The International Zero-Leverage Phenomenon

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This version: March 2012

Abstract

Extreme debt conservatism is an international phenomenon which has increased over time. While only 5% of the firms in our G7 sample pursued a zero-leverage policy in 1989, this fraction rose to roughly 14% by 2010. We document that a large proportion of this upward trend is generated by firms that went public in the more recent sample years. In addition to this IPO effect, there is an industry effect due to a change in industry composition toward sectors where extreme debt conservatism is more commonly adopted. Moreover, the zero-leverage phenomenon is driven by a more general "vintage effect", where newly listed firms in the later sample years are more likely to a purse a zero-leverage policy due to increasing asset volatility over time. Analysing the supply-side of financing choices, we classify zero-leverage firms as financially constrained and unconstrained. While only a small number of very profitable firms with high payout ratios deliberately pursue a zero-leverage policy, 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 also accumulate higher cash holdings than all other sample firms, presumably in an attempt to build up financial flexibility. Finally, country-specific variables affect extreme debt conservatism. Countries with a capital-market-oriented financial system, 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 Europe conference in Porto, the 2011 Swiss Finance Association 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 Apple, Yahoo, Texas Instruments, Bed Bath & Beyond or Urban Outfitters, all have something in common: they are debt-free. These firms are 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. However, the percentage of zero-leverage firms rose to 13.64% by 2010. 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. In their famous M&M proposition I, Modigliani and Miller (1958) proof the irrelevance of a firm's capital structure for its valuation. Since then, numerous theoretical and empirical studies analysed the financing and capital structure decisions of firms. Alleviating the assumptions of M&M's 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 costs of asymmetric information. Moreover, survey evidence by Graham and Harvey's (2001) indicates that the choice of an optimal debt-equity mix is a major concern for financial managers. As noted by Frank and Goyal (2008), the literature is still undecided which theory better describes firms' financing decisions. But perhaps most 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 (Rajan and Zingales, 1995; Frank and Goyal, 2009; Fan et al. 2012) or on testing 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) analyse zero-leverage firms, but they all leave extreme debt conservatism an unexplained mystery. Zero-leverage firms tend to be smaller and accumulate higher cash reserves, and they exhibit a high market-to-book ratio as well as a high payout ratio. Taken together, it is difficult to reconcile these observed firm characteristics with standard capital structure theories. While not all capital structure theories predict an optimal leverage ratio, 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%. More 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 model framework; they argue that firms become debt-free in order to prepare for large capital ex-

penditures in the near future or to exploit future investment opportunities. Considering both adjustment and adverse selection costs, firms attempt to 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.

While the recent literature on zero-leverage firms exclusively focuses on firms from the United States or the United Kingdom, in our study we use a comprehensive sample of G7 firms. Although country-level differences are important, the increasing percentage of zero-leverage firms is an international phenomenon. We uncover several factors which contribute to explain this observation. First, there is an IPO effect. We document that a large proportion of the upward trend in the percentage of zero-leverage firms is generated by firms that went public in the more recent sample years. In fact, the increase in extreme debt conservatism is closely related to the different IPO waves in our sample countries. Second, there is an industry effect due to a change in industry composition toward sectors where extreme debt conservatism is more commonly adopted. The IPO effect and the industry effect are closely interrelated, and both are linked up with an attempt of zero-leverage firms to build up and maintain financial flexibility. Third, the zero-leverage phenomenon is driven by a more general "vintage effect", where newly listed firms in the later years of the sample period are more likely to a purse a zero-leverage policy. We attribute this latter effect mostly to the increasing asset volatility (or business risk) over the sample period.

The zero-leverage phenomenon is hard to reconcile with existing capital structure theories, and the standard capital structure variables are unable to capture the increasing propensity to follow a zero-leverage policy. Nevertheless, firm characteristics that are related to asymmetric information and asset risk contribute to explain firms' debt conservatism. Most important, analysing the supply-side of financing choices, we classify zero-leverage firms as financially constrained and unconstrained. Our results indicate 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 higher cash holdings than all other firms in our sample, presumably in an attempt to build up or maintain financial flexibility. Finally, country-specific influences further contribute to explain differences in the percentage of zero-leverage firms across our 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.

Our study is related to a few other studies on extreme debt conservatism. For example, 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 only temporarily, with more than 50% of the firms dropping it within five years. More recently, Strebulaev and Yang (2006) report that the percentage of zero-leverage 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 the potential agency problems of free cash flow, they focus on dividend paying zero-leverage firms and hypothesize that asymmetric information between managers and investors explains the zero-leverage puzzle. The high market-to-book ratio of zero-leverage firms may induce managers to believe that their equity is overvalued. Their own estimated firm value 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 used to measure the abnormal returns.

Byoun et al. (2008) document that zero-leverage firms tend to be smaller and have fewer tangible assets, higher cash reserves, and fewer credit ratings than their matching firms. These firms pay higher dividends, possibly as an attempt to reduce the adverse selection costs due to agency problems in order to acquire equity at more favourable terms.[1] Byoun et al. (2008) document 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. Furthermore, they document that borrowing constraints (e.g., as measured by the existence of a public credit rating) contribute to extreme debt conservatism. In a related study, Faulkender

[1] Using data from the United Kingdom, Dang (2009) reports that 10% of all 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. These firms hold high cash reserves and rely on equity financing. Dang (2009) argues that zero-leverage firms attempt to mitigate underinvestment problems. Extreme debt conservatism may be consistent with the dynamic trade-off theory as firms with a large deviation from the target leverage are more likely to abandon a zero-leverage policy.

and Petersen (2006) show that firms that are unconstrained by debt capacity carry higher leverage than firms without access to the public debt market. Debt constraints are measured as a firm's probability to obtain a public 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. Marchica and Mura (2010) analyse low leverage policies as part of the intertemporal investment and financing decisions using a sample of firms from the United Kingdom. After a longer period of debt conservative firms have higher capital expenditures and higher abnormal investments, and these investments are likely to be financed through the issuance of debt. Most important, there is a measurable effect from financial flexibility in the form of untapped borrowing reserves. Long-run performance tests uncover that financial flexible firms invest in more profitable project than their size- and industry-matched peers.

The remainder of our 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. Section 3.3 analyses capital supply effects and divides zero-leverage firms into debt constrained and unconstrained zero-leverage firms. Section 4 analyses the cross-country differences in leverage and links the proportion of zero-leverage firms to institutional determinants. Finally, section 5 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 analyse firms that follow a zero-leverage policy, we collect balance sheet and market data of listed firms from the G7 countries that are contained in the Compustat Global database over the time period from 1989 to 2010. While our sample consists of active and inactive publicly traded industrial firms and avoids a survivorship bias, the Compustat Global database tends to cover large firms and hence is potentially biased along size. We use annual data because for most countries quarterly accounting data is not available. Given the specific nature of their businesses, financial and utility firms (with SIC 6000-6999 and 4900-4949) are omitted from the sample. Moreover, firms without a code for a country or an industrial sector in the database as well as firms with a non-consolidated balance sheet are excluded. In this basic specification, our sample consists of 15,190 consolidated firms (9,122 active and 6,068 inactive) with 233,146 firm-year observations from the G7 countries.

The number of firms included in our sample differs considerably across countries. In countries with a more bank-oriented financial system, hence Germany, France, and Italy, we observe a strong increase in the number of covered firms over the sample period. The Compustat Global database includes only 206 firms for these countries in the year 1989, whereas by the year 2010 the number of firms increases to 1,090. The major reason for this sharp increase in the number of listed firms and coverage is the strong European IPO activity during our sample period (Giudici and Roosenboom, 2004; Vismara et al., 2012). The number of Japanese firms also increases strongly from 1,444 firms in 1989 to 2,640 firms in 2010. In contrast, the number of sample firms in the Anglo-Saxon countries, hence the United States, Canada, and the United Kingdom, rises at a lower rate from 2,628 in 1989 to 3,439 in 2010.

Appendices 1 and 2 provide an overview of all variables used in our empirical analyses together with a description of their construction principles. We exclude firm-year observations with missing information about total assets and market value. Furthermore, following Frank and Goyal (2003), we recode deferred taxes, purchase of treasury shares, and preferred stock to zero if firm-year observations are missing. 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. As also shown in Appendix 1, we follow Strebulaev and Yang (2006) and define book leverage as the ratio of the sum of short- and long-term liabilities to total assets. Zero-leverage observations are firm-year observations without leverage.

Table 1 provides descriptive statistics for all variables. For the full sample, the median book leverage ratio (i.e., the ratio of interest bearing debt to total assets) is 19.42%. Italy boasts the highest median book leverage ratio (25.05%), followed by Japan (23.18%), France (20.51%), Canada (19.85%), and the United States (18.61%). Germany (15.84%) and the United Kingdom (14.39%) exhibit the lowest book leverage ratios. These cross-country comparisons are qualitatively similar to those in Rajan and Zingales (1995) and Fan et al. (2012). Country-specific regulations play an important role in capital structure decisions, and these ratios already provide a first indication for the proportion of zero-leverage firms across countries.

[Insert Table 1 here]

2.2. Stylized facts about the international zero-leverage phenomenon

The large number of zero-leverage firms and the sharp increase in the percentage of firms without debt is an international phenomenon. Figure 1 and Table 2 present the distribution of

zero-leverage firms over time. During our sample period, on average, 10.02% of all firm-year observations are classified as zero-leverage. However, a cross-country analysis reveals substantial differences. While approximately 15% of all firm-year observations in the Anglo-Saxon countries are, on average, zero-leverage, this number is 9.59% and 6.23% in Germany and Japan, respectively, and lowest in Italy (2.29%) and France (1.49%). Most important, Figure 1 and Table 2 document a strong increase in the percentage of zero-leverage firms over time. Using all observations in the full G7 sample, only 5.17% of the firms are classified as zero-leverage in 1989, but this value increases to 13.64% by 2010. The increase is most pronounced in the Anglo-Saxon countries. For example, the percentage of zero-leverage firms in the United States and the United Kingdom increases to above 20% by the end of our sample period. In sharp contrast, the zero-leverage phenomenon is much less pronounced in France and Italy. These cross-country differences are explored in more detail in Section 4.

[Insert Table 2 and Figure 1 here]

In order to examine whether size is an important determinant for the decision to follow a zero-leverage policy, we sort all firm-year observations into size quantiles. Figure 2 depicts the fraction of zero-leverage firms for each size group over time. As expected, small firms are most likely to renounce the use of debt. At the end of the sample period, more than 30% of all firms in the smallest size quantile (Q1), which Fama and French (2008) refer to as micro caps, pursue a zero-leverage policy. This finding is consistent with capital structure theories which incorporate motives related to agency costs and/or asymmetric information (see section 3.2). Nevertheless, the zero-leverage phenomenon is not confined to the smallest firms in our sample, and there is a pronounced upward trend in other size quantiles as well. While the fraction of zero-leverage firms in the largest size quantile (Q4) increases slightly but never rises above 5%, it goes up to more than 10% (Q3) and 15% (Q2) in the two middle size quantiles.

[Insert Figure 2 here]

Our sample period is characterized by sharply varying activity on national IPO markets. Most important, Fama and French (2001) report a strong increase in new stock exchange listings at the end of the last century in the United States. They argue that the change in the characteristics of new listings is attributable to a decline in the cost of equity that allowed firms with remote cash flow expectations to raise public equity. Accordingly, 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.[2] Specifically, we define four listing groups according to a firm's IPO date. The first group comprises all firms listed before 1989; the second group includes all firms listed between 1989 and 1993; the third group between 1994 and 2003; and the fourth group between 2004 and 2010. These four groups roughly represent the aggregate IPO cycles during our sample period. Figure 3 depicts the evolution of the percentage of zero-leverage firms in the four different listing groups for the full G7 sample and the individual countries. In fact, the zero-leverage phenomenon is more pronounced in the more recent vintage periods. While the fraction of zero-leverage firms 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 fraction of zero-leverage firms in the more recent listing groups is strongly increasing over time. Although the percentage of zero-leverage firms decreases in the most recent years in all vintage groups, the ordering of the different vintage groups remains unchanged.[3] An exception is the United States, where the fraction of zero-leverage firms in the last vintage group is lower than that in the preceding one. A potential explanation is the sharp decline in IPO activity in the United States after the technology bubble burst in 2000 (Gaoa et al. 2011). An alternative explanation could be the firms' increasing debt capacity during the up-markets just before the outbreak of the financial crises in 2008. In contrast, Canada and Germany experienced a second IPO wave between 2004 and 2007, which may explain the higher fraction of zero-leverage firms in the last vintage group. Taken together, these findings indicate that the upward trend in the percentage of zero-leverage firms is partly driven by those firms in the more recently listed groups, hence by new IPO firms entering the sample.

[Insert Figure 3 here]

In a related analysis, we investigate whether our findings for vintage effects are directly related to firms' age. Firm age is measured as the difference between the actual year and the firms' IPO date. The IPO date is obtained from merging the Compustat Global and the Thomson One databases. We classify a firm as an IPO firm if it was listed over the preceding three year, and as established if the firm is older than three years.[4] Figure 4 depicts the evolution of the

[2] Custódio et al. (2011) use a vintage approach to analyze the declining debt-maturity of US firms.

[3] In results not reported, we use different (fixed-length) listing periods with similar outcomes. France and Italy are included in the full G7 sample, but they are not shown separately due to the low absolute number of observations in some vintage groups. In a robustness check for the United Kingdom, we exclude all IPOs from our sample that are listed on the Alternative Investment Market or AIM (Espenlaub et al., 2009). Our results remain qualitatively unchanged.

[4] As a robustness check, we use a 5-year period in the secondary market to classify IPO firms, and the results remain qualitatively unchanged.

fraction of zero-leverage firms in three different age groups for the full sample and the individual countries: (i) the oldest firms listed before 1989; (ii) IPO firms (not older than three years and listed 1989 or later); (iii) non-IPO firms (older than three years and listed 1989 or later). Young IPO firms exhibit the highest fraction of zero-leverage firms, and it is sharply increasing over time from roughly 6% in 1989 to almost 25% in 2007. Since then, the percentage of zero-leverage firms declined in all G7 countries since the outbreak of the financial crises in 2008, presumably due to the weak IPO markets. Nevertheless, the percentage of zero-leverage firms is increasing in the subsample of non-IPO firms as well. Accordingly, while to a large extent the observable zero-leverage policies are attributable to a vintage effect and an (interrelated) age effect, extreme debt conservatism is not restricted to these firms but rather describes a more widespread phenomenon.

[Insert Figure 4 here]

Our findings so far 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 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 cannot be fully captured by the listing vintage and firm age. Therefore, we examine if changes in the overall industry composition also contribute to explaining the higher percentage of zero-leverage firms in the more recent listing groups. For example, high-technology firms suffer from higher information symmetry and tend to carry less debt, and therefore an increase in newly-listed technology firms in the more recent years may explain the vintage effect. Riskier firms are more debt constrained and tend to exhibit a higher percentage of zero-leverage firms. If riskier industries became relatively larger because of newly-listed IPO firms, this effect may also lead to an increase in the percentage of zero-leverage firms.

In a first step, we assign firms to the 10 Fama and French (1997) industries based on their four-digit SIC codes.[5] Figure 5 illustrates the evolution of the percentage of zero-leverage firms in main industrial sectors (excluding financial and utility firms) for the full G7 sample and the individual countries.[6] Zero-leverage firms are not limited to certain industries. However, a common observation across all countries is that zero-leverage firms are concentrated

[5] 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 sector.

[6] Again, France and Italy are included in the full G7 sample, but they are not shown separately due to the low absolute number of observations in some industries in these countries.

in the healthcare and the information technology sector. In the full sample, the percentage of zero-leverage firms in these two sectors increases to approximately 27% and 31%, respectively, by the end of the sample period. This high concentration of zero-leverage firms is consistent with Titman and Wessel's (1988) notion that firms with unique or specialized products (having large research and development expenditures and high selling expenses) are likely to impose higher costs on their customers, workers, and suppliers in the event of liquidation, and hence they choose extremely conservative debt ratios.[7] The negative relationship between uniqueness and leverage ratio could also be due to the relation between this attribute and lower collateral values.

[Insert Figure 5 here]

Furthermore, there are several country-specific industry effects. For example, the percentage of zero-leverage firms in the telecommunication sector is high in Germany, which is attributable to the privatization of firms in this sector and their going public during the late 1990s. In both the United Kingdom and Canada, the zero-leverage phenomenon is pronounced in the energy and materials sectors. This increase in the percentage of zero-leverage firms is also driven by significant IPO activity in these two sectors in both countries. For example, in our sample the materials sector accounts for 34% of all Canadian IPOs in 2003, 48% in 2004, and 43% in 2005 (in terms of the number of issues), and hence this heavy IPO activity in the materials sector presumably accounts for the sharp increase in the percentage of zero-leverage firms (to more than 30%) during these years. A similar pattern is observable for the materials sector in the United Kingdom. The effect is less pronounced in the energy sector, but this sector accounts for 17% of all new issuances in 2005, which is a sample year with a particular strong increase in the percentage of zero-leverage firms. While the IPO activities in this sector in the United Kingdom were merely average during the early sample period, they increase to an annual 20% of all issuances over the late 2008-2010 sample period. Accordingly, to a large extent the country-specific industry effects seem to be driven by the IPO waves in the different countries.

[7] The HBS case study of Intel Corporation (Froot, 1992) describes an early example from the information technology sector. In the late 1980s and early 1990s, Intel chose a policy of zero net-debt given its highly competitive and technologically risky environment. Similarly, firms in the pharmaceutical sector are potentially threatened by excessive damages claims, and hence they follow extremely conservative leverage policies. As stressed by Stulz (1996), the capital structure constitutes another layer of risk management. Economically, risk management and equity capital are to some extent substitutes, and this holds particularly for opaque risks which are difficult to anticipate or measure.

In a second step, we compare the effective percentage of zero-leverage firms to the percentage of zero-leverage firms when holding the industry weights constant over time. Figure 6 plots the yearly percentage of zero-leverage firms against the value-weighted average, using 1989 market capitalization weights, across industries in each sample year. The two lines for the full sample start to diverge in 1997, when the actual zero-leverage ratio increases more than the zero-leverage ratio using the 1989 weights. This difference increases to roughly 5 percentage points by 2000. Nevertheless, there is a strong increase in the percentage of zero-leverage firms in both groups. If industry effects were able to fully capture the zero-leverage phenomenon, the line comprising the 1989 market capitalization weights should not exhibit a strong upward trend. Accordingly, the zero-leverage phenomenon cannot be purely driven by new IPO firms shifting to industries where extreme debt conservatism is more commonly adopted.

[Insert Figure 6 here]

Overall, these stylized facts provide explanations (albeit incomplete and interrelated ones) for the strong increase of zero-leverage firms over time. The percentage of zero-leverage firms changes with industry, firm size, and age. The vintage effect and changes in industry structure contribute to explaining the surprising increase in the percentage of zero-leverage firms across the G7 countries. However, the fraction of zero-leverage firms is also increasing in the older vintage groups and in the subsample with the 1989 industry composition, and hence there are still unexplained parts of the puzzle. In what follows, we therefore analyse the impact of changing firm-level characteristics and country-specific differences on the zero-leverage phenomenon in more detail.

3. Firm-level regression analysis

3.1 Standard capital structure variables and the zero-leverage phenomenon

This section starts by quantifying the roles of changing firm characteristics and the potentially increasing propensity to adopt a zero-leverage policy in explaining the zero-leverage phenomenon. In order to measure 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 run a logistic regression using the full sample to estimate the probability that firms exhibit zero-leverage during a 1989-1993 base period. The dependent binary variable is 1 for a firm adopting a zero-leverage policy in year t, and 0 otherwise. Our explanatory variables are the standard capital structure variables that are well-known to exert an impact on firms' leverage ratios (Rajan and Zingales, 1995; Frank and

Goyal, 2009). Specifically, these traditional variables are profitability, market-to-book ratio, size, and tangibility (see Appendix 1 for a definition of these variables). In a second step, we calculate the probability for each firm to follow a zero-leverage policy based on these characteristics in each year (starting in 1994) using the average annual coefficient estimates 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 attributable to the changing firm characteristics. Any 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. 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 small, indicating that the coefficients obtained from the base period are good predictors for the expected fraction of zero-leverage firms. However, the actual percentage of zero-leverage firms is higher than the expected percentage, and the difference increases over time. This result seems to suggest that there is an increasing propensity to follow a zero-leverage policy.

[Insert Table 3 here]

Furthermore, we observe that the expected values barely change over time, indicating that the traditional capital structure variables (profitability, market-to-book ratio, size, and tangibility) would not allow for more zero-leverage observations. However, the actual percentage of zero-leverage firms is sharply increasing over time. Using the estimated coefficients from the base period regression on firm characteristics in any given sample year after the base period systematically underestimates the actual fraction of debt-free firms. These findings suggest that we need to consider additional variables to explain the zero-leverage phenomenon.

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 in more detail, we examine this pattern over time and for different subsamples based on firm characteristics. Table 4 reports the evolution of the percentage of zero-leverage firms for a

large set of firm characteristics over three-year subperiods. Moreover, we divide each variable into three groups using the 30th and 70th percentiles of the corresponding firm characteristics as breakpoints. We also test whether there is a significant time trend in the different subperiods. Our discussion is structured along several main determinants of standard capital structure theories, such as agency problems and asymmetric information.

[Insert Table 4 here]

3.2.1 Agency costs

Lower leverage 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 United Kingdom 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 substantial cash reserves and rely heavily on equity financing. If zero-leverage firms attempt to mitigate underinvestment problems by following an extremely conservative debt policy, we expect them to exhibit high growth options, high payouts, poor 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 in Panel A of Table 4. While all estimated time trends are positive and statistically significant, high market-to-book firms exhibit the highest proportion of zero-leverage firms (19.26%), on average. Moreover, high asset growth firms feature a higher fraction of zero-leverage firms (11.71%) than small asset growth firms (10.76%), albeit the difference is only marginal. Taken together, our results for growth opportunities are ambiguous.

The payout variable is also related to agency problems. In the absence of interest and amortization payments, dividend payouts are the only way to smooth the earnings of zero-leverage firms. Presumably, debt conservative firms that do not pay dividends may be prone to free cash-flow problems (Jensen 1986). In addition, firms that do not pay dividends are more likely to be financially constrained and hence less likely to carry a lot of debt. Using a dummy variable that takes the value 1 if a firm pays dividends in year t (and 0 otherwise), Table 4 indicate that the percentage of non-dividend paying zero-leverage firms is much higher. The coefficient on the time trend variable also indicate a strongly increasing trend in the number of non-paying zero-leverage firms. In contrast, only considering dividend-paying firms, both high and low payout firms show higher percentages of zero-leverage firms (16.49% and 13.97%) than firms in the medium range (5.97%). As a large proportion of zero-leverage

firms do not pay dividends at all or pay very low dividends, it seems that zero-leverage firms do not have a strong tendency to substitute dividend payments for leverage.

In addition, we test whether managerial agency costs explain the zero-leverage phenomenon. Devos et al. (2008) examine corporate governance structures of zero-leverage firms and 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. Given that there are no aggregate firm-level corporate governance indices available for our international sample, we analyse firms based on country-level corporate governance characteristics by using a broad definition of governance from the World Bank (Kaufmann et al., 2009).[8] The results in Panel C of Table 4 reveal that the percentage of zero-leverage firms sharply increases for firms in countries with the lowest corporate governance practices. While the corresponding time trend is statistically significant, that for firms in countries with the lowest corporate governance standards is insignificant. By the end of the sample period, zero-leverage firms are more common in countries with poor corporate governance mechanisms, supporting the notion that zero-leverage firms suffer from higher agency costs.[9]

Finally, the hypotheses that zero-leverage firms rely heavily on external equity financing is confirmed in Panel A of Table 4. On average, the percentage of zero-leverage firms is highest in the group of firms with highest equity issuances (19.10%), and it strongly increases over time (from 10.13% to 23.91%). Presumably, zero-leverage firms rely on external equity financing to avoid underinvestment problems and to retain their growth options. All in all, the analysis in Table 4 provides some evidence for the role of agency problems in explaining the increase of zero-leverage firms. The firms' country-level corporate governance environment, their payout behaviour, and their equity issuances point to the existence of agency problems.

3.2.2 Asymmetric information

Given the high percentage of zero-leverage firms among smaller firms, asymmetric information may contribute to the zero-leverage phenomenon. The pecking order theory predicts

[8] In this country-level index, governance is defined as the traditions and institutions by which authority in a country is exercised. The 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.

[9] This finding is consistent with Berger et al. (1997), who document that entrenched managers use less debt. In contrast, in a recent study John and Litov (2011) report that firms with entrenched managers, as measured by the Gompers et al. (2003) governance index, use more debt finance and have higher leverage ratios. They claim that managerial risk-taking and the related terms of access to the credit markets play an important role in understanding this relationship.

that due to adverse selection costs firms prefer internal funds to external funds and debt to equity. If managers know more about the value of the firm than outside investors, the market penalizes the issuance of equity. In contrast, the trade-off theory predicts a lower leverage ratio under high asymmetric information. With pronounced information asymmetries, the costs of financial distress are higher and hence firms choose lower leverage.

We use asset tangibility as a first proxy variable for the degree of asymmetric information. A high proportion of fixed assets to total assets can serve as collateral, which may lead to lower costs of financial distress (Wessels and Titman, 1988; Fama and French, 2002).[10] In contrast, a firm is perceived as riskier in terms of lower recovery rates if tangibility is lower. Panel A of Table 4 shows that zero-leverage firms feature lower tangibility. In fact, as indicated by the magnitude of the intercept terms, the group of firms with lower tangibility use less debt and contribute more to the upward trend in the percentage of zero-leverage firms than firms with medium and high tangibility.

R&D expenses are another proxy variable for the degree of asymmetric information. We classify firms whose R&D-to-assets ratio is above the 70th percentile in a given sample year as 'high R&D firms', and those with R&D-to-assets ratio below the 30th percentile as 'low R&D firms'. While the percentage of zero-leverage firms is only 7.65% for the low and 7.75% for the medium R&D group, on average, the high R&D group consists of 24.16% zero-leverage firms. Supporting the notion that information asymmetry is important for explaining extreme debt conservatism, the fraction of zero-leverage firms increases from 11.86% (1989-1990) to 29.76% (2009-2010) for the latter R&D-intensive group. In contrast, for less R&D-intensive firms this fraction only increases by about 5 percentage points.

Firms with a low or no credit rating at all are expected to suffer from a higher degree of information asymmetry. We use a rating probability variable (see section 3.3) to proxy for the degree of asymmetric information and expect firms with a low rating probability to be more likely to pursue a zero-leverage policy. Indeed, 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 sharply increasing over time, while the zero-leverage ratios in the large rating probability group are almost stable.

[10] However, high tangibility does not necessarily imply that industry-specific assets are highly liquid during turbulent times (Pulvino, 1998; Sibilkov, 2009).

Overall, we observe cross-sectional variation in zero-leverage firms that is consistent with the asymmetric information hypothesis. The increasing trend in the percentage of zero-leverage firms in groups of firms with high information asymmetry suggests that these firms play a major role in explaining the international zero-leverage phenomenon. Furthermore, 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 (see section 3.3).

3.2.3 Asset risk

A zero-leverage firm's stock return volatility reflects its business risk. In fact, without debt the return on equity equals a firm's asset return, and hence stock return volatility equals asset volatility. For all other (debt-financed) firms, we follow Frank and Goyal (2009) and compute the asset volatility by unleveraging the annual volatility of stock returns (see Appendix 1). Annual standard deviations are derived from monthly stock return data (which are matched from Thompson Datastream). With increasing business risk, the prevalence of extreme debt conservatism is likely to increase. And if there was a trend for increasing business risk over time, this further contributes to explaining the zero-leverage phenomenon. Panel A of Table 4 shows that the percentage of zero-leverage firms is highest with 22.15%, on average, in the group of firms in the highest asset risk (as compared to only 3.29% in the group of firms with the lowest asset risk). The high asset risk category also exhibits the strongest increase in the fraction of zero-leverage firms over the sample period, as indicated by the magnitude of the estimated time trend.

Figure 7 depicts the evolution of asset volatility over the four vintage periods (see section 2.2) for both zero-leverage and debt-financed firms. There are two observations: First, asset risk is substantially higher in the zero-leverage group compared with the group of debt-financed firms. And second, there is a more general trend of increasing asset return volatility over time (Campbell, et al., 2010; Wei and Zhang, 2006), and hence the vintage effect seems strongly related to this change in asset risk.[11] Therefore, in addition to IPO and industry effects, higher asset return volatility is another driver of the increasing propensity to pursue a zero-leverage policy over time and in the different vintage periods.

From a corporate risk management perspective, firms with higher business risks should be more likely to engage in risk management. In addition to their risk management choices on the asset side of the balance sheet, their capital structure constitutes another layer of risk man-

[11] We use all months in a given vintage group to compute the asset return volatility. The effect is even more pronounced if we use only the first three years of return data for each vintage group.

agement. To some extent, risk management and equity capital are substitutes (Stulz, 1996). By reducing the amount of debt in its capital structure (or even completely deleveraging), a firm reduces shareholders' total risk exposure because equity represents a residual claim and offers an all-purpose risk cushion against losses. Equity provides protection against risks that are difficult to anticipate or measure (Meulbroek, 2002). In this sense, our findings with regards to asset risk are consistent with our earlier observation that zero-leverage firms are concentrated in the more opaque information technology and healthcare sectors (see section 2.2).

[Insert Figure 7 here]

3.2.4 Signalling

In the presence of information asymmetry, Ross (1977) argues that investors choose larger levels of debt as a signal of higher quality and that profitability and leverage are positively related. An alternative way to incorporate signalling is through abnormal earnings. Barclay and Smith (1995) document that firms with higher abnormal earnings carry more secured debt in order to control for the underinvestment problem, and hence one would expect that zero-leverage firms 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 of equity at time $t-1$. The results in Panel A of Table 4 do not support the signalling 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. Furthermore, 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 inconsistent with the notion that leverage and profitability are positively related and that firms choose larger debt levels as a signal of high quality. Overall, both signalling variables are unable to provide consistent results, and hence the decision to follow a zero-leverage policy seems not driven by signalling considerations.

3.2.5 Taxes

The tax system is another factor that determines capital structure choices (de Jong et al., 2008; Fan et al., 2012). As tax deductions are to a large extent generated by interest payments, it is not surprising that most of the zero-leverage firms exhibit high tax payments, as shown in Panel A of Table 4. Furthermore, even their non-debt tax shield is smaller compared to leveraged firms. This behaviour is hard to explain because any non-debt tax shield is the only possibility for zero-leverage firms to reduce their tax obligations.

3.2.5 Multivariate analysis

In order to examine all firm characteristics in a multivariate setup, we run logistic regressions. 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. Based on the stylized facts in section 2.2, we control for industry effects by including 2-digit SIC code dummy variables (Faulkender and Petersen, 2006). Column 1 in Table 5 shows the results. Similar to the findings from our univariate analysis, size decreases and the market-to-book ratio increases the probability of firms to adopt a zero-leverage policy. Also consistent with our univariate results, the coefficients on tangibility and R&D are significantly negative, and the coefficient on asset risk is significantly positive. Furthermore, the coefficient on the payout dummy variable, indicating whether a firm is paying out dividends and/or repurchasing shares or not, is significantly negative. Together with the positive coefficient for payout ratio, this observation emphasizes that there are two different kinds of zero-leverage firms: non-payout and high payout zero-leverage firms. In fact, if zero-leverage firms are dividend payers, the positive coefficient indicates that a higher payout ratio increases the probability of pursuing a zero-leverage policy (see section 3.3). Consistent with this positive payout coefficient, zero-leverage firms exhibit significantly higher equity issuances than debt firms. Together with higher asset risk, this finding is consistent with the notion that only the riskiest firms are constrained to use equity (Bolton and Freixas, 2000). The coefficient on profitability is positive, further supporting the pecking order theory.

[Insert Table 5 here]

Our analysis suggests that there are more than the standard capital structure variables to consider when exploring why firms adopt a zero-leverage policy. 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. Signalling considerations and agency costs of debt do not contribute to explain the zero-leverage phenomenon. Taken together, however, the characteristics of zero-leverage firms are hard to reconcile with any single capital structure framework.

3.3 The impact of financial constraints and financial flexibility

So far, our analysis only takes demand-side explanations (uses of funds) for a firm's decision to pursue a zero-leverage into account. In order to get a more complete picture of extreme debt conservatism, we also incorporate supply-side effects. In particular, we analyse financial constraints of zero-leverage firms and, in a more dynamic context, their financial flexibility.

3.3.1 Financial constraints

The analysis of firm-level characteristics is unable to unambiguously link the zero-leverage phenomenon to standard capital structure theories. Already 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.[12] Based on Bolton and Freixas' (2000) extended pecking order model, 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 the debt markets is restricted. Firms with a bond rating have easier access to debt markets than firms without a rating, and hence these firms exhibit higher leverage.[13] Similarly, Kisgen (2006) shows that firms near a credit rating upgrade or downgrade issue less debt relative to equity than firms not close to a change in rating.

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. Identifying such firms as being constrained in their debt capacity would lead to biased results. In order to minimize this potential bias, 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. We run a logistic regression using the full sample over the 1989-2010 time period to assess whether a firm is likely able to access debt markets. The dependent binary vari-

[12] 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). 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 constraints.

[13] Consistent with the pecking order theory, Lemmon and Zender (2010) report 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.

able in the logistic model takes a value of 1 if firm i in year t has a long-term credit rating, and 0 otherwise.[14] According to Lemmon and Zender (2010), 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.[15] The results of our predictive model are presented in Appendix 3. While our analysis is based on the full sample, we also test the model for US data as a robustness check. 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 time period. The levels of these probabilities are used as an indicator for 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.[16] Accordingly, we construct a debt constraint dummy variable (i.e., a variable which takes a value of 1 if the rating probability is above the median, and zero otherwise) and include it into the logistic regression model in column 2 of Table 5. As expected, the probability of a firm to follow a zero-leverage policy increases when the firm is debt constrained. All other coefficient estimates remain unchanged compared to the model in column 1.

Table 6 compares the mean characteristics of constrained and unconstrained zero-leverage firms among each other and with all other firms in our sample. For each firm characteristic, we compute the mean across all three subsamples, i.e., leveraged 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 firm-year observations in the different subsamples document that there are far more constrained than unconstrained zero-leverage firms. This observation seems to suggest 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

[14] 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 has a long-term credit rating. 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). Coverage of these RatingXpress historical files differs among the countries groups: 34% of the firms in the United States, the United Kingdom, and Canada, 14% in Germany, France, and Italy, and 9% in Japan.

[15] 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.

[16] Our results (not reported) remain qualitatively unchanged when we use the 30th and 70th percentile as breakpoints to sort firms into three groups.

in Table 4 indicate that zero-leverage firms hold substantial cash reserves. A more detailed analysis in Table 6 reveals that constrained zero-leverage firms even hold significantly higher cash reserves than unconstrained zero-leverage firms and all other debt firms in our sample. This observation supports our 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 net present value 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; their model suggests that concerns about future financing abilities are a major determinant of cash holdings. Similarly, 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 exhibit a higher total payout ratio than non-zero-leverage firms. These seemingly incompatible results can be reconciled by distinguishing between constrained and unconstrained zero-leverage firms. Table 6 shows that constrained zero-leverage firms are less profitable than leveraged firms. In contrast, unconstrained zero-leverage firms tend to be the most profitable ones (even more profitable than all other sample firms). This higher profitability of unconstrained zero-leverage firms is consistent with a high debt capacity, as indicated by their potentially high interest coverage ratio. Accordingly, a smaller subsample of highly profitable zero-leverage firms seems to exist that deliberately chooses an extremely conservative debt strategy. These financially unconstrained firms are more profitable, pay more dividends, and are older as well as bigger than their constrained zero-leverage peers. Moreover, unconstrained zero-leverage firms exhibit significantly lower growth opportunities (market-to-book ratio) compared with their constrained zero-leverage peers. Accordingly, agency costs of free cash flow seem to be a main rational for the high payout ratios of unconstrained zero-leverage firms. This notion 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 large-

ly 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. Finally, constrained zero-leverage firms exhibit higher asset volatility than unconstrained zero-leverage and debt-financed firms.

Taken together, 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 and lower total payout ratios. The observation that they also hoard higher cash reserves is 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 rather small subsample of firms that deliberately chooses to pursue a zero-leverage policy. These financially unconstrained firms are more profitable, pay higher dividends, 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 debt markets. Apple and Google are two prominent examples for firms that are assigned into this latter group of zero-leverage firms over extended periods during our sample period.

3.3.2 Financial flexibility

Separating zero-leverage firms into financially 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 contrast to their higher market-to-book ratios. Financial flexibility, which is a closely related concept, may be the missing link to fully capture the zero-leverage phenomenon.[17] Graham and Harvey's (2001) survey results indicate that financial flexibility is the most important determinant of corporate capital structure. 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. Arslan et al. (2011) suggest that low leverage and high cash holdings are the two components of flexibility. They document that flexible firms have a greater capacity to pursue growth opportunities.

[17] Financial flexibility 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.

Byoun (2011) posits that developing firms that are in the phase of building up financial flexibility choose low leverage ratios. In contrast, growth firms that are in the next phase of their lifecycle and utilize 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. According to Byoun (2011), developing firms are small, with large cash holdings, low capital expenditures, and a low rating probability. In addition, they prefer using equity over debt. In fact, as shown in Panel A in Table 4, zero-leverage firms actively issue new equity. The percentage of zero-leverage firms in the high equity issuance group is 19.10%, while the medium and small equity issuance groups contain only 9.57% and 9.92% zero-leverage firms, respectively. Simutin (2010) reports a positive relationship between excess cash holdings and future stock returns, which he interprets as evidence supporting the use of excess cash holdings as a proxy for risky growth options. The marginal value of cash is high for developing firms with uncertain future investment opportunities; these firms have lower internal funds and face greater financing constraints. Accordingly, developing firms hold more cash in order to build up and maintain financial flexibility (Byoun, 2011). The cash holdings in Panel B of Table 4 confirm this conjecture. The percentage of zero-leverage firms in the group with the largest cash holdings is 25.71%, while the medium and low cash holding groups contain only 8.14% and 2.28% zero-leverage firms, respectively. In addition, in the former group the percentage of zero-leverage firms increases from 11.59% to 33.65% over the sample period.[18]

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. Therefore, developing firms are expected to keep capital expenditures low in order to be able to exploit future investment opportunities. Panel A of Table 4 confirms that the percentage of zero-leverage firms is highest in the group of firms with the lowest level of capital expenditures. Similarly, 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 B in Table 4 indicates that the group of firms with the lowest retained earnings contains the highest fraction of zero-leverage firms, going up from 4.57% to 19.39% over the sample period.

[18] Also consistent with Byoun (2011), similar results are observable for the rating probabilities as an indicator for financial constraints (see section 3.3.1).

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 cash holdings and equity issuances in more detail. If a firm simultaneously exhibits high equity issuances and cash ratios, this behaviour is presumably driven by its demand for financial flexibility. Figure 8 shows the cash holdings and equity issuances of zero-leverage and debt firms in the five years after going public.[19] The sample is divided based on the median sum of capital expenditures and R&D expenses (denoted as $CapexRD$) in each year subsequent to the IPO (event date 0), which delivers four cases: high $CapexRD$ zero-leverage firms, low $CapexRD$ zero-leverage firms, high $CapexRD$ debt firms, and low $CapexRD$ debt firms. One would expect that zero-leverage firms with high equity issuances as well as high capital and R&D expenditures are most likely to attempt to maintain financial flexibility.

[Insert Figure 8 here]

As shown in Panel A of Figure 8, the cash ratio of all firms is slightly decreasing in the years subsequent to their going public. However, there is a large difference between the $CapexRD$ groups. High $CapexRD$ zero-leverage firms boast the highest cash holding. Similarly, high $CapexRD$ debt firms have higher cash levels than low $CapexRD$ debt firms. Most important, the cash holdings of both zero-leverage groups are higher than those of debt firms, presumably indicting that zero-leverage firms attempt to maintain financial flexibility. Panel B further supports this notion; zero-leverage firms maintain their high cash levels compared with debt firms by issuing equity. High $CapexRD$ zero-leverage firms are the most active equity issuers in their attempt to maintain financial flexibility, and even low $CapexRD$ zero-leverage firms execute high equity issuances in order to build up flexibility. This finding is consistent with Jagannathan and Meier's (2002) argument that it is not optimal for firms with growth opportunities that are managerially and organizationally constrained to take any positive NPV project. In fact, they rather wait and maintain flexibility in order to be prepared for better investment opportunities which may come up in the near future. And Arslan et al. (2011) report that leverage and cash holdings as proxies for financial flexibility are more useful predictors of corporate investment behaviour than more standard measures of financial constraints (e.g., age or size). Taken together, we conclude that the IPO effect as an explanation for the zero-leverage phenomenon (see section 2.2) interacts with the demand for financial flexibility of zero-leverage firms.

[19] We exclude all firms from the first vintage period (i.e., being listed before 1989).

4 Country-level regression analysis

In this section, we analyse the zero-leverage phenomenon at a country-level. We start in section 4.1 with a description of the institutional determinants of zero-leverage firms and the results from extended logistic regression models. Section 4.2 examines the influence of different bankruptcy codes.

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 a scant literature for countries outside the United States. Rajan and Zingales (1995) examine the capital structure across G7 countries and document that country-specific factors are important determinants of leverage. 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.[20] Most recently, Fan et al. (2012) 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 determinant of capital structure and exerts a significant 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 substantial 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 compared with a capital-market-oriented financial system. 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. Banks are natural monitors and reduce information asymmetries (Leland

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

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 with a bank-based financial system.

La Porta et al. (1998, 2002) argue 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. Presumably, weaker legal systems and 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. (2012) 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 that influences capital structure decisions. 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. As shown in Appendix 4, 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.[21] The scores indicate that the United Kingdom and Germany have the highest creditor protection, while the scores of France, Canada, and the United States point to the most equity-friendly bankruptcy codes.[22] 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). Therefore, Fan et al. (2012) 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

[21] 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.

[22] Italy and Japan both fall into the middle of the two regimes. Given their relatively low CPS score points, we assign them to the equity-friendly regime in our logistic regression analysis.

creditor protection (such as the United Kingdom and Germany) to have more zero-leverage firms than countries with low creditor protection (such as the United States 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., 2012). There are two major 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-deductible corporate expenses. This tax system prevails in the United States, Japan and the United Kingdom (post-2000). In contrast, the goal of different forms of a dividend imputation tax system is to tax corporate profits only once. 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 United Kingdom (pre-2001). The proportion of corporate tax available as a tax credit under an imputation system varies from country to country. However, given the larger tax benefits from leverage, we expect less zero-leverage firms in countries with a classical tax system.

Panel C of Table 4 provides evidence that countries with capital-market-oriented financial systems, common law origin, and high creditor protection exhibit the highest percentage of zero-leverage firms. Furthermore, the groups based on these country-level variables with high percentages of zero-leverage firms have a strongly significant time trend. In fact, the difference between the percentage of zero-leverage ratios in the large, medium, and high group of the country-specific variables is small at the beginning of our sample period but strongly increases over time.

Next, we again use logistic regressions to further examine the impact of country-level variables on the decision to follow a zero-leverage policy. 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). Following Fan et al. (2012), we use variables 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. Appendix 1 shows the detailed definitions of these country-level variables, and the regression results are provided in column 3 of Table 5.

The coefficient estimates for 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, this result also supports the view 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 United Kingdom 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. One 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 United States, Japan, and the United Kingdom (post 2000), and both the United States and the United Kingdom 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 multinational 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 (Desai et al., 2004; Huizinga et al., 2008).

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. Consistent with their findings, we further uncover a negative 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 differences in the proportion of zero-leverage observations across the different G7 countries. As the financial system and different bankruptcy codes seem most important for

explaining the zero-leverage phenomenon on a country-level, we investigate the impact of the bankruptcy code in more detail.

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

Fan et al. (2012) report that the existence of an explicit bankruptcy code is associated with higher debt ratios. Similarly, Rajan and Zingales (1995) document that the United Kingdom and Germany – two countries with debt-friendly bankruptcy codes compared with the United States – are much less leveraged than US firms. Nevertheless, 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. Their model identifies the liquidation value as a major determinant 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. 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 firms from the United States and the United Kingdom. We adapt their non-parametric test to see if this hypothesis also holds for the proportion of zero-leverage firms in our G7 sample. 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. Therefore, 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.[23] The index is constructed on an industry-level for every year during the sample 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 hence not easily transferable to other firms.

We follow Acharya et al. (2010) and pool all firms in a given year and sort them 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. Our sample countries are broken up according to their creditor protection score (CPS) in Appendix 4, implying that the United Kingdom and Germany exhibit high creditor protection, while the United States, Canada, and France grant low creditor protection.[24] Table 7 presents the results. Panel A uses asset-specificity as a proxy for liquidation value, while Panel B 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 sample 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 in Acharya et al. (2010). Under their hypothe-

[23] 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.

[24] We exclude Italian and Japanese firms from this non-parametric test in order to focus at the two opposite variants of bankruptcy regimes.

sis, the difference in leverage between countries with high creditor protection and low creditor protection 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 one would expect, 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 conjecture. 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).

4.3 Robustness check

In column 4 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 only three 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 to pursue a zero-leverage policy is higher for younger vintage periods, which confirms our findings in Figure 3.

We further validate our results by applying a stepwise regression in order to identify the most relevant variables 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 5 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 the market-to-book ratio. A final noteworthy finding is that not all listing vintage dummies are included in the model with the best fit. In fact, only the later vintage groups have a significant impact on the decision to follow a zero-leverage policy.

The standard capital structure variables play an important role when deciding whether or not to follow a zero-leverage policy. However, these variables represent only a subset of all variables that are important for the decision to adopt extreme debt conservatism. All the explanatory variables that are retained by the stepwise regression, except for the tax variable, are directly related to our explanations in the previous sections. It is not surprising that the tax variable loads significantly. By definition, zero-leverage firms pay more taxes as they have no interest payments from debt to reduce their tax payments.

5. Conclusion

This study examines the research question why a surprisingly large number of firms decide to adopt a zero-leverage policy. This behaviour cannot be explained based on the standard capital structure theories. We examine the zero-leverage phenomenon using a large sample of firms from the G7 countries. Although country-level differences are important, the increasing percentage of zero-leverage firms represents an international phenomenon. Extreme debt conservatism is a cross-country observation which strongly increases over our sample period. While only about 5% of all firms in our sample followed a zero-leverage policy in 1989, this percentage increases to roughly 14% by 2010. We start our analysis with several stylized facts about the zero-leverage phenomenon. First, there is an IPO effect, and hence a large proportion of the upward trend in the percentage of zero-leverage firms is generated by firms that went public in the more recent sample years. The observed increase in the percentage of zero-leverage firms is closely related to the different IPO waves across sample countries. Second, there is an industry effect due to changes in the industry composition toward sectors where extreme debt conservatism is more commonly adopted. The IPO effect and the industry effect are closely interrelated, and both are linked up with the attempt of zero-leverage firms to build up and maintain financial flexibility in order to be able to respond in a timely and value-maximizing manner to unexpected changes in a firm's cash flows or investment opportunities. Third, the zero-leverage phenomenon is driven by a more general vintage effect, where newly listed firms in the later years of the sample period are more likely to a purse a zero-leverage policy. The sharply increasing asset volatility (or business risk) over the sample period offers an explanation for this increase in the percentage of zero-leverage over the listing groups.

At the firm-level, standard capital structure (demand-side) theories are hard to reconcile with the zero-leverage phenomenon. Another novel aspect is to focus on the supply-side of financing choices by dividing zero-leverage firms into financially constrained and unconstrained ones. 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 higher cash holdings than all other firms in our sample, presumably in an attempt to build up or maintain some degree of financial flexibility.

Exploiting the cross-country information from our G7 sample, we show that country-specific variables further contribute to explain the zero-leverage phenomenon. 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.

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Figure 1: Distribution of zero-leverage firms over time

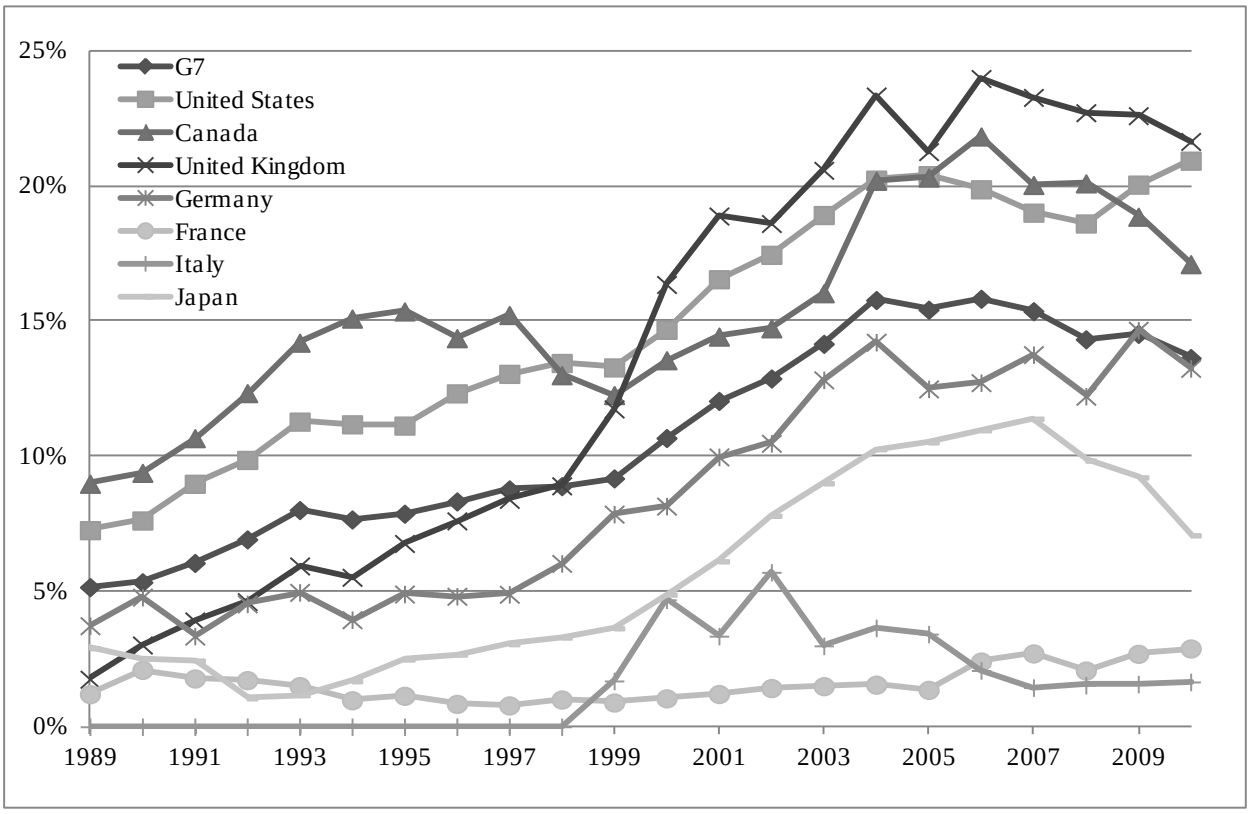


Figure 2: Percentage of zero-leverage firms by size quartile

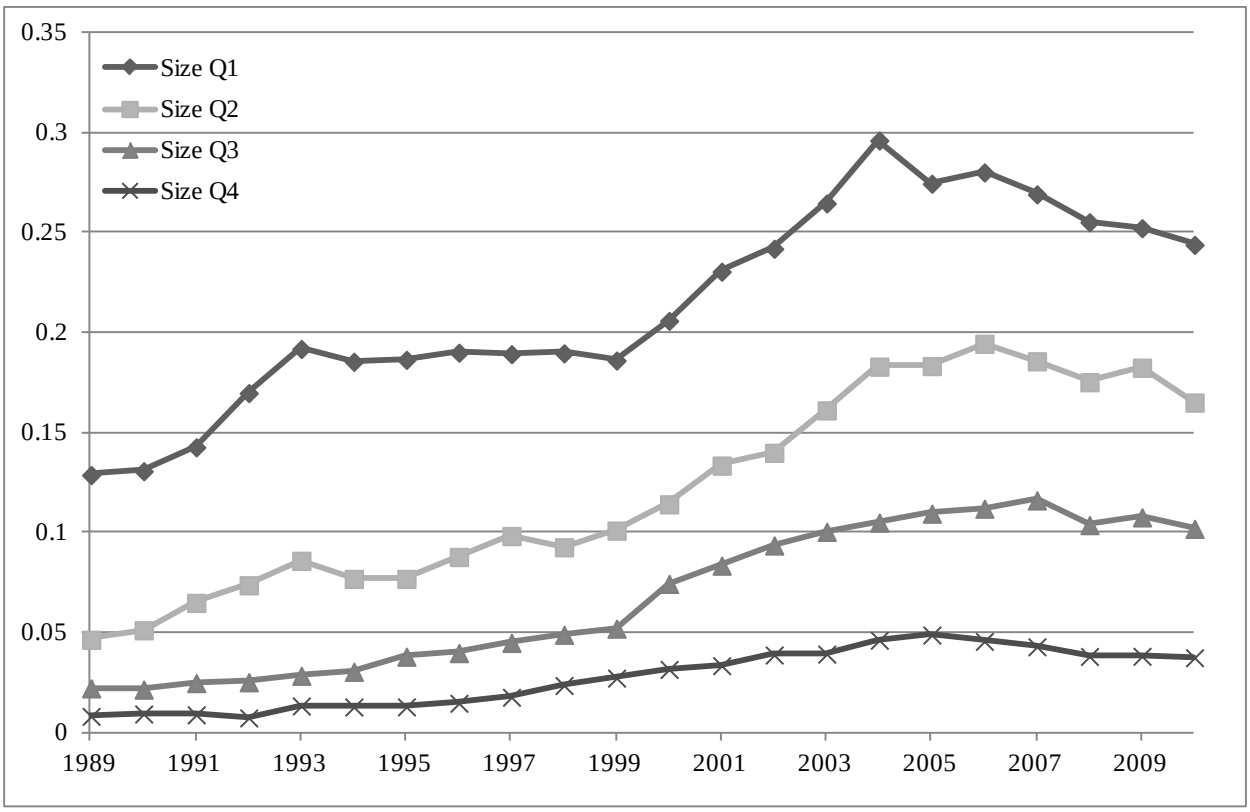
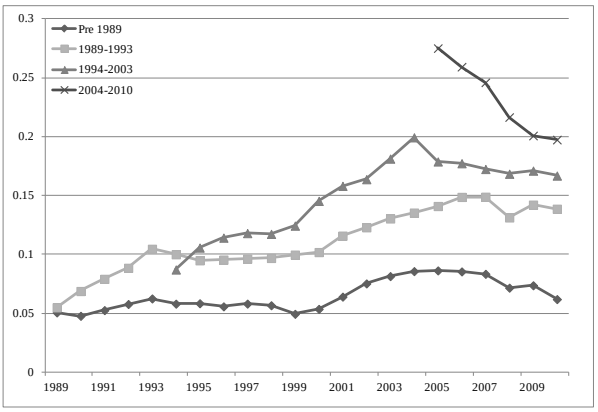


Figure 3: Percentage of zero-leverage firms by listing period

G7



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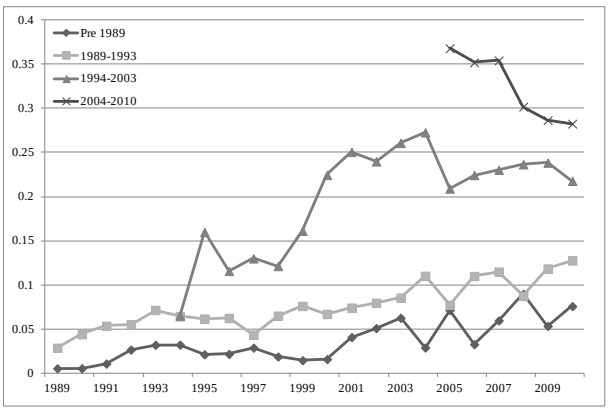
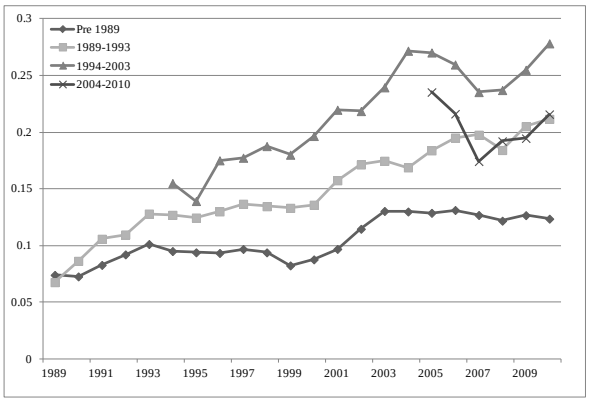
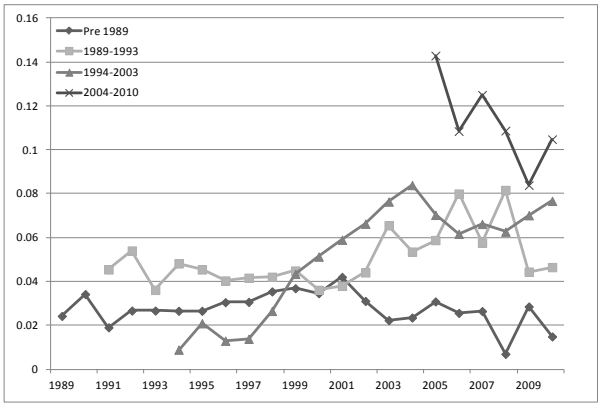


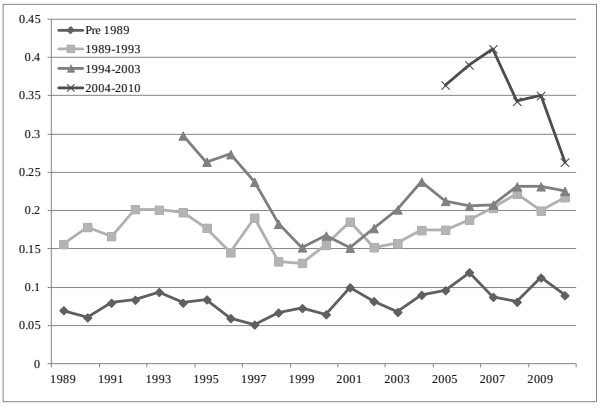
United States



Germany



Canada



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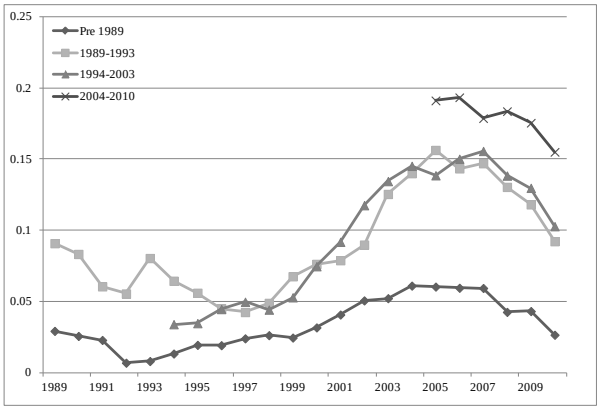
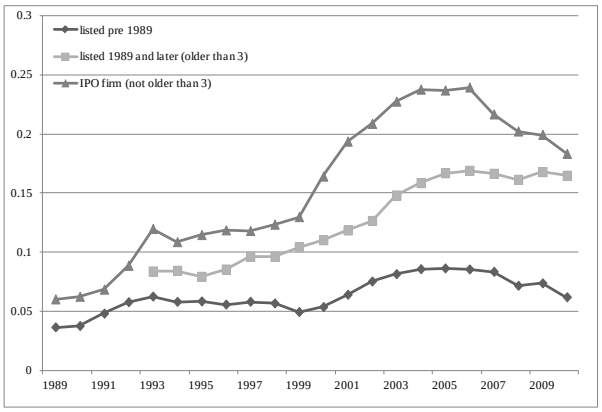


Figure 4: Percentage of zero-leverage firms by age group

G7



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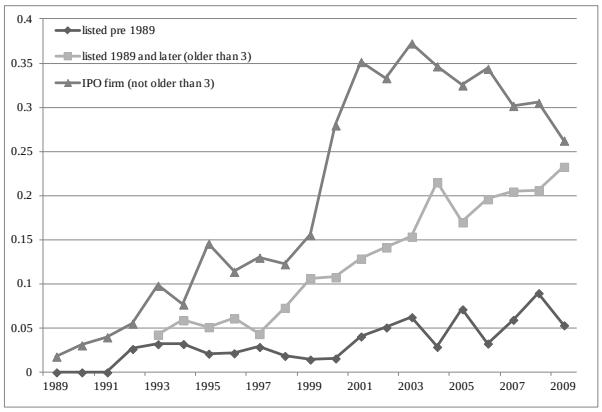
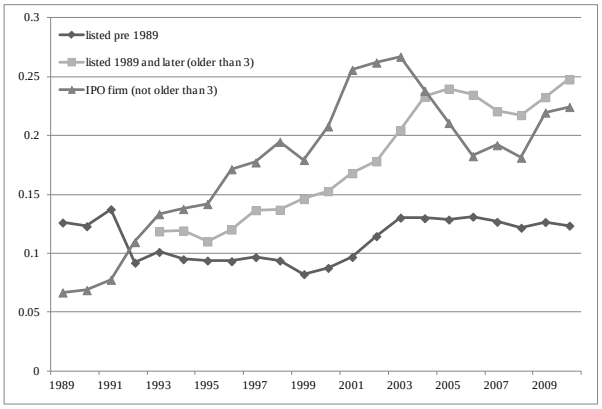
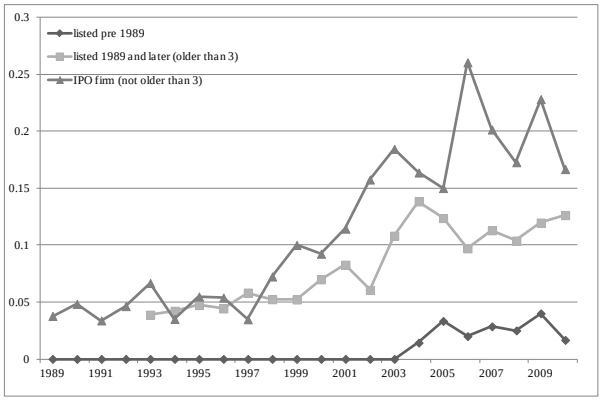


United States



Germany



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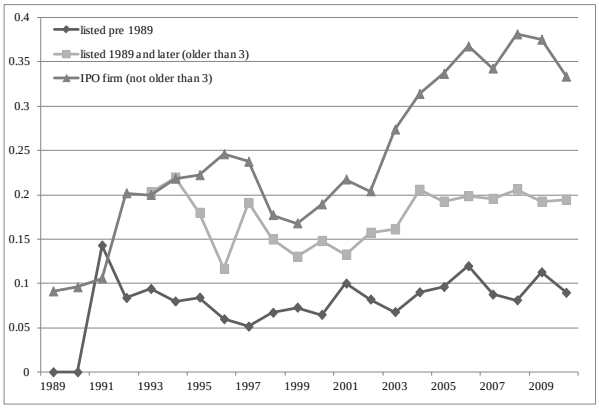

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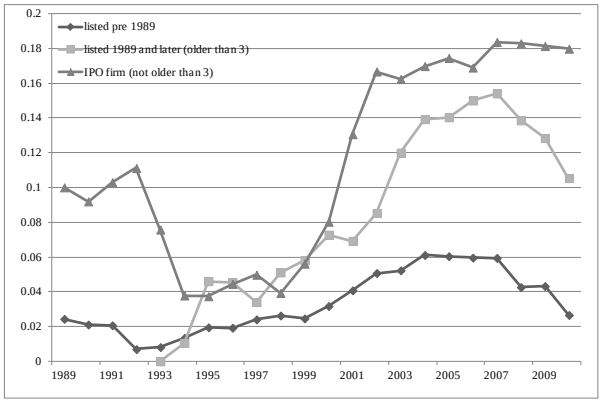
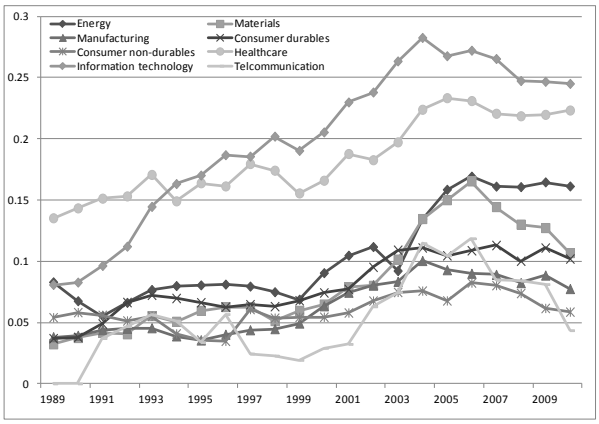
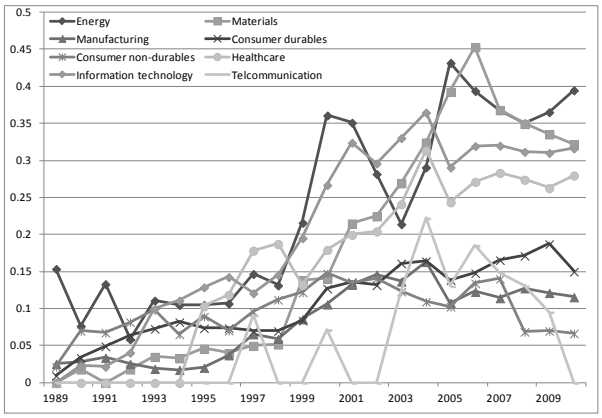


Figure 5: Percentage of zero-leverage firms by industry

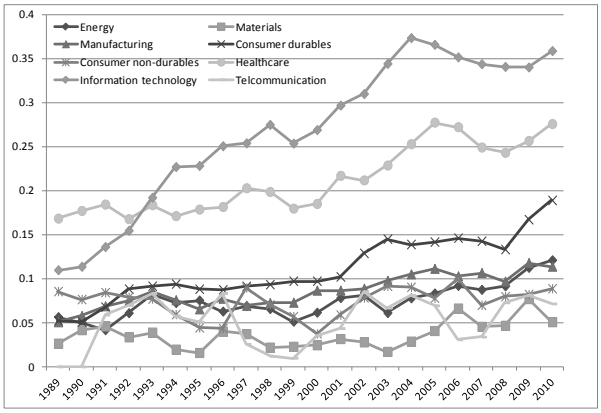
G7



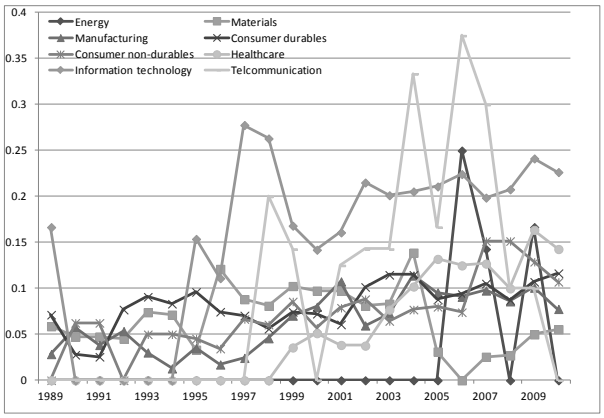
United Kingdom



United States



Germany



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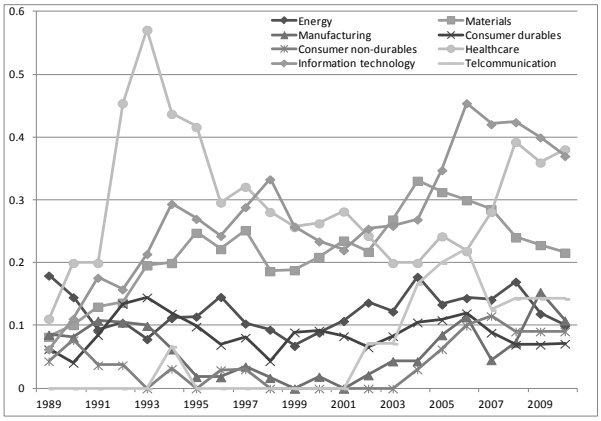

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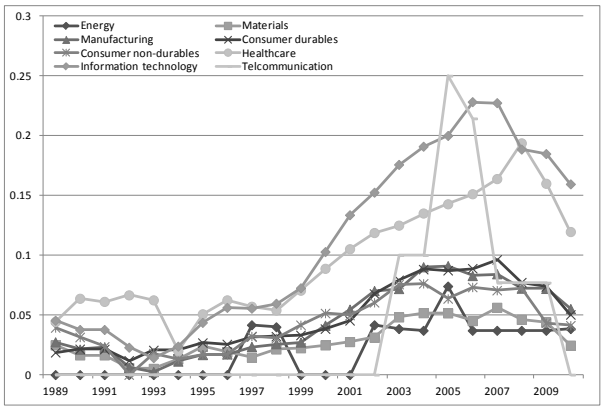


Figure 6: Percentage of zero-leverage firms and changing industry composition

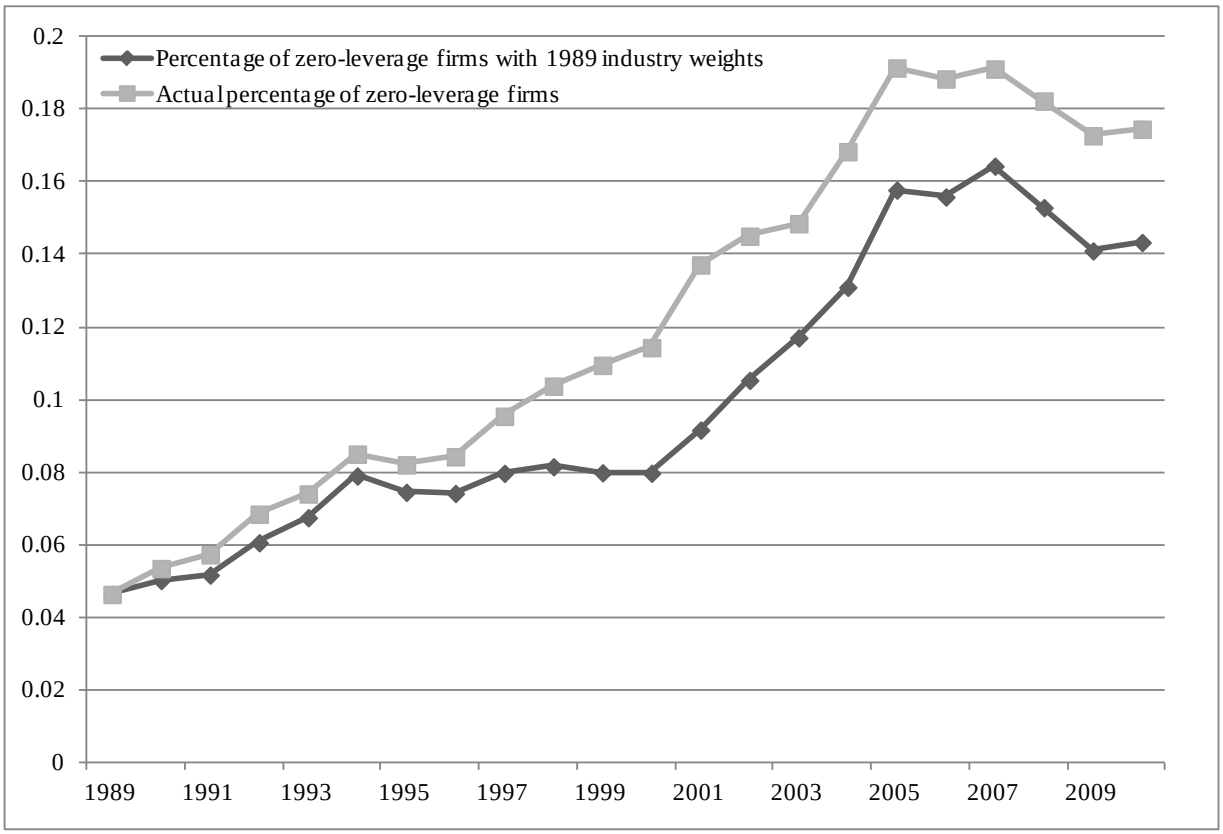


Figure 7: Evolution of median asset risk in the different vintage periods

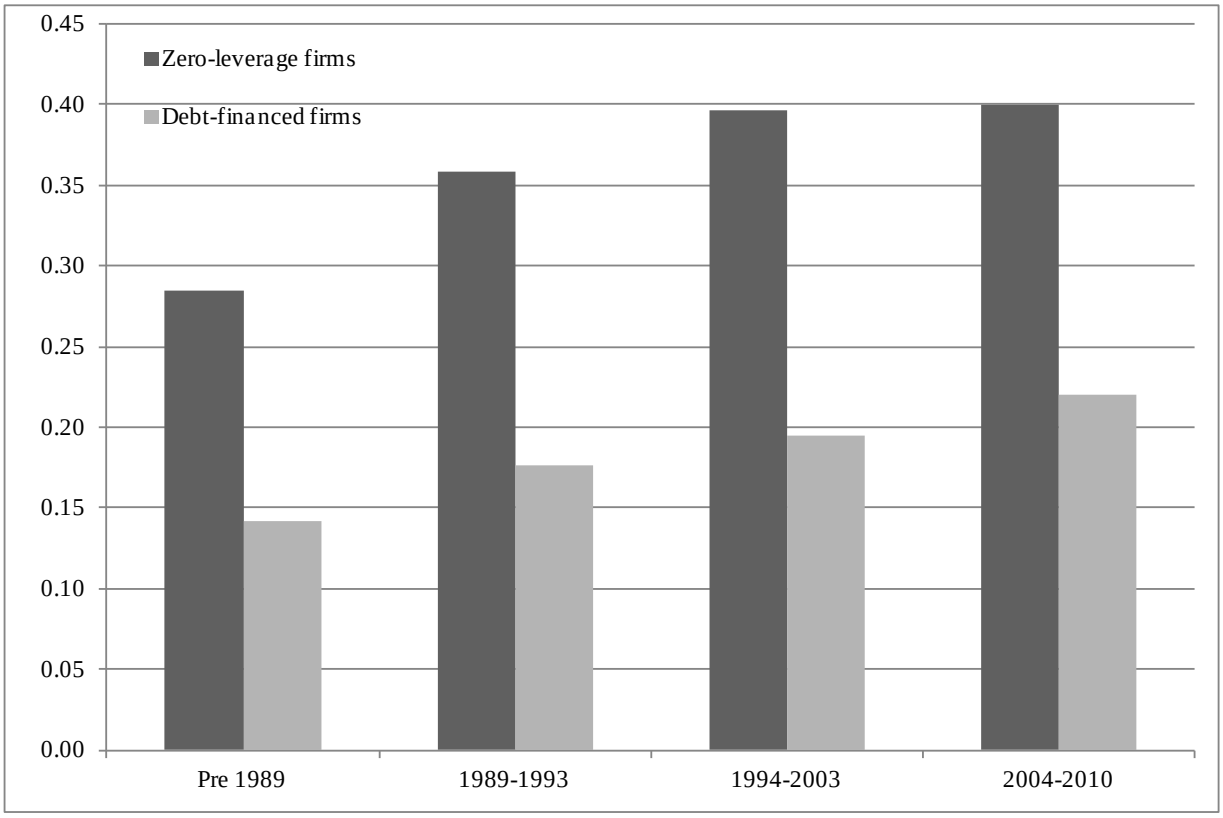
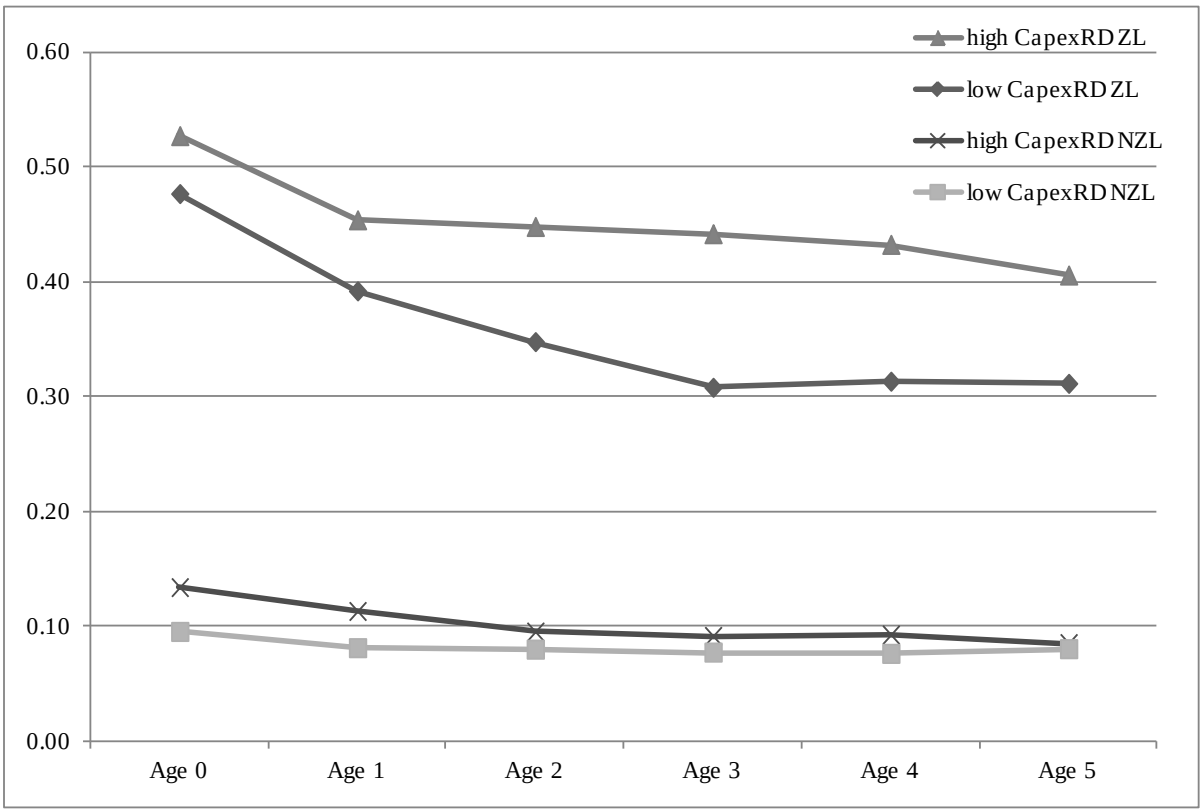


Figure 8: Evolution of cash holdings and equity issuances after IPO

Panel A: Evolution of median cash holdings after IPO



Panel B: Evolution of equity issuances after IPO

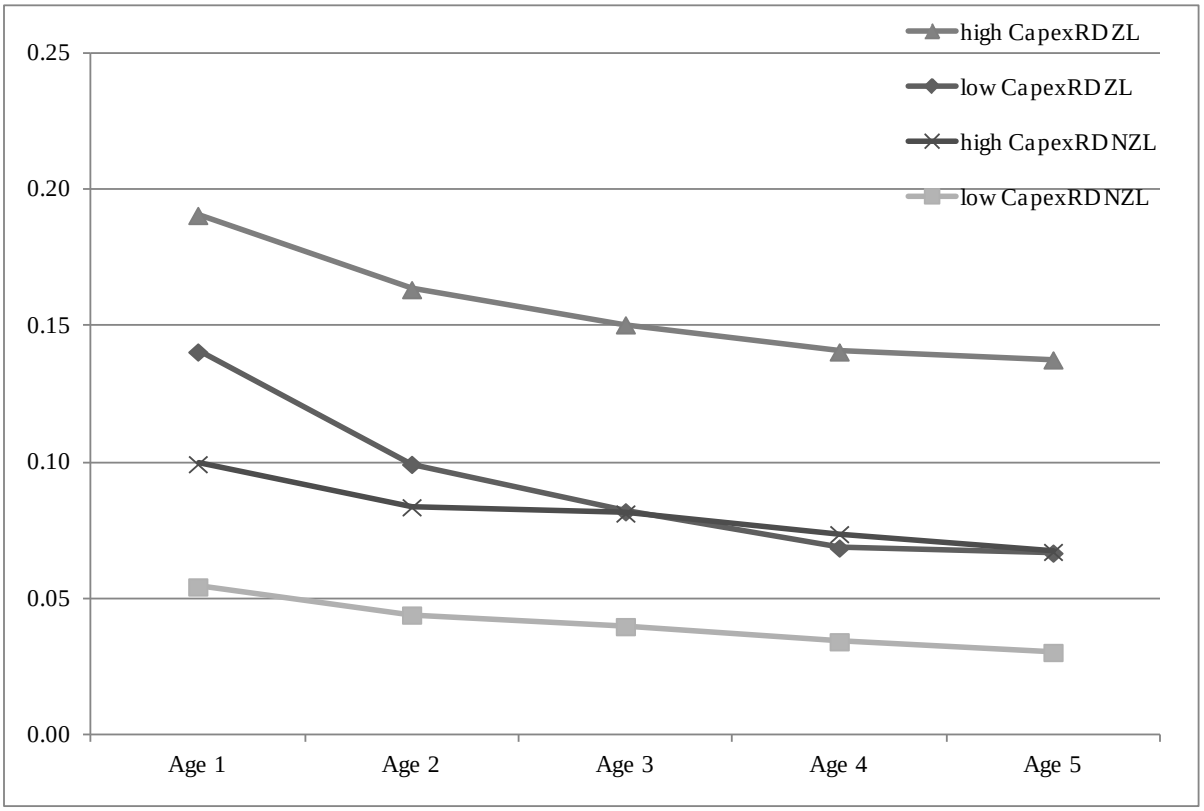


Table 1: Descriptive statistics

	G7					United States			Canada			United Kingdom			Germany			France			Italy			Japan		
Variable	Mean	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	0.2241	0.1942	0.0000	0.992	165,999	0.2263	0.1861	64,154	0.2145	0.1985	9,489	0.1724	0.1439	22,465	0.1920	0.1584	8,552	0.2202	0.2051	8,441	0.2498	0.2505	2,641	0.2511	0.2318	50,257
Size	5.6733	5.5997	0.7029	11.221	166,166	5.7231	5.6585	64,155	5.5137	5.4980	9,489	4.7496	4.5789	22,515	5.3528	5.1079	8,558	5.5900	5.2529	8,442	6.3049	6.0917	2,641	6.0882	5.9352	50,366
Age	12.6823	8.0000	0.0000	61.000	166,757	8.1902	7.0000	64,328	6.9785	6.0000	9,533	6.1307	5.0000	22,793	6.2914	5.0000	8,579	6.2755	5.0000	8,476	5.8827	5.0000	2,642	24.9777	23.0000	50,406
Market-to-book	1.7072	1.2735	0.3296	10.000	166,152	2.0836	1.5129	64,150	1.8452	1.3554	9,487	1.8235	1.3927	22,514	1.5653	1.2271	8,557	1.5182	1.2220	8,437	1.3729	1.1549	2,641	1.2232	1.0628	50,366
Asset growth	0.1176	0.0570	-0.7074	6.592	151,524	0.1441	0.0592	58,957	0.2759	0.0988	8,604	0.1478	0.0604	19,864	0.0802	0.0413	7,657	0.1010	0.0642	7,517	0.1011	0.0513	2,352	0.0517	0.0483	46,573
Payout	0.0207	0.0060	0.0000	0.403	120,549	0.0262	0.0046	57,880	0.0173	0.0009	8,918	0.0210	0.0112	18,886	0.0144	0.0038	6,754	0.0142	0.0079	6,947	0.0133	0.0068	2,352	0.0107	0.0064	18,812
Equity issue	0.0617	0.0023	-0.0088	1.388	119,846	0.0665	0.0052	62,574	0.0916	0.0061	9,278	0.0834	0.0013	20,322	0.0422	0.0000	6,718	0.0237	0.0000	6,952	0.0209	0.0000	2,330	0.0167	0.0000	11,672
Tangibility	0.2859	0.2448	0.0000	0.976	166,063	0.2742	0.2120	64,060	0.4705	0.4582	9,487	0.2862	0.2354	22,511	0.2351	0.2107	8,558	0.1817	0.1438	8,440	0.2396	0.2024	2,641	0.2943	0.2813	50,366
Asset risk	0.4804	0.3929	0.0710	3.198	163,783	0.5475	0.4541	63,322	0.5059	0.4120	9,369	0.4844	0.3861	22,142	0.4966	0.3728	8,393	0.4537	0.3563	8,287	0.4071	0.3437	2,601	0.3940	0.3486	49,669
R&D	0.0292	0.0000	0.0000	0.683	166,166	0.0528	0.0024	64,155	0.0245	0.0000	9,489	0.0195	0.0000	22,515	0.0175	0.0000	8,558	0.0113	0.0000	8,442	0.0038	0.0000	2,641	0.0106	0.0008	50,366
Abnormal earnings	-0.0012	0.0109	-3.6360	3.653	138,026	-0.0003	0.0116	58,835	0.0099	0.0142	8,534	-0.0081	0.0117	19,463	0.0043	0.0121	7,583	0.0003	0.0116	7,452	-0.0054	0.0102	2,339	-0.0027	0.0074	33,820
Profitability	0.0289	0.0531	-1.6721	0.397	165,644	0.0237	0.0730	64,030	0.0103	0.0550	9,419	0.0159	0.0682	22,334	0.0198	0.0490	8,539	0.0496	0.0591	8,416	0.0336	0.0428	2,637	0.0426	0.0382	50,269
Taxes	0.0198	0.0148	-0.1243	0.183	165,643	0.0222	0.0161	64,050	0.0159	0.0088	9,431	0.0180	0.0150	22,305	0.0198	0.0133	8,538	0.0180	0.0145	8,415	0.0187	0.0143	2,637	0.0187	0.0148	50,267
Non-debt tax shield	0.0440	0.0369	0.0000	0.614	152,341	0.0480	0.0407	63,892	0.0522	0.0441	9,397	0.0437	0.0362	22,010	0.0601	0.0482	8,485	0.0445	0.0378	8,369	0.0437	0.0390	2,631	0.0314	0.0277	37,557
Cash	0.1716	0.1112	0.0000	0.918	166,161	0.1911	0.0942	64,154	0.1383	0.0519	9,485	0.1569	0.0874	22,515	0.1510	0.0830	8,558	0.1426	0.0987	8,442	0.1195	0.0784	2,641	0.1707	0.1418	50,366
Capital expenditure	0.0550	0.0363	0.0000	0.706	141,840	0.0601	0.0414	63,380	0.1087	0.0664	9,248	0.0541	0.0359	20,537	0.0541	0.0388	6,680	0.0486	0.0353	7,007	0.0415	0.0292	2,334	0.0331	0.0239	32,654
Retained earnings	-0.1384	0.1166	-22.2110	0.926	165,202	-0.3764	0.1213	63,282	-0.2824	0.0696	9,415	-0.2538	0.1074	22,513	-0.0664	0.0179	8,556	-0.0002	0.0000	8,429	0.0262	0.0067	2,641	0.1951	0.1793	50,366
Specificity	0.0019	0.0012	0.0005	0.010	165,525	0.0017	0.0012	63,762	0.0027	0.0019	9,434	0.0022	0.0016	22,517	0.0018	0.0009	8,554	0.0019	0.0011	8,405	0.0020	0.0016	2,637	0.0017	0.0011	50,216
Intangibles	0.0915	0.0139	0.0000	0.825	158,174	0.1285	0.0542	56,997	0.0794	0.0034	9,179	0.1426	0.0173	22,098	0.1082	0.0414	8,495	0.1505	0.0981	8,416	0.1276	0.0636	2,630	0.0149	0.0048	50,359
Rating probability	0.1396	0.0456	0.0000	0.989	142,964	0.1731	0.0643	55,560	0.1609	0.0536	7,665	0.1084	0.0219	18,315	0.1318	0.0356	7,223	0.1657	0.0383	7,167	0.2039	0.1016	2,263	0.1009	0.0402	44,771
Country-level governance	1.1310	1.1758	0.4469	1.640	94,400	1.2415	1.2134	33,121	1.5975	1.6065	5,038	0.6027	0.5994	13,945	1.4917	1.4891	5,540	1.2314	1.2199	5,612	0.7204	0.6607	1,831	1.1156	1.1566	29,313
Deposits	1.1803	0.7787	0.5079	2.422	166,757	0.6783	0.6721	64,328	0.9580	0.7805	9,533	1.0850	1.0756	22,793	0.9396	0.9833	8,579	0.6927	0.6763	8,476	0.6258	0.5912	2,642	2.0581	2.0316	50,406
GDP per capita growth	0.0148	0.0192	-0.0565	0.067	166,757	0.0165	0.0196	64,328	0.0152	0.0176	9,533	0.0167	0.0209	22,793	0.0137	0.0145	8,579	0.0112	0.0131	8,476	0.0035	0.0074	2,642	0.0130	0.0149	50,406
Inflation rate	0.0140	0.0185	-0.0252	0.084	166,757	0.0229	0.0216	64,328	0.0220	0.0226	9,533	0.0286	0.0279	22,793	0.0112	0.0101	8,579	0.0166	0.0161	8,476	0.0268	0.0262	2,642	-0.0061	-0.0090	50,406
Domestic savings	0.1995	0.1802	0.1108	0.341	166,757	0.1549	0.1589	64,328	0.2280	0.2363	9,533	0.1524	0.1519	22,793	0.2268	0.2225	8,579	0.1995	0.1984	8,476	0.2114	0.2163	2,642	0.2670	0.2537	50,406

Table 2: Distribution of zero-leverage firms over time

This table summarizes the distribution of zero-leverage firms over time by presenting the absolute 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.

	G7			United States			Canada			United Kingdom			Germany			France			Italy			Japan		
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 1989-1993 (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: Firm-level characteristics

	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 3	0.0290	0.0416	0.0611	0.0687	0.0898	0.1226	0.1346	0.1310	0.0848	1.1108 ***
Younger than 3	0.0626	0.0827	0.1061	0.1196	0.1642	0.2227	0.2094	0.1895	0.1446	0.6868 ***
Listing year										
Pre 1989	0.0482	0.0576	0.0575	0.0549	0.0642	0.0845	0.0804	0.0681	0.0644	0.1676 ***
1989-1993	0.0630	0.0928	0.0969	0.0977	0.1132	0.1355	0.1434	0.1406	0.1104	0.4816 ***
1994-2003			0.1076	0.1204	0.1560	0.1866	0.1730	0.1691	0.1521	0.7398 ***
2004-2010						0.2640	0.2197	0.1923	0.2254	-2.6205 ***
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 ***
Asset risk										
Small	0.0142	0.0165	0.0182	0.0206	0.0365	0.0505	0.0590	0.0478	0.0329	0.2521 ***
Medium	0.0416	0.0441	0.0492	0.0566	0.0824	0.1154	0.1111	0.0948	0.0744	0.4573 ***
Large	0.0990	0.1582	0.1833	0.1985	0.2454	0.2957	0.2985	0.2936	0.2215	1.6704 ***
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 ***
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 ***
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 ***
Non-debt tax shield										
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 ***
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 ***

Panel B: Flexibility characteristics

	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: Country-level characteristics

	89-90	91-93	94-96	97-99	00-02	03-05	06-08	09-10	89-10	Time Trend x100	
Corporate governance											
Bad			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	**
Good			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)	(4)	Variables (stepwise regression)	(5)
Pre 1989 listing dummy					Tangibility	-1.2688 ***
1989-1993 listing dummy				0.2162 ***	Size	-0.2683 ***
1994-2003 listing dummy				0.3787 ***	Cash	5.0704 ***
2004-2010 listing dummy				1.0920 **	Payout	3.7175 ***
Size	-0.3297 ***	-0.3170 ***		-0.3354 ***	Taxes	5.2468 ***
Market-to-book	0.0474 ***	0.0482 ***		0.0465 ***	Financial system	1.2212 ***
Asset growth	-0.2683 ***	-0.2738 ***		-0.2530 ***	Rating probability dummy	-1.8193 ***
Payout Dummy	-0.2611 ***	-0.2622 ***		-0.0926 ***	Equity issue	0.6814 ***
Payout	4.0566 ***	4.0711 ***		3.3998 ***	Bankruptcy code	0.5025 ***
Equity issue	0.3898 *	0.3865 *		0.8498 ***	1994-2003 listing dummy	0.9264 *
Tangibility	-0.9779 ***	-0.9770 ***		-1.1901 ***	2004-2010 listing dummy	1.3272 ***
Asset Risk	0.2288 ***	0.2294 ***		0.2360 ***	Capital expenditure	-0.2895 ***
R&D	0.5366 ***	0.5243 ***		0.0602 *	Asset growth	-0.3654 ***
Abnormal earnings	-0.1882 ***	-0.1871 ***		-0.1721 ***	Retained earnings	0.0815 ***
Profitability	0.7595 ***	0.7538 ***		0.5850 ***	Domestic savings	-0.0437 *
Taxes	4.4241 ***	4.4194 ***		4.9467 ***	Non-debt tax shield	-2.2388 **
Non-debt tax shield	-0.4970 *	-0.4783 *		0.0126	Market-to-book	0.0471 ***
Cash	4.4347 ***	4.4328 ***		4.4124 ***		
Capital expenditure	-0.5600 ***	-0.5584 ***		-0.6785 ***		
Retained earnings	0.0675 ***	0.0667 ***		0.0907 ***		
Rating probability dummy		-0.0577 *		-0.1091 ***		
Deposits			-0.2981 ***	-0.6892 ***		
GDP per capita growth			-0.0158 **	-0.0400 ***		
Inflation rate			-0.0462 ***	-0.0345 ***		
Domestic savings			-0.0432 ***	-0.0422 ***		
Tax system			-0.3262 ***	-0.1889 ***		
Bankruptcy code			0.0377 **	0.3021 ***		
Financial system			0.8466 ***	0.9871 ***		
Intercept	-1.0125 ***	-1.0579 ***	-1.4986 ***	-1.5527 ***		
Number of observations	83417	83417	83417	83417		83417
Pseudo R^2	0.2505	0.2506	0.0811	0.2697		0.2841

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 for the G7 countries using a two-sample t-test. 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 3). A firm is classified as zero-leverage if it has no long-term and short-term debt in a given year t. variables are defined in Table 1. ***, **, and * indicate statistical significance at 1, 5, and 10 percent level, respectively.

Variable	ZL unconstrained-ZL constrained	Debt-financed-ZL constrained	Debt-financed-ZL unconstrained
Age	2.4891 ***	4.3858 ***	1.8967 ***
Size	2.4559 ***	1.8872 ***	-0.5687 ***
Market-to-book	-0.1162 ***	-0.7831 ***	-0.6668 ***
Asset growth	-0.0459 ***	-0.0247 ***	0.0212 ***
Payout	0.0195 ***	-0.0078 ***	-0.0272 ***
Equity issue	-0.0650 ***	-0.0405 ***	0.0245 ***
Tangibility	0.0438 ***	0.1413 ***	0.0975 ***
Asset risk	-0.0862 ***	-0.0920 ***	-0.0058 ***
R&D	-0.0300 ***	-0.0532 ***	-0.0232 ***
Abnormal earnings	-0.0004 ***	0.0029 ***	0.0033 ***
Profitability	0.1159 ***	0.0689 ***	-0.0470 ***
Taxes	0.0117 ***	-0.0040 ***	-0.0157 ***
Non-debt tax shield	0.0017 ***	0.0064 ***	0.0047 ***
Cash	-0.0625 ***	-0.2389 ***	-0.1764 ***
Capital expenditure	0.0052 ***	-0.0056 ***	0.0091 ***
Retained earnings	0.9877 ***	0.7216 ***	-0.2661 ***
Intangibles	0.0157 ***	0.0208 ***	0.0051 ***
Specificity	0.0155 ***	0.0345 ***	0.0190 ***
Country-level governance	0.0817 ***	0.0179 ***	-0.0638 ***
Deposits	0.0048 ***	0.1432 ***	0.1384 ***
GDP per capita growth	-0.1802 ***	0.1075 ***	0.2878 ***
Inflation rate	-0.1930 ***	-0.3036 ***	-0.1106 ***
Domestic savings	-0.1820 ***	2.5625 ***	2.7445 ***
Number of observations	Unconstrained: 4262 Constrained: 10848	Debt-financed: 127962 Constrained: 10848	Debt-financed: 127962 Unconstrained: 4262

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 United Kingdom) and low (France, Canada, and the United States) creditor protection in the highest quintile (Q5: highest asset-specificity or intangibles) and the lowest quintile (Q1: lowest asset specificity or intangibles). We then compute the difference of the differences between countries with low and high creditor protection.

	Panel A: Asset-Specificity				Difference of differences	**Panel B: Intangibles**				Difference of differences
	US CAN FRA		UK GER			US CAN FRA		UK GER		
	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	Construction
Book leverage	(dltt+dlc) / at
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
Asset risk: The firm's asset risk is measured by the unlevered annualized volatility of the logarithmic monthly stock returns	(Annual return volatility) * mkval / (at-ceq+mkval)
R&D: The firms's research and development expenses	xrd/at
Abnormal earnings	Δ oibdp / mkval
Profitability: The ratio of EBIT to book assets	ebit / at
Taxes: The ratio of the income taxes paid to total book assets	txt / at
Non-debt tax shield: 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	capx/at
Retained Earnings	re / at

Asset specificity: Herfindahl index on sales (s) for industry	$H_j := \sum_{i=1}^{I_J} s_{i,j}^2$
Rating Probability: Logistic regression model predicting rating probability. See Appendix 3 for further details	
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 for	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 (United States, Canada, United Kingdom) and zero for countries with a civil law system (Germany, France, Italy, Japan). (Source: Titman et al., 2010)	
Financial system: A dummy variable that equals 1 if the country's financial system is market-based (United States, Canada, United Kingdom) and 0 if it is bank-based (Germany, France, Italy, Japan). (Source: Demirgüç-Kunt and Levine, 2001)	
Tax system: A dummy variable that equals 1 if the country has a dividend imputation tax system (Germany, France, Italy, Japan, United Kingdom<=2000) and 0 if the country has a classical tax system (United States, Japan, United Kingdom >=2001) 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; United Kingdom, Germany and 0 if the country has low creditor protection (low CPS; United States, Canada, France, Italy, Japan). (Source: Djankov et al., 2007)	

Appendix 2: Description of Compustat abbreviations

Variable	Description	US, CAN	UK	JPN	GER, 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 earnings	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: 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	United States
Tangibility	0.6582 ***	0.0646
Size	1.1312 ***	1.2621 ***
Market-to-book	0.0863 ***	-0.1032 ***
Ebit/sale	-0.0006	-0.0011 *
RD/sale	0.0027 **	0.0043 **
Age	-0.0339 ***	0.0238 ***
Volatility	-0.0317 **	-0.6665 ***
Intercept	-10.2046 ***	-10.1756 ***
Number of observations	143072	55672
Pseudo R^2	0.3598	0.4392

Appendix 4: 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[1] *"Bankruptcy Code"*	CAN[2] *"Bankruptcy Act"*	UK[3] *"Insolvency Act"*	GER[4] *"Insolvenz-verfahren"*	FRA[5] *"Redressement judicaire"*	ITA[6] *"Concordato preventivo"*	JAP[7] *"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**

[1] The exact procedure can be found in Chapter 11 of the "United States Codes".
[2] The exact procedure can be found in the "Bankruptcy and Insolvency Act".
[3] The exact procedure can be found in the "Insolvency-Act" and in the "Enterprise-Act".
[4] The exact procedure can be found in the "Deutsche Insolvenzordnung".
[5] The exact procedure can be found in the sixth book of the "Code de commerce".
[6] The exact procedure can be found in the "Diritto fallimentare".
[7] 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).