AN EMPIRICAL ANALYSIS OF ZERO-LEVERAGE FIRMS: NEW EVIDENCE FROM THE UK

Viet A. Dang*
Manchester Business School
University of Manchester

This draft: August 2013

Abstract

This paper examines why some firms have no debt in their capital structures despite the potential benefits of debt financing. It adds new insights to this zero-leverage phenomenon by addressing two unexplored questions: Does a firm have zero leverage as a consequence of financial constraints or because of a strategic decision to mitigate underinvestment incentives and preserve financial flexibility? Is the decision to follow a zero-leverage policy affected by macroeconomic conditions? Analyzing a new sample of UK firms over the period 1980–2007, we show that the zero-leverage policy is prevalent but that zero-leverage firms are not homogeneous. There are two distinct groups of unlevered firms with different levels of constraints as measured by their dividend policy, namely payers and non-payers. Importantly, we find new evidence that these groups have different motives for eschewing debt. Firms in the second group (non-payers) have zero leverage mainly due to financial constraints. Firms in the first group (payers) deliberately eschew debt to mitigate investment distortions, as predicted by the underinvestment and financial flexibility hypotheses. Macroeconomic conditions have a significant effect on the zero-leverage decision, especially for this less constrained group.

JEL classification: G32.
Keywords: Capital Structure; Low Leverage; Financial Constraints; Underinvestment; Financial Flexibility.

* Email: Vietanh.Dang@mbs.ac.uk. Tel: +44(0)16127 50438. Manchester Business School, University of Manchester, MBS Crawford House, Booth Street West, University of Manchester, M15 6PB, the U.K. I am grateful to two anonymous referees for their helpful comments and suggestions that greatly improve the paper. I would also like to thank Kevin Aretz, Mike Bowe, Yingmei Cheng, Ian Garrett, David Hillier, Robert Hudson, Edward Lee, Brian M. Lucey (the Editor), Gulnur Muradoglu, Yongcheol Shin, Norman Strong, Toni Whited, and participants at the Financial Management Association (FMA) European Conference 2009, Financial Management Association (FMA) Annual Meeting 2009, NEU Finance Seminar for helpful comments and suggestions on earlier drafts of this paper. Partial financial support from the ESRC (Grant Number RES-000-22-3161) is gratefully acknowledged. The usual disclaimer applies.

AN EMPIRICAL ANALYSIS OF ZERO-LEVERAGE FIRMS: NEW EVIDENCE FROM THE UK

Abstract

This paper examines why some firms have no debt in their capital structures despite the potential benefits of debt financing. It adds new insights to this zero-leverage phenomenon by addressing two unexplored questions: Does a firm have zero leverage as a consequence of financial constraints or because of a strategic decision to mitigate underinvestment incentives and preserve financial flexibility? Is the decision to follow a zero-leverage policy affected by macroeconomic conditions? Analyzing a new sample of UK firms over the period 1980–2007, we show that the zero-leverage policy is prevalent but that zero-leverage firms are not homogeneous. There are two distinct groups of unlevered firms with different levels of constraints as measured by their dividend policy, namely payers and non-payers. Importantly, we find new evidence that these groups have different motives for eschewing debt. Firms in the second group (non-payers) have zero leverage mainly due to financial constraints. Firms in the first group (payers) deliberately eschew debt to mitigate investment distortions, as predicted by the underinvestment and financial flexibility hypotheses. Macroeconomic conditions have a significant effect on the zero-leverage decision, especially for this less constrained group.

JEL classification: G32.

Keywords: Capital Structure; Low Leverage; Financial Constraints; Underinvestment; Financial Flexibility.

1. Introduction

One of the most well-known puzzles in corporate finance is the stylized fact that firms carry substantially less debt than is predicted by dominant capital structure theories (e.g., Miller, 1977; Graham, 2000). In addition, recent research on debt conservatism has documented a new and equally important empirical observation that many firms have no debt presence in their capital structures, despite the potential tax advantage of debt financing (Strebulaev and Yang, 2012). The purpose of this paper is to provide new insights into the zero-leverage phenomenon through an empirical analysis of UK firms.

The reasons why a firm would rely fully on equity financing are not well understood in the literature. Although a number of studies have examined conservative financial policies (Minton and Wruck, 2001; Lemmon and Zender, 2001; Iona et al., 2007) and their interactions with investment strategies (Marchica and Mura, 2010; Arslan-Ayaydin et al., 2012; de Jong et al., 2012; Muradoğlu and Sivaprasad, 2012), they do not specifically investigate the zero-leverage phenomenon. This is a significant omission because studying zero-leverage firms can help us to better understand the related 'low-leverage puzzle' (Korteweg, 2010; Strebulaev and Yang, 2012), and overcome the methodological difficulties in identifying what constitutes a low-leverage policy (Devos et al., 2012).

In two contemporaneous empirical studies, Strebulaev and Yang (2012) and Devos et al. (2012) both investigate zero-leverage firms in the US, but provide mixed results. Strebulaev and Yang (2012) find evidence that firms' zero-leverage decisions are affected by managerial features and governance characteristics such as CEO ownership and tenure, board size and independence, and family control status. However, Devos et al. (2012) argue that neither internal nor external governance mechanisms are likely to explain a firm's conservative approach to debt financing. Specifically, they show that a firm will use little debt, not because its managers are entrenched and prefer conservative financial policies, but because the firm has limited access to the debt markets. Devos et al.'s (2012) results are thus consistent with the financial constraint argument that, due to market frictions, a firm cannot borrow to finance positive NPV projects. In the presence of asymmetric information, for example, some firms, especially those that are small and young (Hadlock and Pierce, 2010), may face credit rationing because lenders are unable to identify the quality of their assets in place and new growth opportunities (e.g., Stiglitz and Weiss, 1981).

In this paper, we are interested in two issues that have not been examined in the aforementioned studies of zero-leverage firms. First, we study whether a firm's zero-leverage policy is simply a consequence of financial constraints or is also driven by strategic motives. There are two potential theoretical explanations of why a firm would deliberately eschew debt financing. The underinvestment hypothesis posits that firms with high growth opportunities should avoid debt financing *ex ante* to alleviate the conflict of interests between debtholders and equityholders, thereby controlling the 'debt overhang' problem and the resulting underinvestment incentives (Myers, 1977). The financial flexibility hypothesis argues that, in the presence of market frictions such as adverse selection (Myers and Majluf, 1984) or transaction costs (e.g., Leary and Roberts, 2005), firms eschew debt but accumulate cash to save their borrowing capacity for future investment opportunities (DeAngelo and DeAngelo, 2007; Gamba and Triantis, 2008). Both the underinvestment and financial flexibility hypotheses predict that firms strategically have zero leverage in order to mitigate investment distortions.

Second, we examine whether macroeconomic variables play a role in determining firms' zero-leverage policies. Existing studies only investigate the effects of firm-level factors on a firm's propensity to have zero leverage (Devos et al., 2012; Strebulaev and Yang, 2012). However, prior evidence in the literature suggests that capital structure decisions are affected, not only by firm-specific characteristics, but also by macroeconomic conditions (Korajczyk and Levy, 2003; Antoniou et al., 2008; Cook and Tang, 2010; Erel et al., 2012). Choe et al. (1993) show that economic growth in expansionary periods reduces adverse selection costs and subsequently leads to greater volumes of equity issues. Thus, at the aggregate level, equity issues are pro-cyclical while debt issues are counter-cyclical. On the other hand, in the context of the credit channel, the balance sheet channel theory implies that firm-level leverage is pro-cyclical. In an economic slowdown, firms use little debt because the value of collateral, against which they borrow, declines (e.g., Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997). Further, the impact of macroeconomic variables on corporate borrowing varies across firms with different degrees of financial constraints (Gertler and Gilchrist, 1993). Unconstrained firms can borrow to smooth the impact of an economic shock, while their constrained counterparts cannot afford to do so due to a proportionately larger premium on external funds. Overall, adverse macroeconomic conditions have an important effect on firms' zero-leverage decisions, although the effect is expected to be more pronounced for constrained firms.

In sum, our paper contributes to the limited literature on zero-leverage firms by addressing two previously unexplored questions: (1) Do firms have zero leverage simply due to their lack of external financing or because of a strategic decision to mitigate underinvestment incentives and preserve financial flexibility? (2) Do macroeconomic conditions affect firms' zero-leverage decisions and is the effect different for constrained and unconstrained firms?

In addition to this main contribution, we analyze a new sample of zero-leverage firms in the UK. As reviewed above, the contemporaneous studies on zero-leverage policies focus on US firms. On the other hand, although several studies have examined the capital structure choices of UK firms (e.g., Bennett and Donnelly, 1993; Bevan and Danbolt, 2002, 2004; Ozkan, 2001), they do not investigate the zero-leverage phenomenon. Our paper thus fills this important gap in the literature by examining zero-leverage firms in the UK. We focus on UK firms because the UK provides a particularly suitable environment in which to study extreme debt conservatism. It is well documented that UK firms, on average, have lower leverage ratios than those in other industrialized economies (Rajan and Zingales, 1995; Antoniou et al., 2008). In particular, while the UK is a market-based economy similar to the US, UK firms are more conservative in their debt policies than US firms. The difference in their leverage choices exists mainly because the UK has a creditor-friendly bankruptcy code and the US has an equity-friendly one (Acharya et al., 2011). We expect the zero-leverage policy to be more widespread among UK firms than among their US counterparts, making the UK corporate sector a better testing ground for the zero-leverage phenomenon.

Our empirical analysis provides four main findings. First, we show that the zero-leverage phenomenon is indeed an important empirical fact in the UK corporate sector. Over the sample period between 1980 and 2007, 12.18% of non-financial (publicly listed) firms in the UK have zero outstanding debt, compared to the 10.2% in the US documented by Strebulaev and Yang (2012). This finding supports our conjecture that the zero-leverage policy is more common in the UK than in the US. Further, we document that more than one third of UK firms have no debt for at least a part of the sample period. Extreme debt conservatism has become more prevalent in recent years, and was especially so over the period 2000–2007, when nearly a fifth of firms were debt-free.

Second, zero-leverage firms are not homogeneous. We identify two relatively equal-sized groups of zero-leverage firms that face different levels of financial constraints, as proxied by their dividend policy, namely dividend payers and non-payers. The second group

(i.e., zero-leverage non-payers) consists of young, growth firms with small size, negative profitability, and low tangibility and *z*-scores. These characteristics fit the description of a typical constrained firm. In contrast, firms in the first group (i.e., zero-leverage payers) do not face severe constraints because they are more mature and profitable, as well as larger in size, with relatively higher dividend payout ratios.

Third, and more importantly, we find that these two groups of firms have different motives for eschewing debt. For firms in the second group (non-payers), having zero leverage is mainly a consequence of their limited exposure to the debt markets. This finding is consistent with the financial constraint hypothesis and is in line with Devos et al. (2012). However, for firms in the first group (payers), the zero-leverage policy is not simply caused by a lack of external financing but is driven by strategic considerations. We find that firms with high growth prospects are more likely to have zero leverage so as to mitigate underinvestment incentives and preserve financial flexibility. Zero-leverage firms, especially those in the first group (payers), are likely to take advantage of their preserved borrowing power and lever up when valuable investment opportunities arise and/or their cash reserves are depleted. Moreover, following the strategic decision to eschew debt, the ability of these firms to invest in future growth opportunities is enhanced. Taken together, we document strong evidence in favor of the financial constraint hypothesis for unlevered non-payers, and some support for the underinvestment and financial flexibility hypotheses, especially for unlevered payers.

Finally, our analysis suggests that firms are likely to eschew debt under macroeconomic conditions that are not conducive to corporate borrowing, conditions characterized by a low, or even negative, GDP growth rate or a widened term structure of interest rates. However, the effects of these macro-level variables on firms' zero-leverage policies and on zero-leverage firms' decisions to issue debt are only significant for the relatively less constrained group of payers.

The remainder of the paper is organized as follows. Section 2 discusses potential theoretical explanations for the zero-leverage phenomenon. Section 3 develops the empirical models and methods, and describes the data and sample. Section 4 analyzes the characteristics of zero-leverage firms. Section 5 provides a multivariate analysis of the propensity of firms to eschew debt and the decision of zero-leverage firms to subsequently lever up. In this section, we also conduct a regression analysis to assess the ability of firms to invest following a period of zero-leverage policy. Section 6 concludes the paper.

2. Potential Explanations for a Zero-Leverage Policy and Hypothesis Development

In this section, we review potential explanations for the zero-leverage phenomenon, as suggested by the existing theories on capital structure. We also discuss several variables that we use in our empirical work to test those explanations.

2.1. The Financial Constraint Hypothesis

In imperfect capital markets, a firm's capital structure is determined not only by its demand for capital, but also by its ability to raise funds externally (i.e., the supply side). In the presence of market frictions, some firms may not be able to obtain sufficient external financing to fund positive NPV projects. Specifically, under asymmetric information, a firm may face credit rationing because lenders cannot easily evaluate the firm's quality and the quality of its investments (Stiglitz and Weiss, 1981). Similarly, some firms are too risky to be able to obtain a bank loan or issue bonds; they must turn to equity financing, which is feasible but has high informational dilution costs (Bolton and Freixas, 2000). In the presence of moral hazard, a firm may not borrow directly (by issuing publicly traded bonds) if it does not have a strong reputation in the debt markets (Diamond, 1991). In a similar vein, a firm is unable to meet liquidity needs if it cannot credibly pledge eventual returns to lenders (Holmstrom and Tirole, 1998). The implication of these arguments is that 'financially constrained' firms are underlevered compared with their unconstrained counterparts. Faulkender and Petersen (2006) show, for example, that firms without access to the public bond market have 35% less debt than firms with such access. In sum, the financial constraint hypothesis suggests that the zero-leverage phenomenon is a consequence of constrained firms being rationed by their lenders.

We use *firm size* and *age* to test the validity of the financial constraint hypothesis. Previous research shows that constrained firms are typically small and young (Hadlock and Pierce, 2010). Accordingly, we predict that firm size and age will have negative effects on a firm's propensity to have zero leverage.

2.2. The Underinvestment and Financial Flexibility Hypotheses

Myers (1977) shows that firms with valuable growth opportunities and risky debt overhang have an incentive to underinvest in positive NPV projects. This underinvestment problem arises because the payoff from a new investment may partially accrue to debtholders rather than fully accruing to equityholders. One possible solution to this incentive problem is for firms anticipating valuable growth opportunities in the future to reduce leverage and the risky

debt overhang (Johnson, 2003; Dang, 2011). In sum, the underinvestment hypothesis predicts that firms have zero leverage for strategic reasons, with a view to reducing the agency costs of debt and mitigating underinvestment incentives.

The financial flexibility hypothesis argues that, in the presence of market frictions such as adverse selection (Myers and Majluf, 1984) and transaction costs (Leary and Roberts, 2005), high-growth firms will strategically choose to have very little debt but large cash reserves in order to preserve their borrowing power and mitigate investment distortions (Modigliani and Miller, 1963; DeAngelo and DeAngelo, 2007; Gamba and Triantis, 2008; de Jong et al., 2012). The intuition behind this argument is that firms use debt conservatively today, in order to save their debt capacity for financing imperfectly anticipated investment opportunities tomorrow. In sum, the hypothesis implies that a firm's zero-leverage policy is driven by its desire to build and preserve financial flexibility.

The underinvestment and financial flexibility hypotheses lead to similar predictions that firms should avoid debt financing in order to alleviate future investment distortions. However, the financial flexibility hypothesis further highlights the role of cash holdings as a mechanism for enhancing investment ability. Both of these hypotheses are different from the financial constraint hypothesis in one important aspect: they predict that firms eschew debt for strategic reasons rather than due to a lack of external financing. The financial constraint hypothesis, by definition, should apply to severely constrained firms such as small and young firms (Hadlock and Pierce, 2010) and non-payers of dividends (e.g., Fazzari et al., 1988). The underinvestment and financial flexibility hypotheses, on the other hand, are likely to be most relevant to unconstrained firms.

We test the underinvestment hypothesis by examining the relation between firms' *growth opportunities* and their propensities to eschew debt. The more valuable the growth options, the higher the agency costs of debt overhang and the greater the incentive to underinvest. Thus, high-growth firms are more likely to reduce debt to mitigate the underinvestment problem. In short, we expect growth opportunities to be positively associated with firms' zero-leverage decisions.[1]

We test the validity of the financial flexibility hypothesis by examining the effects of both *growth opportunities* and *cash holdings* on a firm's zero-leverage policy. As mentioned above, firms with many growth options typically preserve their debt capacity for future

[1] Small and high-growth firms may be credit-constrained due to asymmetric information. We examine this conjecture by categorizing firms into two groups, more and less constrained firms, in subsequent analysis.

investments by eschewing debt and hoarding cash (e.g., DeAngelo and DeAngelo, 2007). Hence, we postulate that cash holdings will have a positive impact on a firm's propensity to be unlevered.

2.3. Macroeconomic Conditions

Firms may use debt financing conservatively under macroeconomic conditions that are not conducive to borrowing. Korajczyk et al. (1990) and Choe et al. (1993) argue that firms prefer equity to debt financing during periods of economic growth. This is because, in expansionary phases of the business cycle, there is less uncertainty about assets in place and there are more investment opportunities and lower adverse selection costs. The implication is that, at the aggregate level, leverage is counter-cyclical. On the other hand, in the context of the credit channel literature, the balance sheet channel theory implies that firm-level leverage is pro-cyclical. The reason for this is that, in an economic downturn, a firm uses little debt, as its net worth and collateral value drop (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Korajczyk and Levy, 2003). See Bernanke and Gertler (1995) for a review.

Moreover, Gertler and Gilchrist (1993) show that the impact of business cycle variables on a firm's capital structure varies with the degree of financial constraint it faces. Using firm size as a proxy for the degree of constraint, the authors document an important difference in the behavior of constrained and unconstrained firms. Following recessions associated with a monetary contraction, lending to the former type of firm declines relative to lending to the latter type. While unconstrained firms are able to borrow more to smooth the impact of declining sales, constrained firms face credit rationing due to a proportionately larger premium on external financing. This behavior is consistent with the hypothesis that constrained firms are more sensitive to credit market frictions and imperfections such as asymmetric information. Taken together, adverse macroeconomic conditions are likely to lead to debt conservatism, but the effect should vary with the degree of constraint.

To examine the impact of macroeconomic conditions on a firm's zero-leverage policy, we use *the (real) GDP growth rate*. Firms are likely to use debt conservatively in an economic slowdown or recession, as would be indicated by a low or negative GDP growth rate. Put differently, the GDP growth rate should have a negative effect on firms' zero-leverage decisions. Further, this effect is likely to be more significant for constrained firms than their unconstrained counterparts.

In addition, we consider two macroeconomic variables often used in capital structure studies (e.g., Antoniou et al., 2008), namely *the term structure of interest rates* and *the equity*

premium. Firms are likely to prefer equity over debt financing when the term structure of interest rates widens, leading to higher costs of debt, especially long-term debt. The effect of equity premiums on capital structure in general, and conservative debt policies in particular, is less clear. A low equity premium means that equity is relatively less costly, thus creating a greater incentive for firms to rely on equity and eschew debt. However, a high premium may be caused by investors' overconfidence in 'hot' market conditions, of which firms can take advantage by issuing more of their overvalued equity (Baker and Wurgler, 2002; Antoniou et al., 2008). Overall, the impact of the equity premium on firms' propensities to be unlevered is ambiguous and will need to be resolved empirically.

2.4. Other Explanations: The Trade-off and Pecking Order Theories

Although our paper focuses on testing the above hypotheses, our empirical analysis also considers other motives for firms to eschew debt, as suggested by the two dominant views of capital structure, namely the trade-off and pecking order theories. We do not, however, examine motives associated with governance and managerial characteristics, as there is conflicting evidence on the effects of corporate governance mechanisms on zero-leverage policies (see Devos et al., 2012; Strebulaev and Yang, 2012).

The static trade-off view predicts that firms have optimal capital structures that balance the costs (e.g., financial distress costs) and benefits (e.g., debt tax shield) of debt financing (e.g., Kraus and Litzenberger, 1973; see also Frank and Goyal, 2007 for a review). Under this framework, firms eschew debt *ex ante* to minimize the (expected) costs of financial distress and bankruptcy. These financial distress concerns are likely to be most relevant to firms with poor performance that would have difficulty servicing debt. On the other hand, firms with low debt tax shields (Graham, 2000) and high non-debt tax shields (DeAngelo and Masulis, 1980) have little incentive to lever up. Moreover, in the spirit of dynamic trade-off models based on transaction costs (Fischer et al., 1989; Leary and Roberts, 2005), firms may deviate from their target leverage ratios and maintain no debt in their capital structures, although they should adjust toward these targets in the long run.

To test the trade-off theory explanation, we consider four variables: *the tax ratio*, *non-debt tax shields*, *tangibility* and *the z-score*. Firms that face a low corporate tax rate, proxied by the effective tax rate, have less incentive to exploit the tax advantage of debt. Firms that have large non-debt tax shields are less likely to use debt, given the potential substitutability between debt and non-debt tax shields. Firms with few tangible assets tend to have little leverage due to the asset substitution effect (Jensen and Meckling, 1976); however,

tangibility is also a proxy for financial constraints (Benmelech and Bergman, 2009). Firms with low *z*-scores are more likely to face high (expected) financial distress costs that discourage them from using debt. In sum, we predict that a firm's propensity to be unlevered will be negatively associated with the tax ratio, asset tangibility and the *z*-score but positively affected by non-debt tax shields.

The pecking order theory offers another potential explanation for the zero-leverage phenomenon. It argues that, under asymmetric information, investors who do not know about a firm's value and its future growth prospects will place a discount on new security issues (Myers and Majluf, 1984; Myers, 1984). Consequently, the firm will prefer to use securities that are less risky and less sensitive to mispricing. Retained earnings will be preferred to debt financing and equity will be issued as a last resort. Hence, profitable firms with large cash flows do not need to raise debt as they can use their internal funds to finance new investment opportunities. The 'modified' version of the pecking order theory also suggests that firms exceeding their debt capacity may prefer equity to debt when they have exhausted internal funds (Myers, 1984; Lemmon and Zender, 2010).

We use the *cash flow* variable to capture the prediction of the pecking order theory. Firms with ample cash flow can fund investment opportunities with retained earnings, and thus have less incentive to use debt. Hence, we expect cash flow to have a negative impact on a firm's propensity to be unlevered.

We consider two further variables, *the dividend payout ratio* and *earnings volatility*, as proxies for the degree of asymmetric information, which is related to both the pecking order theory and the financial constraint hypothesis, as discussed above. Firms with low dividend ratios and/or volatile earnings are more likely to suffer from high informational costs, hence limited access to the debt markets. We thus predict that a firm's propensity to eschew debt financing will be negatively related to the dividend payout ratio and positively associated with earnings volatility.

3. Methodology and Data

3.1. Empirical Models and Methods

We conduct both univariate and multivariate regression analysis. In the univariate analysis, we investigate whether the characteristics of zero-leverage firms are consistent with the hypotheses developed in Section 2. In the multivariate analysis, we perform a number of regressions. First, we conduct a logistic regression analysis to examine both firm-specific and

macroeconomic factors determining a firm's propensity to have zero leverage. The main model takes the following form:

$$\Pr(ZL = 1 \mid \mathbf{X}) = \frac{1}{1 + e^{-(\alpha + \mathbf{X}\boldsymbol{\beta})}}, \quad (1)$$

where *ZL* is a binary variable taking the value 1 if the firm has zero leverage in a given year and 0 otherwise, **X** is a vector of the firm-level and macroeconomic variables that determine a zero-leverage decision, **β** is the vector of coefficients, and α is a constant. As discussed in detail in Section 2, we include in **X** the following firm-specific variables: *firm size*, *age*, *growth opportunities*, *cash holdings*, *the tax ratio*, *non-debt tax shields*, *tangibility, the z-score*, *cash flow*, *the dividend payout ratio* and *earnings volatility*. Unlike contemporaneous studies of zero-leverage firms (Devos et al., 2012; Strebulaev and Yang, 2012), we also consider three macroeconomic variables: *the real GDP growth rate*, *the term structure of interest rates* and *the equity premium*. Additionally, we include a dummy variable for the previous year's zero-leverage decision to control for the persistence of a zero-leverage policy. We use industry dummies to control for the possibility that the zero-leverage policy is dependent on industry. Definitions of the variables are provided in the appendix.

Second, we perform a similar logistic regression to study the decision by a zero-leverage firm to lever up (with an increase in leverage of at least 1%). This analysis is based on the same model (1), with the main change being that the binary, dependent variable is the zero-leverage firm's decision to lever up in the year t+1, having had zero leverage in year t. We consider all the explanatory variables listed above, and add two potential regressors. We include *firm investment* in year t to examine the financial flexibility hypothesis that zero-leverage firms are likely to draw upon their flexibility and use debt when investment opportunities arise. Further, we use *the deviation from target leverage* to investigate whether zero-leverage firms lever up so as to move toward their target leverage, as predicted by the dynamic trade-off theory. In particular, in trade-off models with transaction costs, the likelihood of a leverage adjustment occurring increases with the magnitude of the deviation from target leverage (e.g., Fischer et al., 1989; Leary and Roberts, 2005).[2]

Finally, to distinguish the financial constraint hypothesis from the underinvestment and financial flexibility hypotheses, we further estimate a linear Tobin's *Q* investment model

[2] Target leverage ratios are proxied by the fitted values estimated from a regression of leverage on commonly used firm characteristics, including tangibility, (log of) total assets, non-debt tax shields, growth opportunities and profitability (Rajan and Zingales, 1995; Frank and Goyal, 2009). For brevity, these regression results are untabulated but available upon request.

(Cleary, 1999). This additional regression enables us to examine the effect of a firm's zero-leverage policy on its future investments. If the zero-leverage policy is driven by a strategic decision aimed at mitigating investment distortions, as predicted by the underinvestment and financial flexibility hypotheses, the firm's ability to invest in future growth opportunities should be enhanced. This is an important extension to existing studies of zero-leverage firms that only use logistic regressions and do not examine these alternative explanations.

We use the pooled logistic and OLS estimators for the logistic and linear regressions, respectively. We provide robust standard errors that are adjusted for heteroskedasticity and clustered by firm (Petersen, 2009). For the logistic regressions, we only report the (average) marginal effects, i.e., the partial derivatives $\partial \Pr(ZL_{i,t} = 1)/\partial X$ that measure the change in the predicted probability of a firm having zero leverage resulting from an infinitesimal change in a continuous independent variable or from a switch of a dummy variable from zero to one, holding other variables constant at their respective means (Bartus, 2005).

3.2. Data

We examine a panel of UK listed firms collected from the *Worldscope* database for the period 1980−2007. We retrieve data for the macroeconomic variables from the *Datastream* database. We impose a number of standard data restrictions. First, as in previous capital structure research, we exclude financial and utility firms because these firms are subject to different regulations and have different capital structures. Next, we remove firm-year observations that have missing data for the variables of interest. Finally, we follow the literature (e.g., Flannery and Rangan, 2006) and winsorize the variables (except for leverage) at the 1st and 99th percentiles to mitigate the potential effects of extreme values. The final sample comprises 3,082 firms and 25,408 firm-year observations. The descriptive statistics for the variables are similar to those documented earlier for UK firms (e.g., Ozkan, 2001) and so, for brevity, we do not report them.

4. Univariate Analysis

4.1. Distributions of Zero-leverage Firms

Table 1 reports the empirical distribution of zero-leverage firms by time and according to Fama–French's classification of 10 industry groups. The results reveal that, over the period 1980−2007, 12.18% of the firm-year observations have zero outstanding debt, that is, neither

short-term nor long-term debt. More than one third (34.46%) of UK firms have zero leverage for at least part of the period. Compared to US evidence (Strebulaev and Yang, 2012), the proportion of zero-leverage firms in the UK is slightly larger. This finding is consistent with the empirical fact that UK firms have lower leverage ratios than their US counterparts (Rajan and Zingales, 1995). A potential explanation for this is that under the creditor-friendly bankruptcy code that prevails in the UK, the country's firms adopt a more conservative approach to debt financing (Acharya et al., 2011).

Panel A reveals considerable variation in the proportion of zero-leverage firms over time. This proportion averages at 5.82% over the period 1980–1989, but increases steadily after that, averaging at 7.54% between 1990 and 1999 before rising sharply to 19.06% over the period 2000–2007. This shows that extremely conservative debt policies have prevailed in recent years, consistent with the trend in the late 1990s and early 2000s, when many small, high-growth firms went public but had limited access to debt finance. A similar trend is documented in contemporaneous US research (Devos et al., 2012).

Panel B shows that zero-leverage firms are concentrated in the oil, gas and coal business (25.35%), followed by business equipment/technology (20.39%) and healthcare (20.33%). While extreme debt conservatism is not unexpected in high-growth industries such as technology and healthcare, it is less clear why many large oil, gas and coal firms have no debt. A possible explanation for this finding is that these companies have large cash holdings and, thus, less incentive to borrow, as predicted by the financial flexibility hypothesis. A small fraction of zero-leverage firms operate in traditionally capital-intensive sectors such as manufacturing (5.45%) and chemicals (4.27%). Overall, there is evidence that extreme debt conservatism is dependent on industry.

4.2. Characteristics of Zero-Leverage Firms

4.2.1. Results for the Whole Sample

In this section, we compare the characteristics of zero-leverage firms with those of levered firms. We also consider a proxy sample, consisting of levered firms matched by year, industry and firm size (within ±10% of the original firm size). Using this control group allows us to examine whether comparable firms have different leverage ratios, and if so, what factors determine their differing debt policies. We also construct alternative proxy samples where we match firms in additional dimensions, such as firm age and dividend-paying status,

to control for their varying stages of growth and maturity and access to the debt markets, which affect capital structure decisions. The results (untabulated) are qualitatively similar.

The results in Panel A of Table 2 provide support for all the main hypotheses of interest. First, the zero-leverage firms in our sample (column (1)) are significantly smaller and younger than the levered and matched firms (columns (2) and (3)). These findings are in line with the financial constraint hypothesis because small and young firms are most likely to be credit-constrained (Hadlock and Pierce, 2010). Second, the zero-leverage firms have considerably more valuable growth opportunities than the levered and matched firms. This finding is consistent with the underinvestment hypothesis that high-growth firms eschew debt (Myers, 1977). The results regarding firm investment corroborate this hypothesis: the zero-leverage firms seem to underinvest compared to the levered and matched firms. Third, the zero-leverage firms are highly liquid and hold large cash balances, which is in line with previous evidence on low-leverage firms (Harford, 1999; Opler et al., 1999; Minton and Wruck, 2001). This finding supports the argument that growth firms accumulate cash in order to preserve their financial flexibility and reduce investment distortions (DeAngelo and DeAngelo, 2007). Note that firms may hoard cash today if they are concerned about future financing constraints (Almeida et al., 2004, 2011); however, this dynamic view focuses on anticipated constraints and is not entirely in line with the above finding that the zero-leverage firms have immediate concerns about financing constraints and investment distortions.

There is, however, mixed and weak evidence for other theoretical explanations. The zero-leverage firms in our sample have fewer tangible assets than the levered and matched firms, which is in line with the trade-off view. Taken together with the results regarding firm size and age, this also suggests that zero-leverage firms face substantial agency and transaction costs that limit their access to debt financing. The zero-leverage firms face a lower tax rate than the levered and matched firms, thus giving them less incentive to enjoy the tax benefits of debt financing. While these findings seem consistent with the trade-off theory, the results regarding other characteristics are in opposition to its prediction. The zero-leverage firms have significantly lower non-debt tax shields than the levered and matched firms, which is not in line with a broader trade-off framework (DeAngelo and Masulis, 1980). They also have very high *z*-scores, suggesting that they may not face serious financial distress concerns. More importantly, the zero-leverage policy is suboptimal: the zero-leverage firms are heavily underlevered, with an average 5.8% deviation from their target leverage.

The characteristics of the zero-leverage firms in our sample are not in line with the pecking order theory. The average profit margin for these firms is negative, and significantly lower than for the levered and matched firms. We document a similar pattern for the cash flow variable. Thus, an average zero-leverage firm makes a loss and cannot generate sufficient internal funds. This finding contradicts the pecking order theory and the puzzling observation that the zero-leverage firms pay dividends, albeit at a lower payout ratio than the levered firms.

In the next subsection we will compare the characteristics of zero-leverage firms that pay dividends and those that do not, in order to investigate this puzzling finding. Our analysis is further motivated by previous empirical research that uses dividend policy (Fazzari et al., 1988; Almeida et al., 2004) to distinguish between more and less constrained firms. Firms with greater constraints typically make no dividend payouts in order to reduce the probability of having to visit external capital markets (Cleary, 2006). An analysis of more constrained versus less constrained firms is crucial to our understanding of the zero-leverage phenomenon (Korteweg, 2010; Strebulaev and Yang, 2012). Zero-leverage firms may not be homogeneous. In light of the evidence presented above, it is likely that the group that is more constrained consists of very small and young firms, with poor performance and without access to the debt markets, for which conservative debt policies are expected. However, for the less constrained group, zero leverage may be driven by strategic financial and investment considerations, as predicted by the underinvestment and financial flexibility hypotheses.

4.2.2. Results for Sub-samples of Firms with Different Levels of Financial Constraints: Dividend-paying versus Non-dividend-paying Firms

Panel B of Table 2 reveals several important differences between the two relatively equal-sized groups of zero-leverage firms: dividend payers and non-payers. The latter group (column (2)), which accounts for 6.5% of the sample, indeed possesses several characteristics typical of constrained firms. For example, firms in this group have large negative profit margins and cash flow ratios as well as low asset tangibility and negative *z*-scores. They are very small and young, with large cash holdings and high growth prospects. Hence, our previous observation that zero-leverage firms have negative profitability is driven by the large losses incurred by unlevered non-payers that face high levels of constraints.

On the other hand, more than 46% of the zero-leverage firms in the sample do pay dividends and, interestingly, these firms appear to be in a much healthier financial position (see column (1)). Compared with the unlevered non-payers (column (2)), they are more

mature and larger, with higher profitability and higher tangibility. Compared with the levered payers (column (3)), these firms even have better financial performance, higher dividend payout ratios and higher *z*-scores. However, these unlevered payers remain relatively small and young, suggesting that they still have some (weak) forms of constraints.

In sum, we find that zero-leverage firms are not homogeneous. There exist two clearly distinct groups of unlevered firms with different levels of financial constraints, namely dividend payers and non-payers. Our univariate analysis provides strong evidence to support the financial constraint hypothesis, especially for unlevered non-payers. There is, however, moderate evidence in favor of the underinvestment and financial flexibility hypotheses.

4.3. Characteristics of Zero-Leverage Firms over Time

Since a number of the theoretical explanations for the zero-leverage phenomenon are dynamic in nature, we next analyze the intertemporal financing and investment patterns of zero-leverage firms. Figure 1 demonstrates the changes in several firm-specific characteristics in the five years before and after the event year, *t*, when zero-leverage status is realized. We also compare and contrast these patterns with those for levered firms.

Figure 1 reveals four important patterns. First, the zero-leverage firms in our sample adopt persistent conservative debt policies. As Figure 1.a shows, they maintain consistently lower leverage than the levered firms. Second, according to Figures 1.b and 1.c, these firms are active in both the equity and debt markets. More importantly, they seem to be most credit-constrained between $t - 5$ and t, over which period they do not take on any debt. After the event year, these zero-leverage firms are able to access the debt markets.

Third, Figure 1.d corroborates our earlier evidence that the zero-leverage firms underinvest compared with their levered counterparts. However, the difference in their relative investments decreases gradually after the event year and subsequently becomes negligible. In year $t+1$, these zero-leverage firms experience a substantial increase in their investment, which coincides with a sharp increase in their net debt issues, as shown in Figure 1.c. These findings suggest that, by strategically eschewing debt, zero-leverage firms are able to mitigate investment distortions, which is consistent with the financial flexibility and underinvestment hypotheses.

Fourth, Figure 1.e confirms our earlier finding that the zero-leverage firms are considerably underlevered. Their deviation from target leverage is greatest in the event year. Importantly, dynamic trade-off considerations seem to play a role in the capital structure

decisions of these firms. After the event year, the zero-leverage firms lever up to reduce the deviation from the target leverage.

To account for the differences in the characteristics of zero-leverage firms with different levels of financial constraints, we also partition them into payers and non-payers. The (unreported) results reveal one important difference between these two groups of firms: Unlevered payers invest more than unlevered non-payers, indicating that the former group has a greater ability to reduce investment distortions. This is in line with our prediction that the underinvestment and financial flexibility hypotheses better explain the financing and investment decisions of this less constrained group.

In sum, the analysis in this subsection corroborates our earlier finding that a firm's zero-leverage decision is not simply driven by its limited access to external finance. Underinvestment problems, financial flexibility and the optimal capital structure also play an important role in shaping such a strategy. In the next section, we turn to multivariate regression analysis to examine these alternative explanations in more detail.

5. Multivariate Analysis

5.1. Logistic Regression Analysis of a Firm's Decision to Have Zero Leverage

5.1.1. Results for the Whole Sample

Panel A of Table 3 contains the results from our logistic regression analysis of a firm's propensity to have zero leverage, for the whole sample. We report the full specification of Equation (1) in column (1), and three alternative specifications in the remaining columns. Specifically, in column (2), we exclude cash holdings, because in an (unreported) correlation analysis this variable is strongly correlated with growth opportunities. In column (3), the *z*-score is excluded due to its strong correlation with cash flow and cash holdings. In column (4), the dummy variable for the previous year's zero-leverage policy is not used, in order to avoid any potential estimation complexities associated with this dynamic term. The regression results for the industry dummies are broadly consistent with the univariate analysis above and so are not reported to preserve space.

Overall, all of the regressions are statistically significant, with the pseudo *R*-squared ranging from 0.207 to 0.547. Importantly, the results are generally consistent with the univariate analysis above and supportive of the main hypotheses. The coefficient on firm size is significantly negative in models (1)–(4), while the coefficient on firm age is statistically

significant with a positive sign in the first three models, and insignificant in model (4). The first finding suggests that small firms are likely to have zero leverage, which is consistent with the financial constraint hypothesis. The second finding, regarding firm age, appears to be inconsistent with this view, but it is most likely caused by the correlation with firm size. In an unreported test, when we exclude firm size to avoid this multicollinearity problem, the coefficient on firm age flips sign and becomes significantly negative as predicted.

Next, we find some evidence for the underinvestment and financial flexibility hypotheses. Growth opportunities have a statistically significant, positive effect on a firm's propensity to be unlevered (except in model (1)), although the effect is rather small in magnitude (between 0.003 and 0.008). This finding provides moderate support for Myers' (1977) underinvestment hypothesis. The coefficient on cash holdings is significantly positive, which, taken together with the results for growth opportunities, suggests that firms with large cash reserves and high growth opportunities are more likely to eschew debt. This finding supports the financial flexibility hypothesis that firms adopt conservative financial policies so as to meet imperfectly anticipated capital requirements (DeAngelo and DeAngelo, 2007).

In terms of the macroeconomic variables, the real GDP growth rate and the term structure of interest rates have significant effects on a firm's propensity to become debt-free (except for the GDP growth rate in column (4)). Specifically, firms are more likely to eschew debt when the GDP growth rate declines and/or when the term structure of interest rates widens. The finding regarding economic growth supports the balance sheet channel theory's prediction that leverage is pro-cyclical (e.g., Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997). Overall, the results are consistent with our hypothesis that the zero-leverage policy is driven by adverse macroeconomic conditions that are not conducive to borrowing.

Our regression results provide little support for other theoretical explanations. With respect to the static trade-off theory, the tax ratio is insignificant while non-debt tax shields are significant (except in column (1)), with an unexpected negative sign. A potential explanation for the finding regarding the non-debt tax shields variable is that zero-leverage firms have fewer tangible assets and consequently lower depreciation, which is our proxy for this variable. In sum, the results for the tax-related variables offer no support for the static trade-off theory. Next, the coefficient on the *z*-score is significantly positive but is negligible in magnitude. This finding suggests that financial distress concerns are not an important factor when it comes to firms' zero-leverage decisions. The results regarding asset tangibility and firm size appear to be more in line with the trade-off theory. Firms with limited tangible

assets and small firm size are significantly more likely to be unlevered (except for tangibility in model (1)). However, to the extent that these variables are suitable proxies for access to debt financing, the findings are consistent with the financial constraint view.

Regarding the pecking order theory, the coefficient on cash flow is significantly positive in models (1) and (3), significantly negative in model (2) and insignificant in model (4). Hence, there is mixed and weak evidence supporting the first rung of the pecking order of financing choices, whereby firms should not use debt when they have sufficient internal funds. To examine whether zero-leverage firms follow the second rung of the pecking order (i.e., debt versus equity), we also regress leverage changes on financing gaps, as in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). Our (unreported) analysis shows that any cash flow deficits of zero-leverage firms are mainly offset by their net equity issues, which is inconsistent with the pecking order theory's prediction. Overall, our results provide little support for this theory.

In addition, there is no evidence supporting the related asymmetric information argument that firms with volatile earnings and low dividend payout ratios should eschew debt due to high informational costs. We find that earnings volatility is insignificant, while the dividend payout ratio is significant at 1% with a positive sign. However, the finding regarding the dividend payout ratio should be interpreted with care, given the existence of two groups of zero-leverage firms with different levels of constraints, dividend payers and non-payers.

Finally, we document further support for the conjecture that corporate debt conservatism is persistent over time. The coefficient on the previous year's zero-leverage decision is economically and statistically significant. Thus, consistent with the univariate analysis, zero-leverage firms are likely to maintain their extremely conservative approach to debt financing.

5.1.2. Results for Sub-samples of Firms with Different Levels of Financial Constraints: Dividend-paying versus Non-paying Firms

We now turn to Panel B of Table 3 to study dividend payers and non-payers and examine whether these firms have different motives for eschewing debt. Our analysis is motivated by the finding in the univariate analysis that these two groups are heterogeneous.

Panel B of Table 3 shows that most of the main findings in Panel A still hold true, although the effects of some variables vary in the respective models for payers and non-payers. In particular, the negative effects of firm size and tangibility are stronger for the latter

firms. These results support the financial constraint hypothesis, which should be more relevant to the constrained group of non-payers. However, this hypothesis does not seem to hold for payers. We find that the dividend payout ratio is significantly positive for these firms, which is contrary to what the hypothesis would predict. Next, the coefficient on growth opportunities is only significant with the expected sign for payers and not for non-payers (except in model (4)). This finding is consistent with the underinvestment and financial flexibility hypotheses, which are more relevant to the less constrained group of payers.

Finally, the effect of the GDP growth rate is only significant for payers (except in model (4)). This result is puzzling because it is inconsistent with previous evidence that firms that are constrained (i.e., non-payers) tend to be more vulnerable to adverse macroeconomic conditions (Gertler and Gilchrist, 1993). However, our evidence is broadly in line with Korajczyk and Levy's (2003) finding that the impact of macroeconomic conditions on security choices is more pronounced in the unconstrained group (i.e., payers). The authors argue that unconstrained firms can deviate from their target leverage in order to 'time' their security issues to periods of favorable market conditions, a strategy that constrained firms cannot afford to pursue.

In sum, we find strong evidence to support the financial constraint hypothesis, especially for non-payers, and moderate evidence in favor of the underinvestment and financial flexibility hypotheses, particularly for payers. We also document some evidence that macroeconomic conditions affect firms' zero-leverage decisions, mainly among the less constrained group of payers.

5.2. Logistic Regression Analysis of a Zero-leverage Firm's Decision to Lever Up

5.2.1. Results for the Whole Sample

Next, we study a zero-leverage firm's propensity to take on debt (with an increase in leverage of at least 1%), thereby dropping its zero-leverage policy. The choice of a leverage change of 1% is arbitrary but empirically reasonable considering that firms with a leverage ratio of 1% are above the 20th percentile of the distribution. As described in Section 3.1, in this logistic regression, the dependent variable is the decision by a firm with zero leverage in year t to lever up in year t+1. In addition to the same set of explanatory variables used in Table 3, we consider two additional variables, namely firm investment and target leverage deviation (see footnote 2 for details of the latter variable). Column (1) of Panel A, Table 4, reports the results for the full specification, whereas columns (2) and (3) contain the results for two

restricted models in which firm age, cash holdings, tangibility and/or the *z*-score are excluded to avoid potential multicollinearity problems.

Overall, the results in Panel A of Table 4 are slightly less significant than those in Panel A of Table 3. However, we document continued support for all the main hypotheses. First, in terms of the financial constraint hypothesis, although firm age now loses its statistical significance, firm size remains positive and statistically significant in all models. The latter finding is consistent with this hypothesis because firms are more likely to use debt when they grow in size and become less constrained.

Second, there is further evidence for the underinvestment and financial flexibility hypotheses. Growth opportunities have a negative effect on a zero-leverage firm's propensity to initiate debt. This suggests that high-growth firms still wish to retain their extremely conservative debt policies to mitigate the debt overhang problem, as predicted by the underinvestment hypothesis. The results regarding firm investment and cash holdings indicate that zero-leverage firms are likely to take advantage of their preserved borrowing power and lever up when valuable investment opportunities arise and/or their cash reserves are depleted. Both of these findings are in line with the financial flexibility hypothesis.

Third, in terms of the macroeconomic variables, the term structure of interest rates is only significantly negative in model (3), while the GDP growth rate is significantly positive in all models. The latter finding suggests that firms are likely to start borrowing again when the macroeconomic environment becomes more favorable, as measured by a higher GDP growth rate. It is also consistent with the prediction that leverage is pro-cyclical.

Regarding other theoretical explanations, the results offer little support for the static trade-off theory. Specifically, the tax ratio is insignificant, while non-debt tax shields are significant with a positive sign. On the other hand, the coefficient on asset tangibility is negative and significant (at 10% in model (2)). The latter two findings suggest that zero-leverage firms with more non-debt tax shields and fewer tangible assets are more likely to lever up, both of which are in opposition to the trade-off theory's predictions. Finally, the *z*-score is insignificant in model (1) and significant with an unexpected sign in model (2). This again shows that financial distress is not an important consideration for zero-leverage firms.

Under the dynamic trade-off framework, zero-leverage firms, which are shown to be considerably underlevered, have an incentive to initiate debt to move toward their target leverage. The results provide strong support for this argument as the coefficient on target leverage deviation is both statistically and economically significant. Zero-leverage firms are

likely to drop their conservative approach to debt financing and adjust toward target leverage when the (absolute) deviation becomes sufficiently large. However, this finding should be interpreted with caution as any leverage changes made by zero-leverage firms will always reduce their deviations from target leverage. In particular, the evidence of leverage rebalancing may be driven by mechanical mean reversion (Chang and Dasgupta, 2009).

Finally, we document mixed and weak evidence for the pecking order theory. The coefficient on cash flow has a negative sign but is only significant in models (1) and (3). This finding provides mixed support for the theory's prediction that a firm with greater cash flow should be less likely to issue debt. Moreover, earnings volatility is insignificant while the dividend payout ratio is significant with an unexpected (negative) sign. These results are inconsistent with the asymmetric information argument related to the pecking order theory.

5.2.2. Results for Sub-samples of Firms with Different Levels of Financial Constraints: Dividend-paying versus Non-paying Firms

In Panel B of Table 4, we examine the decision to lever up for two distinct groups of zero-leverage firms with different levels of financial constraints, dividend payers and non-payers. Compared with the results in Panel A, there are some noticeable changes. First, in terms of the firm-specific variables, only cash holdings, growth opportunities, firm investment and size retain their statistical significance for both groups of firms (except firm size in column (1)). The effects of growth opportunities and firm investment are stronger for zero-leverage payers than for non-payers. This finding is consistent with the underinvestment and financial flexibility hypotheses, which should better explain the financing decisions of the less constrained group of payers. However, asset tangibility is significantly negative for dividend payers and insignificant for non-payers. This finding is not in line with the prediction that tangible assets should have a positive impact on the decision to initiate debt, especially for the highly constrained group of non-payers. Empirically, it is inconsistent with the results in Panel B of Table 3, where tangibility is highly significant with the expected sign.

Second, the effects of two macroeconomic variables, the GDP growth rate and the term structure of interest rates, are only significant with the expected signs for zero-leverage payers. These findings are consistent with the results reported in Panel B of Table 3 regarding the differential effects of macroeconomic conditions for the firms that are respectively more and less constrained (i.e., non-payers and payers).

Finally, the results regarding other explanatory variables, such as non-debt tax shields, target leverage deviation and cash flow, are mixed, and weaker than the results in Panel A, thus providing inconclusive evidence regarding the trade-off and pecking order theories.

5.3. Financial Constraints, Underinvestment Incentives and Financial Flexibility

Our empirical results have suggested that the financial constraint, underinvestment and financial flexibility hypotheses combine to provide the most plausible explanations for the zero-leverage phenomenon. However, a potential limitation of the above analysis is that the explanatory variables used to capture these explanations may have multiple interpretations. For example, firms with large cash reserves may also be those that expect to face credit constraints in the future. To further distinguish between these explanations, particularly between the first hypothesis and the last two, we next conduct a direct test of the relation between firms' zero-leverage decisions and their future investments. If a zero-leverage policy is mainly driven by a firm's strategic decision to mitigate investment distortions rather than by financial constraints, then, following a period of applying such a conservative debt policy, the firm's ability to invest should be enhanced.

To test the above prediction, we estimate the following Tobin's Q model of investment (e.g., Cleary, 1999; Aivazian et al., 2005a, 2005b; de Jong et al., 2012):

$$\begin{aligned} Investment_{i,t+1} = \alpha + \beta_{ZL} \cdot Cashflow_{it} \cdot D_{ZL} + \beta_{L} \cdot Cashflow_{it} \cdot D_{L} \\ + \gamma_{ZL} \cdot Q_{it} \cdot D_{ZL} + \gamma_{L} \cdot Q_{it} \cdot D_{L} + \varepsilon_{it}, \end{aligned} \tag{2}$$

where D_{ZL} (D_L) is a dummy variable taking the value 1 if the firm has zero (positive) leverage in year t and 0 otherwise, and ε_{it} is the error term. The coefficient on cash flow, often termed the cash flow sensitivity to investment, measures how dependent firms are on internal funds. This coefficient can be used to test the financial flexibility hypothesis (e.g., Marchica and Mura, 2010). If firms eschew debt deliberately in order to maintain financial flexibility, their dependence on internal funds should be reduced. This is because zero-leverage firms that are financially flexible can draw upon their borrowing power and raise external debt when valuable investment opportunities come along.

Regarding the impact of Tobin's Q, the financial constraint hypothesis and the underinvestment and financial flexibility hypotheses may have opposing predictions. If unlevered firms can mitigate investment distortions through their zero-leverage policies, as predicted by the latter two hypotheses, then their ability to invest in future growth opportunities should be improved. Hence, the effect of Tobin's Q on investment should be at

least as strong for unlevered firms as for levered firms. In contrast, zero-leverage firms that are constrained may take fewer growth opportunities than zero-leverage firms that are able to control investment distortions.

Panel A of Table 5 shows that cash flow and growth opportunities are highly significant for unlevered and levered firms. The cash flow sensitivity to investment is statistically smaller for the former group (0.033 versus 0.069). This finding implies that unlevered firms rely less on their internal funds than levered firms, which is consistent with the financial flexibility explanation. However, the impact of growth opportunities (Tobin's *Q*) on firm investment is significantly smaller for unlevered firms than for their levered counterparts (0.005 versus 0.011). This implies that, on average, zero-leverage firms are likely to invest in fewer growth opportunities than firms with conventional capital structures, which is in line with the financial constraint view. Overall, the results are mixed and suggest that we need to examine sub-samples of firms with different levels of financial constraints.

In Panel B of Table 5, we split firms into dividend payers and non-payers. The results in column (1) reveal that the effect of growth opportunities on firm investment is statistically similar for unlevered and levered payers. Unlike the results for all firms in Panel A, this shows that, following the use of a zero-leverage policy, unlevered payers are able to take advantage of investment opportunities just as well as their levered counterparts. Next, the coefficient on cash flow is smaller and less significant for unlevered payers than for levered payers (0.081 versus 0.275). This suggests that zero-leverage payers can raise sufficient funds for investment while relying significantly less on internal cash flow. By eschewing debt, these firms can maintain financial flexibility and/or alleviate underinvestment incentives, thereby mitigating future investment distortions.

In column (2) of Panel B, the coefficient estimates for cash flow are statistically significant, suggesting that both unlevered and levered non-payers must rely on internal funds. Unlike the results for all firms in Panel A, however, there is no statistical difference between the cash flow sensitivities of these firms. Meanwhile, the *F*-test for the differential effect of growth options suggests that unlevered non-payers translate fewer opportunities into real capital expenditures than levered non-payers (0.005 versus 0.009). Further, unlevered non-payers also seem to have weaker investment ability than unlevered payers, as reported in column (1) of Panel B. Taken together, these results are more consistent with the financial constraint hypothesis and possibly drive the results for all firms reported in Panel A.

In sum, the results clearly reveal the different investment behaviors of zero-leverage firms with different levels of constraints, i.e., unlevered payers and non-payers. Following their use of a zero-leverage policy, firms in the first group face fewer investment distortions and take better advantage of growth options than those in the second group. Unlevered payers invest in at least as many investment opportunities as levered payers, which is consistent with the financial flexibility and underinvestment hypotheses. Unlevered non-payers again seem severely constrained, as they rely heavily on their internal funds and consequently invest in fewer growth opportunities than their levered counterparts.

5.4. Robustness Tests

In this section, we summarize several additional tests conducted to evaluate the robustness of the empirical findings. For brevity, the results of these tests are not reported but are available upon request. In the first test, we replicate the above univariate and multivariate analysis for low-leverage firms, which are defined as those with market leverage less than or equal to 0.01 (1%). This robustness check is useful because most theoretical models of capital structure do not account for the optimality of zero leverage (e.g., Goldstein et al., 2001; Ju et al., 2005) while, empirically, having such a marginal debt presence can still be considered a case of debt conservatism (Minton and Wruck, 2001; Strebulaev and Yang, 2012). The results of the test suggest that a large proportion (20%) of firms in the sample adopt a low-leverage policy of this sort. More importantly, we find that the motives for these firms to use debt conservatively are broadly similar to those for zero-leverage firms. In further robustness tests, we consider even less extreme classifications in which a low leverage ratio is considered to be in the range of 0–3% or 0–5%. The main findings of the paper are generally robust to these alternative classifications.

Next, we include time dummies in the logistic regressions to control for the pattern of the zero-leverage phenomenon over time. The results for the firm-level determinants of firms' zero-leverage decisions still hold. In another robustness test, we consider alternative definitions of levering up. In Table 4, a zero-leverage firm's decision to initiate debt is defined as it taking on debt of at least 1%; the results remain qualitatively similar when we increase the minimum threshold to 2% or 3%. Next, we address a potential selection bias toward transitory conservative debt policies by considering a smaller sample of firms that have either zero leverage or low leverage for at least *two* consecutive years. The results obtained from this approach are qualitatively similar to the main empirical findings of the paper. In our analysis of the effects of macroeconomic conditions, we follow Antoniou et al.

(2008) and define the term structure of interest rates as the difference between the rate on long-term UK government bonds and the rate on three-month Treasury-bills. However, our results do not change when we use the long-term rate instead. In model (2), we use the interaction terms between the cash flow and Tobin's Q variables and two dummy variables (D_{ZL} and D_L) in order to examine the differential effects of the former variables on investment for zero-leverage and levered firms. However, our results do not change when we further include the dummy variables to control for changes in the intercept term. In the last robustness test, we categorize firms into two groups with different levels of financial constraints, using alternative measures such as firm size and age, and obtain qualitatively similar results.

6. Conclusions

In this paper, we examine the puzzling question of why some firms have no debt presence in their capital structures, despite the benefits of debt financing. Our study adds several new insights to the current, limited understanding of zero-leverage firms. We show that zero-leverage firms are not homogeneous but consist of two distinct groups with different levels of financial constraints, namely dividend payers and non-payers. Crucially, firms in these groups have different motives for eschewing debt. Those in the second group (i.e., unlevered non-payers) are generally small and young with poor performance; their zero-leverage policies are mainly caused by their lack of external financing. In contrast, firms in the first group (i.e., unlevered payers) are more mature and profitable, and face much weaker forms of constraints. These firms strategically avoid debt financing, as predicted by the underinvestment and financial flexibility hypotheses. Moreover, we show that adverse macroeconomic conditions increase the propensity of firms to eschew debt, especially for this less constrained group. In summary, our results suggest that the zero-leverage phenomenon can be plausibly explained by a combination of considerations of financial constraints, underinvestment incentives, financial flexibility, and macroeconomic conditions.

Our paper offers three main implications for future capital structure research. First, our analysis indicates that firms adopt zero-leverage policies for different reasons. Future studies should take into account such differences when examining financial conservatism. Second, our study sheds light on the effects of macroeconomic variables on firms' zero-leverage decisions. The role of macroeconomic conditions should be explored further in order to gain a better understanding of the 'low-leverage puzzle'. Third, our results suggest that

conservative debt policies may have implications for corporate investment and performance. To the extent that firms strategically avoid debt financing to mitigate investment distortions, their ability to invest in growth opportunities should improve. Future studies could extend this line of enquiry further by examining whether an improved ability to invest subsequently leads to better firm performance. In a related vein, firms that eschew debt and accumulate cash to preserve financial flexibility should be well positioned to meet financing needs and maintain investment in the future, even under adverse economic conditions characterized by a lack of credit. Hence, it would be equally interesting to examine how zero-leverage firms fare in periods of financial crisis.

References

Acharya, V.V., Sundaram, R.K., & John, K. (2011). Cross-country Variations in Capital Structures: The Role of Bankruptcy Codes. Journal of Financial Intermediation, 20(1), 25–54.

Aivazian, V.A., Ge, Y., & Qiu, J. (2005a). The Impact of Leverage on Firm Investment: Canadian Evidence. Journal of Corporate Finance, 11(1&2), 277–291.

Aivazian, V.A., Ge, Y., & Qiu, J. (2005b). Debt Maturity Structure and Firm Investment. Financial Management, 34(4), 107–119.

Almeida, H., Campello, M., & Weisbach, M.S. (2004). The Cash Flow Sensitivity of Cash. Journal of Finance, 59(4), 1777–1804.

Almeida, H., Campello, M., & Weisbach, M.S. (2011). Corporate Financial and Investment Policies When Future Financing Is Not Frictionless. Journal of Corporate Finance, 17(3), 675–693.

Altman, E. (1968). Financial Ratios, Discriminant Analysis, and the Prediction of Corporate Bankruptcy. Journal of Finance, 23(4), 589–609.

Antoniou, A., Guney, Y., & Paudyal, K. (2008). The Determinants of Capital Structure: Capital Market-Oriented versus Bank-Oriented Institutions. Journal of Financial and Quantitative Analysis, 43(1), 59–92.

Arslan-Ayaydin, O., Florackis, C., & Ozkan, A. (2012). Financial Flexibility, Corporate Investment and Performance: Evidence from Financial Crises. Review of Quantitative Accounting and Finance, forthcoming.

Baker, M., & Wurgler, J. (2002). Market Timing and Capital Structure. Journal of Finance, 57(1), 1–32.

Bartus, T. (2005). Estimation of Marginal Effects Using margeff. Stata Journal, 5(3), 309–329.

Benmelech, E., & Bergman, N.K. (2009). Collateral Pricing. Journal of Financial Economics, 91(3), 339–360.

Bennett, M., & Donnelly, R. (1993). The Determinants of Capital Structure: Some UK Evidence. British Accounting Review, 25(1), 43–59.

Bernanke, B., & Gertler, M. (1989). Agency Costs, Net Worth and Business Fluctuations. American Economic Review, 79(1), 14–31.

Bernanke, B., & Gertler, M. (1995). Inside the Black Box: the Credit Channel of Monetary Transmission. Journal of Economic Perspectives, 9(4), 27–48.

Bevan, A.A., & Danbolt, J. (2002). Capital Structure and its Determinants in the UK – A Decompositional Analysis. Applied Financial Economics, 12(3), 159–170.

Bevan, A.A., & Danbolt, J. (2004). Testing for Inconsistencies in the Estimation of UK Capital Structure Determinants. Applied Financial Economics, 14(1), 55–66.

Bolton, P., & Feixas, X. (2000). Equity, Bonds, and Bank Debt: Capital structure and Financial Market Equilibrium under Asymmetric Information. Journal of Political Economy, 108(2), 324–351.

Chang, X., & Dasgupta, S. (2009). Target Behavior and Financing: How Conclusive is the Evidence? Journal of Finance, 64(4), 1767–1796.

Choe, H., Masulis, R., & Nanda, V. (1993). Common Stock Offerings across the Business Cycle: Theory and Evidence. Journal of Empirical Finance, 1(1), 3–31.

Cleary, W.S. (1999). The Relationship between Firm Investment and Financial Status. Journal of Finance, 54(2), 673–692.

Cleary, W.S. (2006). International Corporate Investment and the Relationship between Financial Constraint Measures. Journal of Banking and Finance, 30(5), 1159–1180.

Cook, D.O., & Tang, T. (2010). Macroeconomic Conditions and Capital Structure Adjustment Speed. Journal of Corporate Finance, 16(1), 73–87.

Dang, V.A. (2011). Leverage, Debt Maturity and Firm Investment: An Empirical Analysis. Journal of Business Finance and Accounting, 38(1&2), 225–258.

DeAngelo, H., & DeAngelo, L. (2007). Capital Structure, Payout Policy, and Financial Flexibility. Working Paper, University of Southern California.

DeAngelo, H., & Masulis, R. (1980). Optimal Capital Structure under Corporate and Personal Taxation. Journal of Financial Economics, 8(1), 3–29.

de Jong, A, Verbeek M., & Verwijmeren, P. (2012). Does Financial flexibility Reduce Investment Distortions? Journal of Financial Research, 35(2), 243–259.

Devos, E., Dhillon, U., Jagannathan, M., & Krishnamurthy, S. (2012). Why Are Firms Unlevered? Journal of Corporate Finance, 18(3), 664–682.

Diamond, D.W. (1991). Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt. Journal of Political Economy, 99(4), 689–721.

Erel, I., Julio, B., Kim, W., & Weisbach, M.S. (2012). Macroeconomic Conditions and Capital Raising. Review of Financial Studies, 25(2), 341–376.

Faulkender, M., & Petersen, M.A. (2006). Does the Source of Capital Affect Capital Structure? Review of Financial Studies, 19(1), 45–79.

Fazzari, S., Hubbard, R.G., & Petersen, B. (1988). Financial Constraints and Corporate Investment. Brookings Papers on Economic Activity, 19(1), 141–206.

Fischer, E.O., Heikel, R., & Zechner, J. (1989). Dynamic Capital Structure Choice: Theory and Tests. Journal of Finance, 44(1), 19–40.

Flannery, M., & Rangan, K. (2006). Partial Adjustment toward Target Capital Structures. Journal of Financial Economics, 79(3), 469–506.

Frank, M.Z., & Goyal, V.K. (2003). Testing the Pecking Order Theory of Capital Structure. Journal of Financial Economics, 67(2), 217–248.

Frank, M.Z., & Goyal, V.K. (2007). Trade-off and Pecking Order Theories of Debt, in: Eckbo, B.E. (Ed). Handbook of Corporate Finance: Empirical Corporate Finance. North Holland Handbooks of Finance, Elsevier Science, pp. 136. 202.

Frank, M., & Goyal, V.K. (2009). Capital Structure Decisions: Which Factors Are Reliably Important? Financial Management, 38(1), 1–37.

Gamba, A., & Triantis, A.J. (2008). The Value of Financial Flexibility. Journal of Finance, 63(5), 2263–2296.

Gertler, M., & Gilchrist, S. (1993). The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence. Scandinavian Journal of Economics, 95(1), 43–63.

Goldstein, R., Ju. N., & Leland, H.E. (2001). An EBIT-Based Model of Dynamic Capital Structure. Journal of Business, 74(4), 483–512.

Graham, J.R. (2000). How Big Are the Tax Benefits of Debt. Journal of Finance, 55(5), 1901–1941.

Hadlock, C.J., & Pierce, J.R. (2010). New Evidence on Measuring Financial Constraints: Moving beyond the KZ index. Review of Financial Studies, 23(5), 1909–1940.

Harford, J., 1999. Corporate Cash Reserves and Acquisition. Journal of Finance, 54(6), 1969–1997.

Holmstrom, B., & Tirole, J. (1998). Private and Public Supply of Liquidity. Journal of Political Economy, 106(1), 1–40.

Iona, A., Leonida, L., & Ozkan, A. (2007). Determinants of Financial Conservatism: Evidence from Low-Leverage and Cash-Rich UK Firms. Working Paper, University of York.

Jensen, M., & Meckling, W. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics, 3(4), 305–360.

Johnson, S.A. (2003). Debt Maturity and the Effects of Growth Opportunities and Liquidity Risk on Leverage. Review of Financial Studies, 16(1), 209–236.

Ju, N., Parrino, R., Poteshman, A., & Weisbach, M.S. (2005). Horse and Rabbits? Trade-Off Theory and Optimal Capital Structure. Journal of Financial and Quantitative Analysis, 40(2), 259–281.

Kiyotaki, N., & Moore, J. (1997). Credit Cycles. Journal of Political Economy, 105(2), 211–248.

Korajczyk, R.A., & Levy, A. (2003). Capital Structure Choice: Macroeconomic Conditions and Financial Constraints. Journal of Financial Economics, 68(1), 75–109.

Korajczyk, R.A., Lucas, D., & McDonald, R.L. (1990). Understanding Stock price Behavior around the Time of Equity Issues, in: Hubbard, R.G. (Ed.), Asymmetric Information, Corporate Finance and Investment. NBER and University of Chicago Press, Chicago, pp. 257. 278.

Korteweg, A.G. (2010). The Net Benefits to Leverage. Journal of Finance, 65(6), 2137–2170.

Kraus, A., & Litzenberger, R.H. (1973). A State-Preference Model of Optimal Financial Leverage. Journal of Finance, 28(4), 911–922.

Leary, M.T., & Roberts, M.R. (2005). Do Firms Rebalance Their Capital Structures. Journal of Finance, 60(6), 2575–2619.

Lemmon, M.L, & Zender, J.F. (2001). Looking Under the Lamppost: An Empirical Examination of the Determinants of Capital Structure. Working Paper, University of Utah and University of Arizona.

Lemmon, M.L., & Zender, J.F. (2010). Debt Capacity and Tests of Capital Structure Theories. Journal of Financial and Quantitative Analysis, 45(5), 1161–1187.

Marchica, M., & Mura, R. (2010). Financial Flexibility, Investment Ability and Firm Value: Evidence from Firms with Spare Debt Capacity. Financial Management, 39(4), 1339–1365.

Miller, M. H. (1977). Debt and Taxes. Journal of Finance, 32(2), 261–275.

Minton, B. A., & Wruck, K. H. (2001). Financial Conservatism: Evidence on Capital Structure from Low Leverage Firms. Working Paper, Ohio State University.

Modigliani, F., & Miller, M.H. (1963). Taxes and the Cost of Capital: A Correction. American Economic Review, 53(3), 433–443.

Muradoğlu, Y.G., & Sivaprasad, S. (2012). Using Firm-Level Leverage as an Investment Strategy. Journal of Forecasting, 31(3), 260–279.

Myers, S.C. (1977). Determinants of Corporate Borrowing. Journal of Financial Economics, 5(2), 145–175.

Myers, S.C. (1984). The Capital Structure Puzzle. Journal of Finance, 39(3), 574–592.

Myers, S.C., & Majluf, N.S. (1984). Corporate Financing and Investments Decisions When Firms Have Information That Investors Do Not Have. Journal of Financial Economics, 13(2), 187–221.

Opler, T., Pinlowitz, L., Stulz, R., & Williamson, R. (1999). The Determinants and Implications for Corporate Cash Holdings. Journal of Financial Economics, 52(1), 3–46.

Ozkan, A. (2001). Determinants of Capital Structure and Adjustment to Long Run Target: Evidence from UK Company Panel Data. Journal of Business Finance and Accounting, 28(1&2), 175–198.

Petersen, M. (2009). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. Review of Financial Studies, 22(1), 435–480.

Rajan, R.G., & Zingales, L. (1995). What Do We Know about Capital Structure? Some Evidence from International Data. Journal of Finance, 50(5), 1421–1461.

Shyam-Sunder, L., & Myers, S. (1999). Testing Static Trade-off against Pecking Order Models of Capital Structure. Journal of Financial Economics, 51(2), 219–244.

Stiglitz, J.E., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. American Economic Review, 71(3), 393–410.

Strebulaev, I.A., & Yang, B. (2012). The Mystery of Zero-Leverage Firms. Journal of Financial Economics, forthcoming.

Taffler, R.J. (1984). Empirical Models for the Monitoring of UK Corporations. Journal of Banking and Finance, 18(2), 199–227.

Appendix. Variable Definitions

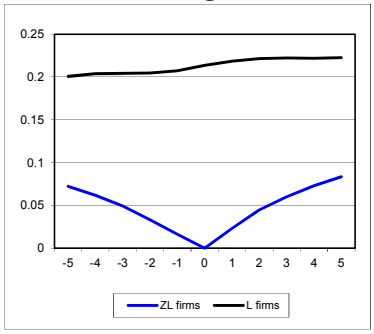
This table describes the definitions of the variables considered in this paper, including relevant *Worldscope* fields for accounting items. All accounting items are denominated in pounds sterling.

Variables	Definitions
Panel A − Firm-level Variables	
Age	The difference between the year of the observation and the first date of trading available in *Worldscope*.
Cash flow	Net income used to calculate basic Earnings Per Share (EPS) (01706) plus depreciation (01151), all divided by total assets (02999). Total assets are the sum of total current assets, long-term receivables, investment in subsidiaries, other investments, net Property, Plant and Equipment (PPE) and other assets.
Cash flow deficit	Net cash flow from financing (04890) divided by the firm's market value. The firm's market value is the sum of the market value of equity (08001) and the book value of debt (03255).
Cash holdings	Cash and short-term investments (02001) divided by total assets (02999).
Debt tax shields	Interest expense on debt (01251) divided by total assets (02999).
Dividend payout ratio	Cash dividends paid (04551) divided by total assets (02999).
Earnings volatility	The absolute value of the difference between the annual % change in net income (01706) and the (time-series) average of this change.
Growth opportunities	The firm's market value (the market value of equity (08001) plus the book value of debt (03255)) divided by total assets (02999).
Investment	Capital expenditures (04601) divided by total assets (02999).
Liquidity	Total current assets (02201) divided by total current liabilities (03101).
Market leverage	Total debt, including both short-term and long-term debt, (03255) divided by the firm's market value (the market value of equity (08001) and the book value of debt (03255)).
Net debt issued	The increase in long-term borrowings (04401) plus the increase/decrease in short-term borrowings (04821) minus the reduction in long-term debt (04701), all divided by the firm's market value (the market value of equity (08001) plus the book value of debt (03255)).
Net equity issued	Net proceeds from the sale/issue of common and preferred stocks (04251) minus common/preferred stocks redeemed, retired, converted etc. (04751), all divided by the firm's market value (the market value of equity (08001) plus the book value of debt (03255)).
Non-debt tax shields	Depreciation and depletion (01151) divided by total assets (02999).
Profitability	Earnings before interest, taxes and depreciation (EBITDA) (18198) divided by total assets (02999).
Size	Log of total assets (02999) in 1995 prices.
Stock return	Change in stock price (05001), i.e., capital gains plus cash dividends paid (04551), all divided by last year's stock price.
Tangibility	Fixed assets (Net PPE) (02501) divided by total assets (02999).
Target leverage deviation	Target leverage minus actual (market) leverage, where target leverage is the fitted value obtained from a fixed-effects regression of leverage on five variables, including growth opportunities, non-debt tax shields, firm size, profitability and tangibility.
Tax ratio	Income taxes (01451) divided by profit before tax (pre-tax income) (01401).
Z-score	UK version of the Altman (1968) *z*-score, based on Taffler (1984): $$z = 3.20 + 12.18X_1 + 2.50X_2 - 10.68X_3 + 0.024X_4$$ where X_1 is the ratio of profit before tax (01401) to current liabilities (03101), X_2 is the ratio of current assets (02201) to total liabilities (03351), X_3 is the current liabilities (03101) to total assets (02999), X_4 is the number of credit intervals, measured by quick assets (02001) less current liabilities (03101), all divided by the total sales (01001) less profit before tax (01401) less depreciation (01151), divided by 365.
Panel B – Macro-level Variables	
GDP growth rate	Annual real GDP growth rate.
Equity premium	Difference between the annual return on the stock market index and that on three-month Treasury-bills.
Term structure of interest rates	Difference between the yield on long-term UK government bonds and the interest rate on three-month Treasury-bills.

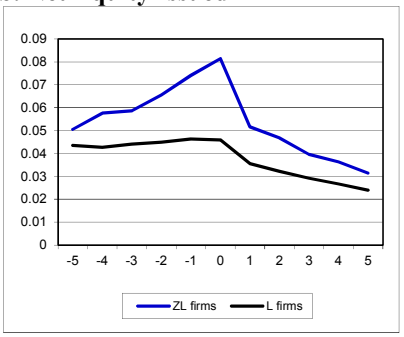
Figure 1. Firm Characteristics around the Zero-Leverage Year

The following figures present an analysis of the evolution of several important firm characteristics of zero-leverage (ZL) firms and levered (L) firms within the ±5 years around the event year, which is when zero-leverage status is realized. See appendix for the definitions of the variables.

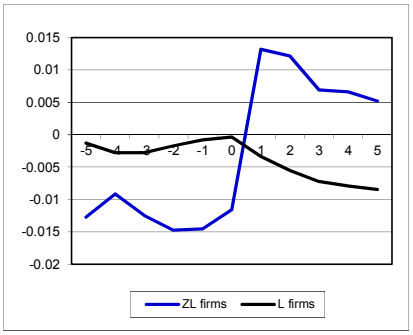
a. Market Leverage



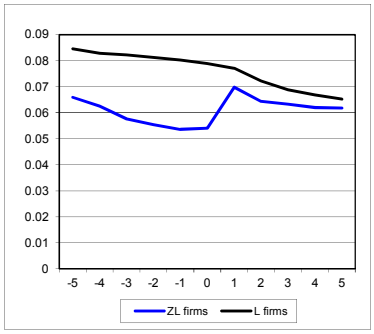
b. Net Equity Issued



c. Net Debt Issued



d. Firm Investment



e. Target Leverage Deviation

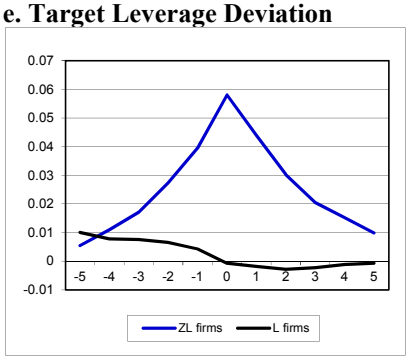


Table 1. Distribution of Zero-Leverage Firms by Time and Industry

This table summarizes the distribution of zero-leverage (ZL) firms by time and industry. Panel A lists the number and percentage of firms that have a ZL status (i.e., firms that have zero leverage) in a given year. Panel B presents the distribution of these firms according to Fama−French's 12 industries, with utilities and finance excluded.

Panel A – Distribution of Zero-leverage Firms by Time

Periods	All Sample	ZL	%
1980 – 1989	5005	291	5.82
1990 – 1999	9417	710	7.54
2000 – 2007	10986	2094	19.06
Number of firm-year observations	**25,408**	**3,095**	**12.18**
Number of firms	**3,082**	**1,062**	**34.46**

Panel B – Distribution of Zero-leverage Firms by Industry

Industry	All Sample	ZL	%
Consumer Non-Durables	2,687	241	8.97
Consumer Durables	897	87	9.70
Manufacturing	3,319	181	5.45
Oil, Gas, and Coal Extraction and Products	793	201	25.35
Chemicals and Allied Products	679	29	4.27
Business Equipment	3,462	706	20.39
Telephone and Television Transmission	638	81	12.70
Wholesale, Retail, and Some Services	4,238	430	10.15
Healthcare, Medical Equipment, and Drugs	1,102	224	20.33
Other (Mines, Construction, Hotels, etc.)	7,304	898	12.29

Table 2. Characteristics of Zero-Leverage Firms

Panel A of this table compares the mean firm-specific characteristics of zero-leverage (ZL) firms with those of levered firms. The means are calculated by taking the average equally across observations. A ZL status means firms have zero leverage (no debt) in the year in question. Proxy sample refers to a sample of levered firms matched on year, industry and size (within ±10% of the original firm size). Panel B compares the characteristics of zero-leverage (ZL) firms with different levels of financial constraints, namely those that pay dividends (ZL payers) and those that do not (ZL non-payers), and the characteristics of levered firms that pay dividends (levered payers) and those that do not (levered non-payers). See appendix for variable definitions. *, ** and *** indicate that the differences are significant at the 10%, 5% and 1% levels, respectively.

Panel A. Zero-Leverage Firms versus Levered and Matched Firms

Variable	ZL firms (1)	Levered firms (2)	Proxy Sample (3)	T-statistic for diff. in means (1) vs. (2)	T-statistic for diff. in means (1) vs. (3)
Age	5.617	7.811	6.664	-19.049***	-9.408***
Cash flow	-0.084	0.032	-0.028	-23.352***	-7.742***
Cash flow deficit	0.071	0.026	0.053	11.961***	3.941***
Cash holdings	0.381	0.117	0.141	80.050***	51.265***
Debt tax shields	0.002	0.019	0.017	-53.509***	-43.404***
Dividend payout ratio	0.019	0.020	0.015	-3.077***	7.396***
Growth opportunities	2.593	1.436	1.657	34.564***	20.032***
Investment	0.054	0.079	0.074	12.490***	8.448***
Liquidity	5.452	1.655	1.872	73.112***	41.948***
Market leverage	0.000	0.213	0.196	-61.057***	-54.114***
Net debt issued	-0.012	-0.000	-0.003	-5.413***	-3.805***
Net equity issued	0.081	0.046	0.063	14.569***	5.861***
Non-debt tax shields	0.034	0.045	0.049	-15.309***	-16.248***
Profitability	-0.061	0.074	0.007	-26.190***	-9.090***
Size	8.365	10.304	9.049	-51.041***	-22.903***
Stock return	0.150	0.118	0.086	2.604***	4.135***
Tangibility	0.175	0.328	0.284	-34.132***	-21.213***
Target leverage deviation	0.058	-0.001	0.002	23.208***	19.815***
Tax ratio	0.159	0.228	0.177	-12.587***	-2.970***
Volatility	2.882	2.612	3.327	2.435**	-3.222***
Z-score	5.382	-0.422	-2.719	14.951***	13.533***
Number of observations	**3,095**	**22,313**	**7,250**		

Continued next page

Panel B. Zero-Leverage Payers and Non-Payers versus Levered Firms Payers and Non-Payers							
Variable	**ZL payers (1)**	**ZL non-payers (2)**	**Levered payers (3)**	**Levered non-players (4)**	**T-statistic for diff. in means (1) vs. (2)**	**T-statistic for diff. in means (1) vs. (3)**	**T-statistic for diff. in means (2) vs. (4)**
Age	6.990	4.430	8.401	6.010	14.585***	8.165***	11.390***
Cash flow	0.114	-0.255	0.091	-0.149	30.044***	-7.593***	9.555***
Cash flow deficit	-0.029	0.129	-0.008	0.094	-20.449***	4.638***	-5.747***
Cash holdings	0.267	0.479	0.095	0.184	-22.842***	-51.210***	-43.965***
Debt tax shields	0.002	0.003	0.019	0.021	-.2901***	43.113***	31.221***
Dividend payout ratio	0.042	0.000	0.027	0.000	61.269***	-27.313***	-
Growth opportunities	1.859	3.226	1.231	2.062	-14.468***	-20.406***	-15.680***
Investment	0.062	0.046	0.082	0.070	4.266***	7.764***	6.660***
Liquidity	2.696	7.857	1.496	2.145	-25.090***	-37.238***	-46.198***
Market leverage	0.000	0.000	0.210	0.224	-	45.262***	37.575***
Net debt issued	-0.009	-0.013	0.004	-0.013	1.826*	4.880***	0.086
Net equity issued	0.011	0.136	0.026	0.100	-22.134***	6.283***	-7.326***
Non-debt tax shields	0.036	0.033	0.042	0.057	1.914*	6.945***	16.923***
Profitability	0.164	-0.252	0.139	-0.121	33.038***	-7.237***	11.617***
Size	9.095	7.735	10.818	8.731	27.207***	-34.671***	20.889***
Stock return	0.193	0.108	0.147	0.022	3.078***	-3.205***	-3.490***
Tangibility	0.257	0.104	0.348	0.269	21.551***	14.722***	23.774***
Target leverage deviation	0.057	0.059	0.004	-0.017	-0.381	-15.285***	-18.353***
Tax ratio	0.281	0.052	0.277	0.073	26.891***	-0.555***	2.514**
Volatility	1.645	4.034	2.088	4.266	-10.632***	3.359***	1.107
Z-score	11.722	-0.183	1.870	-7.467	8.087***	-35.864***	-7.699***
Number of observations	**1,432**	**1,663**	**16,815**	**5,498**			

Table 3. Logistic Regressions of Firms' Zero-leverage Decisions

This table reports the marginal effects (∂P/∂X) and standard errors from the logistic regressions of firms' zero-leverage (ZL) decisions. Panel A presents the results for all firms. Panel B contains the results for dividend payers and non-payers. See appendix for variable definitions. Standard errors of coefficients are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

	Panel A. Whole Sample				**Panel B. Dividend Payers versus Non-payers**							
	(1)	**(2)**	**(3)**	**(4)**	**(1)**		**(2)**		**(3)**		**(4)**	
	All	**All**	**All**	**All**	**Payers**	**Non-payers**	**Payers**	**Non-payers**	**Payers**	**Non-payers**	**Payers**	**Non-payers**
Previous ZL decision	0.343***	0.386***	0.393***	-	0.340***	0.349***	0.366***	0.394***	0.397***	0.397***	-	-
	(0.014)	(0.015)	(0.015)	-	(0.021)	(0.016)	(0.022)	(0.018)	(0.021)	(0.018)	-	-
Age	0.001***	0.001**	0.001***	-0.000	0.000	0.003***	0.000	0.002**	0.001**	0.002**	0.002**	-0.003
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)
Cash flow	0.016**	-0.015**	0.014**	0.015	-0.002	0.034***	-0.002	-0.017	0.059**	0.009	0.160***	-0.007
	(0.007)	(0.007)	(0.006)	(0.011)	(0.024)	(0.013)	(0.029)	(0.013)	(0.030)	(0.011)	(0.048)	(0.019)
Cash holdings	0.150***	-	-	-	0.100***	0.249***	-	-	-	-	-	-
	(0.008)	-	-	-	(0.011)	(0.018)	-	-	-	-	-	-
Dividend payout ratio	0.384***	0.486***	0.483***	1.215***	0.254***	0.000	0.360***	0.000	0.408***	0.000	1.066***	0.000
	(0.071)	(0.071)	(0.071)	(0.168)	(0.070)	(0.000)	(0.070)	(0.000)	(0.071)	(0.000)	(0.150)	(0.000)
Growth opportunities	0.000	0.003***	0.003***	0.008***	0.003*	-0.001	0.004***	0.002	0.004**	0.003	0.009***	0.006*
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Non-debt tax shields	-0.052	-0.142***	-0.190***	-0.749***	0.014	-0.163*	-0.002	-0.403***	-0.133**	-0.456***	-0.684***	-1.305***
	(0.042)	(0.047)	(0.047)	(0.114)	(0.056)	(0.087)	(0.058)	(0.097)	(0.062)	(0.098)	(0.184)	(0.206)
Size	-0.016***	-0.018***	-0.019***	-0.045***	-0.011***	-0.023***	-0.012***	-0.024***	-0.014***	-0.024***	-0.040***	-0.043***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.004)	(0.007)
Tangibility	-0.001	-0.045***	-0.048***	-0.127***	0.008	-0.051**	-0.013	-0.134***	-0.017**	-0.137***	-0.019	-0.366***
	(0.009)	(0.009)	(0.009)	(0.022)	(0.008)	(0.025)	(0.008)	(0.027)	(0.009)	(0.026)	(0.021)	(0.062)
Tax ratio	0.001	-0.004	-0.005	-0.008	0.000	0.002	-0.002	-0.000	-0.001	-0.004	0.015	-0.013
	(0.006)	(0.006)	(0.006)	(0.009)	(0.006)	(0.014)	(0.007)	(0.014)	(0.007)	(0.014)	(0.011)	(0.020)
Earnings volatility	-0.000	-0.000	-0.000	-0.001	-0.001	0.000	-0.000	-0.000	-0.001	-0.000	-0.002**	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Z-score	0.000**	0.001***	-	-	0.001***	0.000	0.001***	0.001***	-	-	-	-
	(0.000)	(0.000)	-	-	(0.000)	(0.000)	(0.000)	(0.000)	-	-	-	-
Equity premium	0.007	-0.003	-0.004	-0.006	0.008	0.016	0.008	-0.020	0.003	-0.017	0.008	-0.007
	(0.010)	(0.010)	(0.010)	(0.012)	(0.010)	(0.026)	(0.010)	(0.026)	(0.010)	(0.026)	(0.012)	(0.033)
GDP growth	-0.241**	-0.275**	-0.287**	-0.002	-0.181*	-0.346	-0.245**	-0.206	-0.278***	-0.285	-0.135	0.237
	(0.117)	(0.115)	(0.116)	(0.174)	(0.101)	(0.423)	(0.100)	(0.421)	(0.101)	(0.422)	(0.164)	(0.556)
Term structure	0.273***	0.317***	0.332***	0.534***	0.224***	0.676**	0.264***	0.642**	0.262***	0.708**	0.409***	1.014**
	(0.093)	(0.093)	(0.094)	(0.143)	(0.082)	(0.318)	(0.082)	(0.327)	(0.085)	(0.321)	(0.136)	(0.432)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	21,122	21,122	21,412	21,412	15,706	5,416	15,706	5,416	15,889	5,523	15,889	5,523
Pseudo *R*-squared	0.547	0.518	0.513	0.207	0.568	0.484	0.555	0.442	0.538	0.438	0.215	0.166

Table 4. Logistic Regressions of Zero-leverage Firms' Decisions to Lever Up

This table reports the marginal effects (∂P/∂X) and standard errors from the logistic regressions of zero-leverage firms' decisions to drop the zero-leverage (ZL) policy and lever up. Panel A presents the results for all firms. Panel B contains the results for dividend payers and non-payers. See appendix for variable definitions. Standard errors of coefficients are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

	Panel A. Whole Sample			**Panel B. Dividend Payers versus Non-payers**					
	(1)	**(2)**	**(3)**	**(1)**		**(2)**		**(3)**	
Independent Variable	**All**	**All**	**All**	**Payers**	**Non-payers**	**Payers**	**Non-payers**	**Payers**	**Non-payers**
Age	-0.003	-0.002	-	-0.001	-0.006**	-0.002	-0.005*	-	-
	(0.002)	(0.002)	-	(0.002)	(0.003)	(0.002)	(0.003)	-	-
Cash flow	-0.119***	-0.022	-0.097***	-0.190	-0.119***	-0.121	-0.019	-0.519***	-0.064**
	(0.033)	(0.034)	(0.028)	(0.140)	(0.035)	(0.181)	(0.035)	(0.202)	(0.030)
Cash holdings	-0.551***	-	-	-0.480***	-0.542***	-	-	-	-
	(0.050)	-	-	(0.096)	(0.055)	-	-	-	-
Dividend payout ratio	-0.687*	-1.072***	-1.246***	0.086	0.000	-0.517	0.000	-0.727	-
	(0.406)	(0.395)	(0.398)	(0.512)	(0.000)	(0.543)	(0.000)	(0.553)	-
Growth opportunities	-0.018***	-0.024***	-0.025***	-0.032**	-0.013**	-0.041**	-0.016***	-0.028*	-0.018***
	(0.005)	(0.006)	(0.006)	(0.015)	(0.005)	(0.017)	(0.006)	(0.015)	(0.006)
Investment	0.562***	0.553***	0.515***	0.712***	0.413***	0.692***	0.442***	0.667***	0.491***
	(0.073)	(0.075)	(0.064)	(0.155)	(0.080)	(0.165)	(0.085)	(0.117)	(0.076)
Non-debt tax shields	0.412**	0.643***	0.678***	-0.567	0.730***	-0.602	1.043***	-0.457	1.140***
	(0.205)	(0.221)	(0.213)	(0.432)	(0.224)	(0.509)	(0.249)	(0.535)	(0.238)
Size	0.022***	0.028***	0.027***	0.017	0.031***	0.023**	0.029***	0.032***	0.028***
	(0.006)	(0.006)	(0.006)	(0.011)	(0.009)	(0.012)	(0.010)	(0.010)	(0.009)
Tangibility	-0.204***	-0.078*	-	-0.307***	-0.063	-0.223***	0.065	-	-
	(0.043)	(0.044)	-	(0.079)	(0.052)	(0.085)	(0.057)	-	-
Target leverage deviation	0.328**	0.503***	0.463***	0.202	0.333**	0.321	0.513***	0.506**	0.400**
	(0.136)	(0.134)	(0.132)	(0.235)	(0.168)	(0.240)	(0.167)	(0.232)	(0.162)
Tax ratio	0.019	0.039	0.041	0.065	0.021	0.082	0.028	0.057	0.039
	(0.031)	(0.031)	(0.032)	(0.063)	(0.038)	(0.062)	(0.041)	(0.051)	(0.041)
Earnings volatility	0.001	0.001	0.001	-0.001	0.000	-0.001	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)
Z-score	-0.000	-0.001***	-	-0.006***	0.000	-0.008***	-0.001***	-	-
	(0.000)	(0.000)	-	(0.002)	(0.000)	(0.003)	(0.000)	-	-
Equity premium	0.001	0.031	0.027	-0.055	0.045	-0.070	0.113	-0.039	0.084
	(0.054)	(0.058)	(0.057)	(0.077)	(0.071)	(0.079)	(0.078)	(0.081)	(0.078)
GDP growth	2.170***	2.339***	2.292***	2.486***	1.239	2.806***	0.445	3.178***	-0.714
	(0.735)	(0.772)	(0.767)	(0.838)	(2.096)	(0.842)	(2.404)	(0.884)	(2.366)
Term structure	-0.771	-1.011	-1.298**	-1.235*	-0.114	-1.583**	0.163	-1.688**	-0.823
	(0.574)	(0.626)	(0.623)	(0.699)	(1.351)	(0.725)	(1.465)	(0.752)	(1.422)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,316	2,316	2,371	1,158	1,158	1,158	1,158	1,181	1,190
Pseudo *R*-squared	0.202	0.129	0.118	0.211	0.262	0.181	0.162	0.125	0.148

Table 5. Investment Decisions of Zero-leverage Firms

This table reports the results for the Tobin's *Q* model of investment for zero-leverage (ZL) and levered (L) firms. Panel A presents the results for all firms. Panel B contains the results for two groups of firms with different levels of financial constraints, namely dividend payers and non-payers. See appendix for variable definitions. *F*-test is a test for the difference in coefficients. Standard errors of coefficients are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

	Panel A. Whole Sample	**Panel B. Dividend Payers vs. Non-payers**	
Independent Variable	**(1)**	**(1)**	**(2)**
	All	**Payers**	**Non-payers**
***Cash flow* · D_{ZL}**	0.033***	0.081	0.022**
	(0.008)	(0.064)	(0.009)
***Cash flow* · D_L**	0.069***	0.275***	0.031***
	(0.005)	(0.033)	(0.005)
***Tobin's Q* · D_{ZL}**	0.005***	0.009**	0.005***
	(0.001)	(0.004)	(0.001)
***Tobin's Q* · D_L**	0.011***	0.005***	0.009***
	(0.001)	(0.002)	(0.001)
Number of observations	21,737	16,058	5,679
Adjusted *R*-squared	0.044	0.075	0.035
***F*-test (*Cash flow* · D_{ZL} = *Cash flow* · D_L)**	14.74***	8.068***	0.879
***F*-test (*Tobin's Q* · D_{ZL} = *Tobin's Q* · D_L)**	24.93***	0.716	6.571***