverage if it has no long-term and short-term debt in a given year t.

	G7			US			CAN			UK			DEU			FRA			ITA			JPN		
Year	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%
1989	4278	221	5.17	1952	142	7.27	278	25	8.99	398	7	1.76	107	4	3.74	83	1	1.20	16	0	0.00	1444	42	2.91
1990	4582	245	5.35	2031	155	7.63	298	28	9.40	529	16	3.02	146	7	4.79	95	2	2.11	22	0	0.00	1461	37	2.53
1991	4785	290	6.06	2158	194	8.99	309	33	10.68	562	22	3.91	149	5	3.36	112	2	1.79	23	0	0.00	1472	36	2.45
1992	4703	326	6.93	2431	240	9.87	324	40	12.35	605	28	4.63	154	7	4.55	116	2	1.72	29	0	0.00	1044	11	1.05
1993	5288	424	8.02	2737	309	11.29	387	55	14.21	622	37	5.95	181	9	4.97	133	2	1.50	31	0	0.00	1197	14	1.17
1994	6115	469	7.67	2949	330	11.19	437	66	15.10	669	37	5.53	202	8	3.96	204	2	0.98	52	0	0.00	1602	27	1.69
1995	6686	527	7.88	3123	348	11.14	462	71	15.37	752	51	6.78	224	11	4.91	262	3	1.15	56	0	0.00	1807	45	2.49
1996	7485	624	8.34	3340	412	12.34	466	67	14.38	1024	78	7.62	290	14	4.83	355	3	0.85	101	0	0.00	1909	51	2.67
1997	7788	684	8.78	3339	436	13.06	466	71	15.24	1165	98	8.41	306	15	4.90	380	3	0.79	104	0	0.00	2028	62	3.06
1998	8043	716	8.90	3336	449	13.46	492	64	13.01	1189	106	8.92	364	22	6.04	397	4	1.01	115	0	0.00	2150	71	3.30
1999	8565	787	9.19	3475	462	13.29	497	61	12.27	1131	133	11.76	483	38	7.87	446	4	0.90	118	2	1.69	2415	88	3.64
2000	9155	978	10.68	3588	527	14.69	494	67	13.56	1210	198	16.36	588	48	8.16	571	6	1.05	149	7	4.70	2555	125	4.89
2001	9116	1099	12.06	3388	561	16.56	471	68	14.44	1233	233	18.90	621	62	9.98	578	7	1.21	179	6	3.35	2646	162	6.12
2002	8901	1147	12.89	3253	568	17.46	468	69	14.74	1203	224	18.62	553	58	10.49	559	8	1.43	175	10	5.71	2690	210	7.81
2003	8696	1232	14.17	3095	586	18.93	480	77	16.04	1190	245	20.59	522	67	12.84	533	8	1.50	167	5	2.99	2709	244	9.01
2004	8772	1385	15.79	3048	617	20.24	495	100	20.20	1277	298	23.34	499	71	14.23	514	8	1.56	164	6	3.66	2775	285	10.27
2005	8885	1371	15.43	2935	599	20.41	497	101	20.32	1391	296	21.28	504	63	12.50	513	7	1.36	175	6	3.43	2870	302	10.52
2006	8974	1421	15.83	2826	562	19.89	467	102	21.84	1455	349	23.99	542	69	12.73	539	13	2.41	192	4	2.08	2953	324	10.97
2007	8793	1352	15.38	2676	509	19.02	419	84	20.05	1400	326	23.29	581	80	13.77	553	15	2.71	207	3	1.45	2957	337	11.40
2008	8336	1195	14.34	2524	470	18.62	378	76	20.11	1250	284	22.72	556	68	12.23	529	11	2.08	195	3	1.54	2904	286	9.85
2009	7891	1147	14.54	2383	478	20.06	355	67	18.87	1119	253	22.61	518	76	14.67	519	14	2.70	190	3	1.58	2807	259	9.23
2010	7169	978	13.64	2201	461	20.95	333	57	17.12	905	196	21.66	460	61	13.26	449	13	2.90	181	3	1.66	2640	187	7.08
Number of observations	165999	16630	10.02	59570	8561	14.37	8801	1343	15.26	20441	3069	15.01	7574	726	9.59	7473	111	1.49	2270	52	2.29	44810	2790	6.23

Table 3: Propensity Model

This table reports the out-of sample estimates from logistic regressions for the difference between the expected and the actual percentage of zero-leverage firms. In a first step, we use a logistic model to estimate the probabilities that firms with given characteristics (profitability, market-to-book ratio, size, and tangibility) exhibit zero-leverage during the 1989-1993 base period (coefficients are reported in the first row). In a second step, we calculate the probability for each firm to follow a zero-leverage policy based on the characteristics in each year (after 1993), using the average annual coefficients from this base period. The expected percentage of zero-leverage firms is obtained by averaging the individual probabilities across firms in each year and multiplying the result by one hundred.

	Average coefficients 1989-1992 (base period) and average annual values				all		
	1.998	**0.262**	**-0.517**	**-1.528**			
year	Profitability	Market-to-book	Size	Tangibility	actual %	exp. %	expected -actual %
1994	0.051	1.663	5.701	0.328	7.670	6.022	-1.648
1995	0.054	1.867	5.672	0.323	7.882	6.662	-1.220
1996	0.053	1.857	5.596	0.317	8.337	6.790	-1.546
1997	0.046	1.861	5.571	0.315	8.783	6.732	-2.051
1998	0.026	1.796	5.614	0.316	8.902	6.302	-2.600
1999	0.022	2.261	5.654	0.299	9.189	7.881	-1.307
2000	0.008	1.867	5.583	0.278	10.683	6.703	-3.980
2001	-0.029	1.625	5.469	0.282	12.056	5.875	-6.181
2002	-0.016	1.359	5.506	0.282	12.886	5.378	-7.509
2003	0.009	1.758	5.617	0.273	14.167	6.440	-7.728
2004	0.023	1.835	5.664	0.262	15.789	6.731	-9.058
2005	0.027	1.927	5.626	0.250	15.431	7.162	-8.268
2006	0.023	1.853	5.683	0.242	15.835	6.801	-9.033
2007	0.017	1.685	5.790	0.242	15.376	6.154	-9.222
2008	0.007	1.225	5.794	0.256	14.335	5.139	-9.197
2009	0.012	1.414	5.878	0.257	14.536	5.385	-9.151
2010	0.036	1.489	6.050	0.253	13.642	5.419	-8.223

Table 4: Percentage of zero-leverage firms by group of firms

This table reports the percentage of zero-leverage firms by group of firms. The breakpoints for the small, medium and large groups are the yearly 30th and 70th percentiles of each firm characteristic. The sample consists of observations on Compustat firms from 1989 to 2010. Refer to table 1 and appendix 1 for variables definitions.

Panel A

	89-90	91-93	94-96	97-99	00-02	03-05	06-08	09-10	89-10	Time Trend x100	
Size											
Small	0.1136	0.1575	0.1740	0.1771	0.2126	0.2693	0.2553	0.2375	0.1996	1.0776	***
Medium	0.0344	0.0487	0.0576	0.0716	0.1095	0.1391	0.1533	0.1453	0.0949	0.8209	***
Large	0.0101	0.0122	0.0154	0.0262	0.0369	0.0497	0.0471	0.0408	0.0298	0.2298	***
Age											
older than 5	0.0290	0.0416	0.0611	0.0687	0.0898	0.1226	0.1346	0.1310	0.0848	1.1108	***
younger than 5	0.0626	0.0827	0.1061	0.1196	0.1642	0.2227	0.2094	0.1895	0.1446	0.6868	***
Listing year											
pre 1989	0.0468	0.0518	0.0492	0.0531	0.0628	0.0858	0.0774	0.0625	0.0612	0.1776	***
1989-1992	0.0540	0.0738	0.0742	0.0719	0.0866	0.1021	0.1080	0.0998	0.0838	0.2858	***
1993-2000		0.1263	0.1100	0.1190	0.1354	0.1645	0.1624	0.1606	0.1397	0.5255	***
2001-2003					0.1817	0.1973	0.1814	0.1804	0.1852	-0.1710	
2004-2007						0.2539	0.2228	0.1892	0.2220	-2.2322	***
after 2007							0.2338	0.2183	0.2260	-2.8689	
Market-to-book											
Small	0.0405	0.0368	0.0440	0.0528	0.1007	0.0978	0.1254	0.1118	0.0762	0.5841	***
Medium	0.0283	0.0367	0.0392	0.0500	0.0716	0.1077	0.1008	0.0874	0.0652	0.4805	***
Large	0.0914	0.1489	0.1699	0.1793	0.1994	0.2631	0.2469	0.2423	0.1926	1.1526	***
Asset growth											
Small	0.0549	0.0608	0.0600	0.0882	0.1234	0.1497	0.1689	0.1547	0.1076	0.8701	***
Medium	0.0488	0.0578	0.0728	0.0713	0.0925	0.1285	0.1297	0.1083	0.0887	0.5067	***
Large	0.0411	0.0841	0.1004	0.1004	0.1275	0.1648	0.1511	0.1675	0.1171	0.7401	***
Payout dummy											
Payer	0.0593	0.0832	0.0795	0.0813	0.0908	0.1173	0.1239	0.1394	0.0968	0.4342	***
Non payer	0.1064	0.1262	0.1419	0.1404	0.1611	0.2104	0.2214	0.2122	0.1650	0.8666	***
Payout											
Small	0.1054	0.1262	0.1419	0.1404	0.1611	0.2104	0.2214	0.2122	0.1649	0.8687	***
Medium	0.0391	0.0470	0.0496	0.0500	0.0607	0.0720	0.0804	0.0792	0.0597	0.2471	***
Large	0.0861	0.1227	0.1102	0.1216	0.1273	0.1701	0.1737	0.2055	0.1397	0.6778	***
Equity issue											
Small	0.0735	0.0851	0.0754	0.0719	0.0861	0.1195	0.1397	0.1423	0.0992	0.4595	***
Medium	0.0495	0.0718	0.0775	0.0761	0.0901	0.1239	0.1282	0.1482	0.0957	0.5563	***
Large	0.1013	0.1406	0.1653	0.1789	0.2071	0.2486	0.2469	0.2391	0.1910	1.1222	***
Tangibility											
Small	0.0892	0.1319	0.1527	0.1750	0.2356	0.2850	0.2802	0.2639	0.2017	1.5723	***
Medium	0.0317	0.0445	0.0542	0.0604	0.0819	0.1093	0.1134	0.1060	0.0752	0.5114	***
Large	0.0383	0.0431	0.0411	0.0435	0.0507	0.0738	0.0755	0.0659	0.0540	0.2274	***
Volatility											
Small	0.0495	0.0627	0.0551	0.0613	0.0767	0.0996	0.1177	0.1044	0.0784	0.4031	***
Medium	0.0450	0.0584	0.0594	0.0739	0.0997	0.1471	0.1525	0.1458	0.0977	0.7662	***
Large	0.0613	0.0939	0.1327	0.1355	0.1841	0.2067	0.1857	0.1719	0.1465	0.9170	***
R&D											
Small	0.0528	0.0572	0.0554	0.0608	0.0707	0.1043	0.1065	0.1044	0.0765	0.3824	***
Medium	0.0396	0.0503	0.0639	0.0705	0.0858	0.1102	0.1065	0.0933	0.0775	0.4061	***
Large	0.1186	0.1705	0.2263	0.2432	0.2631	0.3066	0.3072	0.2976	0.2416	1.5317	***
Rating probability											
Small	0.0913	0.1302	0.1570	0.1601	0.1992	0.2511	0.2452	0.2328	0.1834	1.1692	***
Medium	0.0476	0.0568	0.0585	0.0654	0.0934	0.1331	0.1420	0.1378	0.0918	0.6808	***
Large	0.0141	0.0143	0.0151	0.0228	0.0378	0.0491	0.0495	0.0492	0.0315	0.2482	***
Abnormal earnings											
Small	0.0655	0.0777	0.0800	0.0822	0.1184	0.1499	0.1570	0.1646	0.1119	0.7182	***
Medium	0.0365	0.0655	0.0765	0.0774	0.0850	0.1167	0.1119	0.1106	0.0850	0.4264	***
Large	0.0910	0.1139	0.1225	0.1058	0.1336	0.1715	0.1791	0.1530	0.1338	0.5442	***
Profitability											
Small	0.0615	0.0798	0.0921	0.1146	0.1915	0.2213	0.2176	0.1997	0.1473	1.2517	***
Medium	0.0286	0.0303	0.0386	0.0469	0.0614	0.0874	0.0866	0.0752	0.0569	0.3804	***
Large	0.0700	0.1137	0.1209	0.1209	0.1197	0.1640	0.1701	0.1696	0.1311	0.5713	***
Cash flow											
Small	0.0721	0.0920	0.0952	0.1098	0.1698	0.1934	0.1926	0.1854	0.1388	0.9449	***
Medium	0.0299	0.0505	0.0491	0.0486	0.0687	0.0988	0.0989	0.0835	0.0660	0.3867	***
Large	0.0982	0.1326	0.1340	0.1271	0.1244	0.1696	0.1751	0.1713	0.1416	0.4380	***

continued	89-90	91-93	94-96	97-99	00-02	03-05	06-08	09-10	89-10	Time Trend x100	
Taxes											
Small	0.0561	0.0750	0.0878	0.1048	0.1616	0.2149	0.2040	0.1882	0.1365	1.1587	***
Medium	0.0197	0.0285	0.0374	0.0444	0.0739	0.0861	0.0886	0.0795	0.0573	0.4260	***
Large	0.0872	0.1209	0.1267	0.1340	0.1336	0.1723	0.1812	0.1752	0.1414	0.5640	***
NonDebtTS											
Small	0.0948	0.1449	0.1385	0.1332	0.1663	0.2142	0.2273	0.2134	0.1666	0.8780	***
Medium	0.0450	0.0694	0.0708	0.0745	0.0906	0.1271	0.1245	0.1146	0.0896	0.4723	***
Large	0.0553	0.0544	0.0618	0.0692	0.0986	0.1111	0.1064	0.1026	0.0824	0.3951	***
TargetBLdev											
Small	0.0000	0.0000	0.0000	0.0001	0.0006	0.0000	0.0003	0.0000	0.0001	-0.0039	
Medium	0.0068	0.0169	0.0122	0.0105	0.0327	0.0589	0.0637	0.0579	0.0325	0.3439	***
Large	0.2014	0.2690	0.2782	0.2876	0.3412	0.4161	0.4144	0.3908	0.3248	2.3101	***

Panel B

	89-90	91-93	94-96	97-99	00-02	03-05	06-08	09-10	89-10	Time Trend x100	
Cash											
Small	0.0157	0.0153	0.0156	0.0169	0.0278	0.0314	0.0304	0.0290	0.0228	0.1016	***
Medium	0.0285	0.0343	0.0436	0.0432	0.0573	0.0832	0.0865	0.0814	0.0573	0.3581	***
Large	0.1159	0.1735	0.1924	0.2242	0.2912	0.3622	0.3611	0.3365	0.2571	2.3159	***
Capital expenditure											
Small	0.1019	0.1254	0.1298	0.1281	0.1573	0.2108	0.2101	0.1995	0.1579	0.8238	***
Medium	0.0649	0.0811	0.0876	0.0958	0.1009	0.1283	0.1320	0.1183	0.1011	0.3815	***
Large	0.0545	0.0850	0.0964	0.0852	0.0943	0.1125	0.1084	0.1076	0.0930	0.2448	***
Retained earnings											
Small	0.0457	0.0719	0.0890	0.1114	0.1813	0.2209	0.2171	0.1939	0.1414	1.2886	***
Medium	0.0177	0.0302	0.0381	0.0432	0.0536	0.0711	0.0738	0.0631	0.0488	0.2952	***
Large	0.0986	0.1219	0.1263	0.1289	0.1410	0.1871	0.1895	0.1932	0.1483	0.6710	***

Panel C

	89-90	91-93	94-96	97-99	00-02	03-05	06-08	09-10	89-10	Time Trend x100	
Corporate governance											
Small			0.0425	0.0689	0.1107	0.1407	0.1709	0.1980	0.1220	1.4356	***
Medium			0.0000	0.0660	0.0950	0.1507	0.1648	0.0923	0.0948	1.1761	**
Large			0.1112	0.1255	0.1435	0.1683	0.1120	0.1128	0.1289	-0.0033	
Deposits											
Small	0.0728	0.0904	0.1008	0.1196	0.1325	0.1895	0.1737	0.1682	0.1309	0.8457	***
Medium	0.0384	0.0925	0.0965	0.1038	0.1491	0.1456	0.1558	0.1456	0.1159	0.7306	***
Large	0.0272	0.0194	0.0328	0.0335	0.0677	0.0965	0.1118	0.0708	0.0575	0.5420	***
GDP per capita growth											
Small	0.0650	0.0758	0.0771	0.0318	0.0730	0.1333	0.1412	0.1269	0.0905	0.3966	**
Medium	0.0542	0.0674	0.0709	0.1133	0.1322	0.1594	0.1746	0.1759	0.1185	0.9506	***
Large	0.0253	0.0693	0.0955	0.1219	0.1292	0.1690	0.1365	0.0800	0.1034	0.5077	***
Inflation rate											
Small	0.0266	0.0722	0.0336	0.0410	0.0643	0.0979	0.1074	0.0884	0.0664	0.4467	***
Medium	0.0697	0.0675	0.1017	0.1199	0.1420	0.1542	0.1546	0.1663	0.1220	0.7454	***
Large	0.0419	0.0709	0.0961	0.1085	0.1460	0.1955	0.2007	0.1899	0.1312	1.1902	***
Domestic savings											
Small	0.0714	0.0858	0.1061	0.1212	0.1747	0.1990	0.1967	0.2090	0.1455	1.0632	***
Medium	0.0395	0.1005	0.0998	0.0951	0.1019	0.1396	0.1287	0.1061	0.1014	0.4532	***
Large	0.0272	0.0187	0.0241	0.0392	0.0684	0.1187	0.1257	0.0896	0.0639	0.7100	***
Tax system											
imputation system	0.0467	0.0632	0.0733	0.0809	0.0928	0.1019	0.1010	0.0968	0.0821	0.7644	***
classical system	0.0519	0.0728	0.0823	0.0937	0.1270	0.1631	0.1646	0.1521	0.1134	0.3088	***
Financial system											
Market based	0.0660	0.0945	0.1104	0.1246	0.1643	0.2026	0.2062	0.2072	0.1470	0.4839	***
Bank based	0.0270	0.0177	0.0227	0.0330	0.0598	0.0895	0.0949	0.0790	0.0529	1.0590	***
Law system											
Civil law	0.0270	0.0177	0.0227	0.0330	0.0598	0.0895	0.0949	0.0790	0.0529	1.0590	***
Common law	0.0660	0.0945	0.1104	0.1246	0.1643	0.2026	0.2062	0.2072	0.1470	0.4839	***
Bankruptcy code											
high creditor protection	0.0270	0.0475	0.0630	0.0888	0.1522	0.1932	0.2033	0.1952	0.1213	0.5262	***
low creditor protection	0.0540	0.0745	0.0830	0.0898	0.1103	0.1406	0.1374	0.1276	0.1022	1.3203	***

Table 5: Logistic regression of zero-leverage observations

This table reports the results from firm- and country-level logistic regressions for zero-leverage (ZL) firms. Country- and firm-specific characteristics are described in table 1 and appendix 1. A firm is classified as zero-leverage if it has no long-term and short-term in a given year t. All explanatory variables are lagged by one period. All regressions use industry dummy variables using two-digit SIC codes (unreported). ***, **, and * indicate statistical significance at 1, 5, and 10 percent level, respectively.

Variables	(1)	(2)	(3)	Variables (stepwise regression)	(4)
Pre 1989 listing dummy				Tangibility	-1.2688 ***
1989-1992 listing dummy			0.2599 ***	Size	-0.2683 ***
1994-2000 listing dummy			0.4296 ***	Cash	5.0704 ***
2001-2003 listing dummy			0.5027 ***	Payout	3.7175 ***
2004-2007 listing dummy			0.4583 ***	Taxes	5.2468 ***
After 2007 listing dummy			1.4261 ***	Financial system	1.2212 ***
Size	-0.3103 ***		-0.3661 ***	Rating probability dummy	-1.8193 ***
Market-to-book	0.0238 ***		0.0278 ***	Profitability	0.6814 ***
Asset growth	-0.3370 ***		-0.2956 ***	Bankruptcy code	0.5025 ***
Payout Dummy	-0.1409 ***		0.0037 **	1994-2000 listing dummy	0.4002 ***
Payout	3.6258 ***		2.8541 ***	2001-2003 listing dummy	0.4753 ***
Equity issue	0.5117 **		1.0828 ***	2004-2007 listing dummy	0.5094 ***
Tangibility	-1.1939 ***		-1.3132 ***	After 2007 listing dummy	1.4727 ***
Volatility	0.6902 ***		0.6392 ***	Capital expenditure	-0.2895 ***
R&D	1.0361 ***		0.8296 ***	Asset growth	-0.3654 ***
Rating probability dummy	-0.0362 ***		-0.0372 ***	Retained earnings	0.0815 ***
Abnormal earnings	-0.2137 ***		-0.2021 ***	Domestic savings	-0.0437 ***
Profitability	0.7588 ***		0.6253 ***	NonDebtTS	-2.2388 ***
Taxes	4.6860 ***		5.4029 ***		
NonDebtTS	-1.1331 ***		-0.8784 **		
Cash	4.5758 ***		4.6150 ***		
Capital expenditure	-0.6314 ***		-0.6865 ***		
Retained earnings	0.0837 ***		0.1162 ***		
Deposits		0.3785 ***	0.5198 ***		
GDP per capita growth		-0.0024	-0.0182 **		
Inflation rate		-0.0254 **	-0.0187 **		
Domestic savings		-0.0562 ***	-0.0411 ***		
Tax system		-0.2191 ***	-0.1493 **		
Bankruptcy code		0.1815 ***	0.3457 ***		
Financial system		0.7266 ***	0.9417 ***		
Intercept	-1.3410 ***	-1.5413 ***	-1.9034 ***		
Number of observations	69515	69515	69515	Number of observations	69515
Pseudo R^2	0.2583	0.0772	0.2733	Pseudo R^2	0.2838

Table 6: Constrained and unconstrained zero-leverage firms

This table compares the mean characteristics of constrained and unconstrained zero-leverage (ZL) firms with non-zero-leverage (NZL) firms. Following Lemmon and Zender (2010), we use the probability of a firm to have a public debt rating (debt capacity) to divide the sample into constrained and unconstrained firms (see appendix 4). A firm is classified as zero-leverage if it has no long-term and short-term debt in a given year t. All variables are defined in table 1. ***, **, and * indicate statistical significance at 1, 5, and 10 percent level, respectively.

	G7		
Variable	ZL unconstrained- ZL constrained	NZL- ZL constrained	NZL- ZL unconstrained
Age	2.8566 ***	5.3606 ***	2.5040 ***
Size	2.4260 ***	1.8886 ***	-0.5373 ***
Market-to-book	-0.1465 ***	-0.8015 ***	-0.6550 ***
Asset growth	-0.0667 ***	-0.0462 ***	0.0205
Payout	0.0178 ***	-0.0070 ***	-0.0248 ***
Equity issue	-0.0767 ***	-0.0564 ***	0.0203 ***
Tangibility	0.0623 ***	0.1383 ***	0.0760 ***
Volatility	-0.0222 ***	-0.0271 ***	-0.0049 ***
R&D	-0.0341 ***	-0.0521 ***	-0.0180 ***
Abnormal earnings	0.0003	0.0045 **	0.0042 *
Profitability	0.1360 ***	0.0883 ***	-0.0477 ***
Cash flow	0.1189 ***	0.0786 ***	-0.0403 ***
TargetBLdev	0.0143 ***	-0.2228 ***	-0.2371 ***
Taxes	0.0142 ***	-0.0013 ***	-0.0155 ***
NonDebtTS	0.0072 ***	0.0100 ***	0.0029 ***
Cash	-0.1063 ***	-0.2513 ***	-0.1450 ***
Capital expenditure	0.0079 ***	0.0134 ***	0.0056 ***
Retained earnings	1.0667 ***	0.8262 ***	-0.2405 ***
Intangibles	0.0534 ***	0.0270 ***	-0.0264 ***
Deposits	-0.0132 *	0.1192 ***	0.1324 ***
GDP per capita growth	-0.1758 ***	0.1657 ***	0.3415 ***
Inflation rate	-0.0733 ***	-0.2868 ***	-0.2135 ***
Domestic savings	-0.4346 ***	2.4039 ***	2.8385 ***
Number of observations	unconstrained: 3868 constrained: 11586	NZL: 148002 constrained: 11586	NZL: 148002 unconstrained: 3868

Table 7: Non-parametric difference of difference test

All firms are pooled and classified into quintiles on a yearly basis based on their asset-specificity or intangibles. The percentages of zero-leverage firms and the means of book leverage are shown for firms in countries with high (Germany and the UK) and low (France, Canada, and the US) creditor protection in the highest quintile (Q5: highest asset-specificity or intangibles) and the lowest quintile (Q1: lowest asset specificity or intangibles).

Year	Asset-Specificity				Difference of differences	Intangibles				Difference of differences
	US CAN FRA		UK DEU			US CAN FRA		UK DEU		
	Q5	Q1	Q5	Q1		Q5	Q1	Q5	Q1	
1989	6.51%	10.74%	4.67%	1.11%	-7.79%	3.21%	12.85%	2.34%	0.00%	-11.97%
1990	8.48%	11.81%	4.03%	1.60%	-5.75%	3.51%	13.25%	3.71%	0.00%	-13.45%
1991	9.29%	13.36%	6.33%	2.29%	-8.10%	5.00%	14.71%	4.75%	0.00%	-14.46%
1992	10.07%	14.20%	4.97%	3.65%	-5.44%	4.04%	15.70%	5.29%	0.00%	-16.95%
1993	9.76%	18.64%	6.55%	5.23%	-10.19%	4.39%	17.88%	6.79%	2.38%	-17.90%
1994	9.08%	18.43%	6.59%	4.85%	-11.09%	5.03%	18.37%	6.17%	2.44%	-17.08%
1995	10.46%	16.83%	7.33%	8.60%	-5.10%	4.92%	18.53%	7.03%	4.00%	-16.64%
1996	11.11%	17.29%	9.13%	7.89%	-7.40%	4.10%	21.08%	8.04%	5.97%	-19.04%
1997	12.15%	18.57%	10.46%	7.23%	-9.64%	4.01%	22.53%	8.95%	7.32%	-20.16%
1998	11.20%	19.75%	10.30%	8.86%	-9.99%	3.58%	23.22%	12.52%	6.10%	-26.07%
1999	9.16%	13.73%	12.33%	7.14%	-9.75%	4.13%	21.29%	20.54%	8.14%	-29.56%
2000	10.64%	15.38%	13.64%	9.20%	-9.18%	4.85%	24.11%	26.29%	10.57%	-34.97%
2001	12.18%	17.14%	14.16%	13.40%	-5.72%	7.75%	25.72%	26.35%	14.71%	-29.60%
2002	12.72%	18.60%	13.90%	14.43%	-5.35%	6.70%	28.56%	31.12%	16.79%	-36.18%
2003	14.18%	18.00%	18.47%	14.14%	-8.15%	8.52%	31.39%	34.90%	17.55%	-40.22%
2004	15.05%	19.51%	21.09%	19.66%	-5.89%	8.66%	33.95%	38.37%	20.42%	-43.24%
2005	14.65%	19.85%	21.35%	16.54%	-10.00%	8.68%	32.38%	36.31%	18.79%	-41.22%
2006	15.81%	19.75%	22.94%	23.87%	-3.00%	6.91%	32.67%	40.00%	17.51%	-48.26%
2007	15.93%	18.21%	21.65%	22.64%	-1.28%	6.30%	31.26%	39.41%	18.28%	-46.09%
2008	13.61%	19.94%	21.46%	22.06%	-5.74%	7.07%	30.39%	36.45%	16.34%	-43.43%
2009	15.44%	20.99%	21.55%	22.13%	-4.97%	6.52%	29.74%	36.43%	15.46%	-44.19%
2010	16.45%	25.25%	20.83%	22.22%	-7.41%	7.12%	31.23%	36.56%	13.86%	-46.82%
				mean	-7.13%				mean	-28.33%
				t-value	-12.57***				t-value	-10.60***

Appendix 1: Definition of variables

Variable	Definition
Book leverage	(dltt+dlc) / at
Market leverage	(dltt+dlc) / (at-seq+mkval)
Size: The logarithm of total book assets	log(at)
Age: The difference between the actual year and the firms' IPO date	
Market-to-book: The market-to-book ratio	lt-txdc+pstk+mkval) / at
Asset growth	$(at_i(n) / at_i(n-1))-1$
Payout: The firm's payout ratio	(rp+div) / at
Equity issue: The ratio of total equity issues to book assets	sstk / at
Tangibility: The ratio of fixed asset to book assets	ppent / at
Volatility: The firm's risk is measured by the annualized volatility of the logarithmic monthly stock returns.	
R&D: The firms's research and development expenses	xrd/at
Rating Probability: Logistic regression model predicting rating probability. See Appendix 4 for further details	
Abnormal Earnings	Δ oibdp / mkval
Profitability: The ratio of EBIT to book assets	ebit / at
Cash flow: The firm's cash flow	cfl / at
TargetBLdev: A firm's target leverage deviation measured in book and market values. The actual leverage is subtracted from the target leverage. The target leverage is obtained from a fixed effects regression of leverage on a set of control variables (see appendix 2): TargetBLdev = TargetBL – Book Leverage	
Taxes: The ratio of the income taxes paid to total book assets	txt / at

NonDebtTS: The ratio of depreciation to total assets	dp / at
Cash: The ratio of cash to book assets	che / at
Capital expenditure: The ratio of capital expenditure to book assets	
Retained Earnings	re / at
Asset specificity: Herfindahl index on sales (s)	$H_j := \sum_{i=1}^{I_J} s_{i,j}^2$
Intangibles: The ratio of operating expenses to book assets	intan / at
Country-level governance: World Governance Index, World Bank (Kaufmann et al. 2009). Average score on mean of six governance indicator from 1996-2009	
Deposits: Ratio of a country's deposits (liquid liability) to GDP. (Source: World Bank)	
GDP per capita growth: Annual real GDP growth rate of each country. (Source: World Bank)	
Inflation: Annual rate of change on Consumer Price Index. (Source: World Bank)	
Domestic savings: Ratio of a country's gross domestic savings to GDP. (Source: World Bank)	
Legal system: A dummy that equals one for countries with a common law system (US, CAN, UK) and zero for countries with a civil law system (DEU, FRA, ITA, JPN). (Source: Titman et al., 2010)	
Financial system: A dummy variable that equals 1 if the country's financial system is market-based (US, CAN, UK) and 0 if it is bank-based (DEU, FRA, ITA, JPN). (Source: Demirgüç-Kunt and Levine, 2001)	
Tax system: A dummy variable that equals 1 if the country has a dividend imputation tax system (DEU, FRA, ITA, JPN, UK<2001) and 0 if the country has a classical tax system (US, JPN, UK >2000) during our sample period. (Source: Titman et al., 2010)	
Bankruptcy code: A dummy variable that equals 1 if the country has a high creditor protection (high CPS; UK, DEU) and 0 if the country has low creditor protection (low CPS; US, CAN, FRA). (Source: Djankov et al., 2007)	

Appendix 2: Description of Compustat abbreviations

Variable	Description	US, CAN	UK	JPN	DEU, FRA, ITA
at	Assets - Total	at	at	at	at
capx	Net capital expenditure	capx (f.c. 1, 3, 5, 7)	capx (f.c. 7, 10, 11, 12) capxfi (f.c. 12)	capx (f.c. 10, 11)	capx (f.c. 10, 11)
cfl	Cash flow	cfl	cfl	cfl	cfl
che	Cash and equivalents	che	che	che	che
div	Cash dividend	dv (f.c. 1, 3, 5, 7)	dv (f.c.7, 10, 11) eqdivp (f.c.12)	dv (f.c.10, 11)	dv (f.c.10, 11)
dlc	Short-term debt	dlc	dlc	dlc	dlc
dltt	Long-term debt	dltt	dltt	dltt	dltt
dp	Depreciation expenses	dp	dp	dp	dp
ebit	Earnings before interest and taxes	ebit	ebit	ebit	ebit
intan	Intangibles	intan	intan	intan	intan
lt	Liabilities – Total	lt	lt	lt	lt
mkval	Market value	mkval	mkval	mkval	mkval
oibdp	Op. income bf. depreciation & amortization	oibdp	oibdp	oibdp	oibdp
ppent	Property, plant, and equipment (Net) - Total	ppent	ppent	ppent	ppent
pstk*	Preferred stock – Total	pstk*	pstk*	pstk*	pstk*
re	Retained Eranings	re	re	re	re
rp	Purchase of common and preferred stocks	prstkc (f.c. 1, 3, 5, 7)	prstkc (f.c.7, 11, 12) prstkc + purtshr* (f.c. 10)	prstkc (f.c.11) prstkc + purtshr * (f.c. 10)	prstkc (f.c.11) prstkc + purtshr * (f.c. 10)
sale	Sales/Turnover	sale	sale	sale	sale
seq	Shareholders' equity – Total	seq	seq	seq	seq
sstk	Sale of common and preferred stock	sstk	sstk	sstk	sstk
txdc*	Deferred taxes	txdc*	txdc*	txdc*	txdc*
txt	Total taxes	txt	txt	txt	txt
xint	Interest expense	xint	xint	xint	xint
xopr	Operating expense	xopr	xopr	xopr	xopr
xrd*	Research and Development Expense	xrd	xrd	xrd	xrd

* Missing observations are replaced by zero.

** f. c. means „format code", which identifies the format of a firm's Flow of Funds Statement in Compustat Global.

Appendix 3: Distribution of zero-leverage firms by industry

This table summarizes the distribution of zero-leverage firms by industry. The industries are defined using the Fama-French 10-industry classification scheme. For each country group the table reports the average proportion (in percent) of zero-leverage (ZL) observations in a given sector over the 1989-2010 sample period.

	G7			US			CAN			UK			DEU			FRA			ITA			JPN		
Industry	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%	All	ZL	%
Energy	7997	872	10.90	4026	296	7.35	2062	251	12.17	1025	310	30.24	38	3	7.89	176	0	0.00	107	0	0.00	563	12	2.13
Materials	17197	1470	8.55	4459	154	3.45	2648	588	22.21	2071	479	23.13	723	49	6.78	689	3	0.44	297	7	2.36	6310	190	3.01
Manufacturing	39289	2562	6.52	11697	985	8.42	1035	58	5.60	5344	494	9.24	2336	161	6.89	1911	35	1.83	605	6	0.99	16361	823	5.03
Consumer durables	39467	3256	8.25	14308	1525	10.66	1288	114	8.85	6222	725	11.65	2019	176	8.72	2211	20	0.90	950	12	1.26	12469	684	5.49
Consumer non-durables	12251	736	6.01	3835	278	7.25	674	23	3.41	1553	154	9.92	590	46	7.80	860	7	0.81	146	6	4.11	4593	222	4.83
Healthcare	15297	2901	18.96	9991	2136	21.38	574	166	28.92	1493	324	21.70	727	60	8.25	541	3	0.55	106	4	3.77	1865	208	11.15
Information technology	30232	6647	21.99	14149	3989	28.19	883	251	28.43	3468	920	26.53	1940	348	17.94	1756	55	3.13	318	10	3.14	7718	1074	13.92
Telcommunication	2467	140	5.67	1436	71	4.94	297	13	4.38	282	26	9.22	112	17	15.18	74	0	0.00	99	0	0.00	167	11	6.59
Others	1802	171	9.49	253	66	26.09	28	3	10.71	1007	86	8.54	67	3	4.48	223	1	0.45	13	0	0.00	211	12	5.69
Number of observations	165999	18755	11.30	64154	9500	14.81	9489	1467	15.46	22465	3518	15.66	8552	863	10.09	8441	124	1.47	2641	45	1.70	50257	3236	6.44

Appendix 4: Logistic-regression predicting debt ratings

This table reports the logistic regressions on the G7 countries that are used to predict bond ratings. We further report the results for the same logistic regression on US firms as a robustness check. The dependent variable is a dummy variable that equals to 1 if the firm has a bond rating in the RatingXpress historical file from Standard and Poors (S&P) in a given year. The independent variables are described in table 1. All explanatory variables are lagged by one period. The model also uses dummy variables for each two-digit SIC code (unreported). ***, **, and * indicate statistical significance at 1, 5, and 10 percent level, respectively.

	G7	US
Tangibility	0.6615 ***	0.1220 *
Size	1.1311 ***	1.2812 ***
Market-to-book	0.0897 ***	-0.1474 ***
Ebit/sale	-0.0006	-0.0011 **
RD/sale	0.0027 **	0.0058 *
Age	-0.0338 ***	0.0245 ***
Volatility	-0.0005 **	-0.0005 *
Intercept	-10.2083 ***	-10.4114 ***
Number of observations	143936	55863
Pseudo R^2	0.3601	0.4380

Appendix 5: Bankruptcy laws in the G7 countries

This table summarizes the bankruptcy procedures in the G7 countries. The last line reports the "Creditor Protection Scores" (CPS) according to La Porta et al. (1998). The score ranges from 0 to 4, where 0 indicates very low and 4 very high creditor protection.

	US[17] "*Bankruptcy Code*"	CAN[18] "*Bankruptcy Act*"	UK[19] *"Insolvency Act"*	DEU[20] "*Insolvenz-verfahren*"	FRA[21] "*Redressement judicaire*"	ITA[22] "*Concordato preventivo*"	JAP[23] "*Kaisha Seiri*"
Super-priority financing	Yes	Yes	No	Yes	Yes	-	-
Automatic stay on assets	Unlimited	Unlimited	No	3 months	Unlimited	Unlimited	Unlimited
Secured creditors first paid	Yes	Yes	Yes	Limited	No	Yes	Yes
Restrictions for going into reorganization	No	No	Yes	Yes	No	Yes	No
Management control in bankruptcy	Management stays in control; supervision by court	Insolvency administrator; appointed by court	Secured creditors	Insolvency administrator; appointed by court	Insolvency administrator; appointed by court	Insolvency administrator; appointed by court	Neutral administrator
CPS	1	1*	4	3	0	2	2**

[17] The exact procedure can be found in Chapter 11 of the "United States Codes".
[18] The exact procedure can be found in the "Bankruptcy and Insolvency Act".
[19] The exact procedure can be found in the "Insolvency-Act" and in the "Enterprise-Act".
[20] The exact procedure can be found in the "Deutsche Insolvenzordnung".
[21] The exact procedure can be found in the sixth book of the "Code de commerce".
[22] The exact procedure can be found in the "Diritto fallimentare".
[23] The exact procedure can be found in the "Kaisha kôsei hô".
* Change from 2 to 1 in 1992 caused by an amendment to the „Bankruptcy and Insolvency Act". In the amendment the act was broadened to provide ways for insolvent debtors to avoid bankruptcy by negotiating reorganizations. (Djankov et al. 2007).
** Change from 3 to 2 in 2000 as a result of the "Corporate Reorganization Law". The law prohibits the enforcement of collateral rights outside the reorganization process. (Djankov et al. 2007).