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## An empirical analysis of zero-leverage and ultra-low leverage firms: Some UK evidence

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# Working Paper Series

## An Empirical Analysis of Zero-Leverage and Ultra-Low Leverage Firms: Some U.K. Evidence

Viet Anh Dang

Manchester Business School Working Paper No 584

## Manchester Business School

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## **Keywords**

Capital Structure, Low-leverage, Zero-leverage, Underinvestment, Financial Flexibility.

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# AN EMPIRICAL ANALYSIS OF ZERO-LEVERAGE AND ULTRA-LOW LEVERAGE FIRMS: SOME U.K. EVIDENCE

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## Abstract

This paper studies conservative debt policies, focusing on firms with no debt (zero-leverage) or with extremely low debt. Examining an unbalanced panel of U.K. firms, we show that debt conservatism is a common, persistent yet puzzling empirical regularity: nearly 10% of U.K. firms have zero leverage and 18% have market leverage of less than or equal to 1% (ultra-low leverage). Firms maintaining zero-leverage or ultra-low leverage are generally smaller, younger, and less profitable but have a higher payout ratio. These firms also have substantial cash reserves and rely heavily on equity financing in order to mitigate underinvestment incentives. Firms with high-growth opportunities are more likely to adopt and switch to an extremely conservative debt policy. Firms with a large deviation from the target leverage are more likely to lever up. Our explanations for the zero-leverage puzzle are inconsistent with the pecking order theory, inconclusive on the financial flexibility hypothesis but generally supportive of the underinvestment hypothesis and the dynamic trade-off theory.

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## 1 Introduction

One of the most known puzzles in corporate finance is the stylized fact that firms carry substantially less debt than predicted by dominant capital structure theories, hence the ‘low-leverage puzzle’ (Miller, 1977; Graham, 2000). Moreover, recent research on debt conservatism has documented a fresh and equally important empirical observation that many firms have no, or marginal, debt presence in their capital structure, despite the potential benefits of debt financing (Strebulaev and Yang, 2006). This new observation can be termed as the ‘zero-leverage puzzle’.

While the low-leverage puzzle has been studied extensively, the related zero-leverage phenomenon is not well understood.<sup>1</sup> Theoretically, a number of recent dynamic trade-off models have been able to produce lower optimal leverage ratios (even as low as 5-10%), more consistent with those observed in practice (Goldstein et al., 2001; Morellec, 2004; Ju et al., 2005; Strebulaev, 2007).<sup>2</sup> These models clearly represent an important step toward solving the low-leverage puzzle; though they are far from being able to account for the zero-leverage phenomenon. In particular, these dynamic trade-off models cannot explain why a large fraction of firms in the economy consider all-equity financing as optimal, thus leaving considerable money on the table.<sup>3</sup>

The vast empirical literature on capital structure is mainly focused on examining the determinants of leverage (e.g. Titman and Wessels, 1988; Rajan and Zingles, 1995), and/or testing the dominant theories of capital structure (e.g. Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003; Flannery and Rangan, 2006). Recent research has started to examine the issues of low-leverage (Minton and Wruck, 2001), financial conservatism, i.e. low-leverage and rich-cash firms (Iona et al., 2004), financial flexibility and implications for the interactions of corporate financing and investment (Mura and Marchica, 2007). These studies, however, do not

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<sup>1</sup> Strebulaev and Yang (2006) and Korteweg (2009) argue that an understanding of zero-leverage firms is the key to solving the low-leverage puzzle since excluding zero-leverage and ultra-low-leverage firms helps increase the average leverage ratio significantly. The solution to the low-leverage puzzle may lie in the mystery of zero-leverage firms.

<sup>2</sup> Earlier static trade-off models typically predict high optimal leverage ratios, e.g. between 70-90% as in Leland (1994).

<sup>3</sup> Recent dynamic trade-off models that incorporate endogenous investment appear to be able to produce zero-leverage as optimal capital structure (e.g. Hennessy and Whited, 2005; DeAngelo et al., 2009). Empirically, however, these models are unable to fully explain the significant fraction of zero-leverage (ultra-low-leverage) firms observed in the economy.

specifically analyze the zero-leverage puzzle. Strebulaev and Yang (2006) are the first to investigate zero-leverage firms but cannot find any plausible explanations for their empirical observation; their conclusions leave the zero-leverage phenomenon as a mystery. Most recently, Devos et al. (2008) examine whether financial flexibility or managerial entrenchment is the main factor determining the firm's decision not to lever up. This study, however, does not consider several other potential theoretical explanations for the zero-leverage puzzle. Given the limited understanding of zero-leverage firms, further research on this area is warranted.<sup>4</sup> Moreover, since the existing studies analyze a sample of U.S. firms, it is important to examine whether the zero-leverage puzzle is an important empirical regularity that exists in non-U.S. economies. Hence, in this paper, we focus on U.K. firms because the U.K. provides a particularly suitable testing context for extreme debt conservatism: while the U.K. is a market-based economy similar to the U.S., U.K. firms, on average, have the lowest leverage ratio, compared to firms in other industrialized economies (see Rajan and Zingales, 1995).

The objective of our paper is to fill the existing gaps in the literature and examine empirically conservative debt policies in the U.K., with a special focus on firms without debt (zero-leverage) or with extremely low debt (ultra-low leverage). We define a zero-leverage firm as one with zero debt of both short-term and long-term maturities in any given year. In addition to this 'extreme' classification, we also consider ultra-low leverage firms that have a marginal debt presence in their capital structure, i.e. with a market leverage ratio of less than or equal to 0.01 (1%). We aim to explore a number of research questions. We first investigate the characteristics of zero-leverage and ultra-low leverage firms. We next examine the determinants of a decision to use zero-leverage or ultra-low leverage. We then ask what triggers a switch from a less conservative debt policy to the zero-leverage or ultra-low leverage policy. Additionally, we investigate the persistence of debt conservatism and study why firms with zero-leverage or ultra-low leverage revert back to a less conservative debt policy and initiate debt.

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<sup>4</sup> See also Cook et al. (2008), who show that empirical capital structure studies using conventional regression models of leverage may suffer from misspecification errors because most, if not all, of these models (including the Tobit model) do not account for the many statistical complexities arising from the zero-leverage phenomenon.

To address the above research questions, we consider several alternative explanations that can be drawn from the existing theories of capital structure. First, we investigate whether firms have zero-leverage or ultra-low leverage because they are ‘financially constrained’ and rationed by their lenders (Stiglitz and Weiss, 1981; Faulkender and Petersen 2006). Second, we examine whether the zero-leverage puzzle can be explained by the pecking order theory, which says firms do not lever up when they have sufficient internal funds to finance new investment opportunities. Third, from a trade-off perspective, firms may use debt conservatively if they face high financial distress costs, low debt tax shields (Graham, 2000), high non-debt tax shields (DeAngelo and Masulis, 1980) and/or substantial substitutes for debt such as leases (Yan, 2006). Under the dynamic trade-off framework, firms may maintain low leverage and deviate away from the target but undertake leverage adjustment in the long-run (Fischer et al., 1989; Leary and Roberts, 2005; DeAngelo et al., 2009). Fourth, the financial flexibility hypothesis suggests that firms have low leverage in order to stockpile debt capacity to be used to fund future capital expenditures (DeAngelo and DeAngelo, 2007; Gamba and Triantis, 2008). A final potential explanation for the zero-leverage or ultra-low leverage phenomenon is the underinvestment hypothesis (Myers, 1977), which suggests that firms facing high growth opportunities should have low debt to mitigate the debt overhang problem.

We find that the zero-leverage (ultra-low-leverage) phenomenon is an important empirical regularity for U.K firms. Between 1996 and 2003, 9.3% of non-financial firms in our sample have zero outstanding debt. Additionally, 18% and 25% of firms have an extremely low debt presence with market leverage below 1% and 3%, respectively. Further, extreme debt conservatism is a prevalent and persistent empirical phenomenon. 22% of firms have no debt at least once in the sample period. 57% of firms with no debt in any given year adopt the same zero-leverage policy in the following year, and more than a third do not take on any new debt in the next three years. A similar pattern is documented for a larger sample between 1980 and 2005.

Our descriptive analysis shows that zero-leverage and ultra-low-leverage firms have, on average, substantial cash balances and highly valuable growth opportunities, and rely heavily on equity financing to fund considerable future capital expenditures. Further, these firms are smaller, younger, and less profitable but have a higher dividend payout ratio. These findings are inconsistent with the pecking order theory,

but generally in line with the underinvestment hypothesis (Myers, 1977). The logistic regression results provide additional support for this hypothesis as we find high-growth firms are more likely to adopt (or switch to) an extremely conservative debt policy. There is mixed evidence on the financial flexibility hypothesis. While zero-leverage or ultra-low leverage firms tend to build up cash reserves, their decision to initiate debt is not driven by an increase in future investment spending but rather by optimal capital structure considerations. We find that consistent with the dynamic trade-off theory (e.g. Fischer et al., 1989; Leary and Roberts, 2005), firms revert back to a less conservative debt policy when the deviation from the target leverage becomes sufficiently large, at which point the benefits of being close to the target outweigh transaction costs, triggering leverage adjustment.

The remainder of the paper is organized as follows. Section 2 discusses potential theoretical explanations for the zero-leverage puzzle. Section 3 describes the data and sample selection process, and then analyzes the characteristics of firms being classified into the ‘zero-leverage’ or ‘ultra-low leverage’ subsets. Section 4 provides an empirical analysis of the decision to adopt a zero-leverage or ultra-low leverage policy. In this section, we also examine the propensity of firms to switch to or drop these extremely conservative debt policies. Section 5 concludes.

## **2 Potential Theoretical Explanations for the Zero-Leverage Puzzle**

In this section, we briefly review the existing theories of capital structure in order to search for potential explanations for the zero-leverage and ultra-low puzzle. First, in imperfect capital markets, capital structure decisions are determined by not only the firm’s characteristics (demand side), but also its ability to raise capital externally (supply side). In the presence of market frictions (e.g. asymmetric information and investment distortions), some firms may not be able to obtain sufficient external financing to fund positive NPV projects (Stiglitz and Weiss, 1981). As a result, these ‘financially constrained’ firms tend to be under-leveraged as compared to their unconstrained counterparts. Faulkender and Petersen (2006) show empirically that firms without access to the public bond market have much (35%) less debt than firms with such access. This suggests that the zero-leverage or ultra-low leverage phenomenon may be caused by financially constrained firms being rationed by their lenders.



Another potential explanation for the zero-leverage puzzle is based on asymmetric information. The pecking order theory suggests that when investors do not know about the firm value and its future growth prospects, they will place a discount on a new security issue (Myers and Majluf, 1984; Myers, 1984). Consequently, the firm prefers to use securities that are less risky and less sensitive to mis-pricing. Retained earnings are preferred to debt financing and equity is only used as the last resort. The implication follows that highly profitable firms with large cash flow from operations should use their internal funds to finance new investment opportunities and rely less on external financing, including both debt and equity.

The static trade-off theory predicts that firms have an optimal capital structure that balances the costs (financial distress) and benefits (tax shields) of debt financing. Under the trade-off framework, a low-leverage policy should be adopted when the firm has high financial distress costs, low debt tax shields (Graham, 2000), high non-debt tax shields (DeAngelo and Masulis, 1980) and/or potentially large substitutes for debt such as leases (Yan, 2006). Moreover, dynamic trade-off models suggest that, due to transaction costs (Fischer et al., 1989; Leary and Roberts, 2005) or investment dynamics (DeAngelo et al., 2009), firms may maintain low leverage and deviate away from the target leverage, toward which they adjust in the long-run. Empirically, however, the existing trade-off models are not yet able to fully explain the optimality of all-equity financing and the relatively large fraction of zero-leverage firms in the economy (Strebulaev and Yang, 2006).

Based on elements of both the trade-off and pecking order theories, the financial flexibility hypothesis suggests that firms choose to have low leverage and large cash reserves (and possibly maintain high dividend payments) in order to stockpile debt capacity and preserve their borrowing power that can be used to fund new investment opportunities in the future (Modigliani and Miller, 1963; DeAngelo and DeAngelo, 2007; Gamba and Triantis, 2008; see also Denis and Sibilkov, 2009).<sup>5</sup> The desire to build, preserve and draw down financial flexibility, in the presence of market frictions such as adverse selection (Myers, 1984) and/or transaction costs (Leary and Roberts, 2005), is argued to be an important factor explaining zero-leverage or ultra-low leverage decisions (e.g. Devos et al., 2008).

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<sup>5</sup> Recent surveys show that financial flexibility is considered by finance managers as one of the key determinants of their capital structure decisions (e.g. Graham and Harvey, 2001).

A final potential explanation for the zero-leverage or ultra-low leverage puzzle is based on agency theory. The underinvestment hypothesis (Myers, 1977) shows that firms with valuable growth opportunities and risky debt overhang have an incentive to under-invest in positive NPV projects because the payoff from a new investment may accrue partially to debt-holders rather than accruing fully to equity-holders. One of the possible solutions to this underinvestment problem is to reduce the risky debt overhang. The prediction follows that firms have extremely low leverage with a view to mitigating underinvestment incentives.

### **3 Data, Sample Selection and Descriptive Analysis**

#### ***3.1 Data and Classification of Zero-Leverage and Ultra-Low Leverage Firms***

We examine a panel of U.K. firms collected from Thompson *Datastream*. The database's initial sample has more than 1,600 firms, for which we collected the relevant company accounting data from the earliest possible year to 2005, creating an unbalanced panel data set of nearly 20,000 firm-year observations. We imposed a number of standard data restrictions. First, we excluded financial and utility firms because these firms are subject to different accounting regulations. Second, we only retained firms that have five-years or more of observations since our empirical analysis involves investigating the evolution of financing and investment decisions over a given period of time (e.g. Minton and Wruck, 2001). This process resulted in a sample comprising of 988 firms and 14,552 firm-year observations between 1980 and 2005. We only provide some descriptive statistics for this sample because of the many missing items in the cash flow statement, which are required for our main empirical analysis (see Appendix 1). Finally, after removing the observations with missing items, we obtained an unbalanced panel data set comprising of 858 firms and 5,389 firm-year observations over the sample period 1997-2003. Table 1 and Table 2 present the formal definition and standard descriptive statistics for the variables under consideration, respectively.

A *zero-leverage* firm is defined as one that has zero total debt in any given year. In addition to this 'extreme' classification, we also define an *ultra-low leverage* firm as one that has market leverage of less than or equal to 0.01 (1%). This latter classification is useful because theoretically, most dynamic models of capital structure do not account for the optimality of zero leverage; and empirically, having such a marginal debt presence can still be considered as a stylized fact for extreme debt

conservatism. Note that while our chosen cut-off point of 1% is ad-hoc and arbitrary, it is on the conservative side and generally stricter than previously used classifications (see Minton and Wruck, 2001; Strebulaev and Yang, 2006).<sup>6</sup>

Figure 1 depicts the empirical distribution of three alternative measures of leverage, namely total market leverage, short-term market leverage and long-term market leverage, respectively. It is clearly seen that all the distributions are highly right-skewed and have their mass concentrated on the left. Importantly, there is a point mass at zero-leverage for all these three measures of leverage. Consistent with the recent U.S. evidence by Cook et al. (2008), our analysis shows that the zero-leverage and ultra-low leverage phenomenon are a prevalent empirical observation.

Table 3 reports the empirical distribution of zero-leverage and ultra-low leverage firms by time and industry. The results in Panel A show that over the main sample period 1996-2003, on average, 9.3% (17.9%) of firms have zero-leverage (ultra-low leverage). There is considerable variation in the proportion of unlevered (lowly levered) firms across the years, from a minimum 5.9% (20.1%) in 1996 to 14.46% (27.3%) in 2003. Interestingly, 22.3% (38.7%) of firms have zero-leverage (ultra-low leverage) at least once during the sample period. We observe a similar pattern of zero-leverage and ultra-low leverage policies when examining the larger sample of 14,552 firm-year observations in a much longer time span between 1980 and 2005. Notably, in Panel A of Appendix 1, 9.5% (17%) of the observations have zero-leverage (ultra-low leverage). Overall, the finding suggests that extremely conservative debt policies are prevalent among U.K. firms and generally consistent with the recent U.S. evidence (Strebulaev and Yang, 2006).

The results in Panel B of Table 3 reveal that zero-leverage firms are concentrated in the oil and gas business (29.7%), followed by technology (17.1%) and healthcare (14.8%). While extreme debt conservatism is not unexpected in high-growth industries such as technology and healthcare, it remains unclear as why oil and gas firms have no (or little) debt.<sup>7</sup> The evidence on ultra-low leverage firms is similar: among firms that have market leverage of less than or equal to 1%, most operate in technology (36.7%), healthcare (33.1%) and oil and gas (34.8%). Only a small

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<sup>6</sup> Minton and Wruck (2001) define a firm as financially conservative if its long-term leverage is in the first 20% of the distribution (for five consecutive years). Strebulaev and Yang (2006) consider *almost zero-leverage* firms as those with market or book leverage of less than 5%.

<sup>7</sup> One possible explanation for this finding is that oil and gas companies often have large cash holdings and thus less incentive to borrow.

fraction of zero-leverage firms operate in traditionally capital-intensive sectors such as telecommunications (2%) and industrials (5.6%); the pattern is qualitatively similar for ultra-low leverage firms. For the larger sample between 1980 and 2005, the pattern is slightly different however (see Panel B of Appendix 1). Oil and gas firms are again the most financially conservative but in general zero-leverage and ultra-low leverage firms are more evenly distributed. In sum, there is inconclusive evidence that debt conservatism is industry-dependent.

### ***3.2 Persistence of Zero-Leverage and Ultra-Low Leverage Policies***

In Table 4, we examine whether zero-leverage is a short-term and transitory phenomenon. The results show that 57% of the firms that have zero-leverage in any given year adopt the same conservative approach to debt financing in the next financial year. More than a third of zero-leverage firms do not take on any new debt in the next three consecutive years. After five years, nearly 20% of zero-leverage firms still have no debt presence in their balance sheet. We observe the same degree of persistence for the ultra-low leverage policy: 21% of ultra-low leverage firms maintain its market leverage under the 1% threshold in the next five consecutive years. This pattern of persistence is even more pronounced when we turn to examine the larger sample between 1980 and 2005 (see Table A-2 of Appendix 1). In sum, the evidence suggests that debt conservatism is not a short-term and transitory policy but more likely a ‘sticky’ one, a finding consistent with the U.S. evidence on zero leverage (e.g. Strebulaev and Yang, 2006) and the recent empirical finding on the persistence of corporate capital structure (Lemmon et al., 2008).

### ***3.3 Characteristics of Zero-Leverage and Ultra-Low Leverage Firms***

Table 5 reports the mean statistics for several characteristics of zero-leverage and ultra-low-leverage firms. In Panel A, we compare the characteristics of zero-leverage firms with those of non-zero-leverage firms. We also consider a proxy sample consisting of firm-year observations that are in the same year and industry, and have a comparable firm size as zero-leverage firms (i.e. within  $\pm 10\%$  of the original firm size). The construction of the proxy sample allows us to examine whether firms of similar size operating in the same sector have different leverage ratios, and if so, what underlying factors determine the differential debt policy. The results in Panel A show that all the firm characteristics (except the tax ratio, cash flow deficit and net debt

issued) are significantly different at the 1% level for the two subsets of firms, i.e. zero-leverage versus non-zero-leverage firms, and zero-leverage versus control firms. The following analysis focuses on the results in Panel A as the results in panel B for ultra-leverage firms are broadly similar.

By construction, market leverage is significantly higher for non-zero-leverage and control firms. Removing zero-leverage firms from the sample increases the market leverage mean to 22.1% from 20%. Zero-leverage firms are clearly under-leveraged in the sense that their leverage is, on average, 4.1% below the target leverage.<sup>8</sup> In contrast, non-zero-leverage and proxy firms maintain leverage relatively closer to the target. The equity ratio is, expectedly, significantly higher for zero-leverage firms, which must rely on retained earnings and/or equity as the sources of financing. The evidence on gross and net debt issued suggests that zero-leverage firms issue little new debt (about 0.1%) but retire the outstanding debt aggressively. These firms, however, have a significantly higher net equity issued ratio (12%) than do non-zero-leverage firms (4.7%) and proxy firms (5.7%). This finding suggests that zero-leverage firms are heavily equity-financed, hence inconsistent with previous U.S. evidence on low-leverage firms (Minton and Wruck, 2001).

Zero-leverage firms are significantly smaller and younger than non-zero-leverage firms and control firms. They also have a lower tangibility ratio and, therefore, fewer collateralized assets.<sup>9</sup> These characteristics may indicate that zero-leverage firms face substantial agency costs, asymmetric information problems and hence higher costs of debt financing. However, this argument is inconsistent with the above evidence that zero-leverage firms are relatively active in the capital market and make large equity issues to finance their investment opportunities. Further, the z-score for zero-leverage firms is particularly high (6.4), as compared to that of non-zero-leverage firms (0.17) and control firms (-0.17), respectively.<sup>10</sup> This suggests zero-leverage firms are less likely to face financial distress and high external financing

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<sup>8</sup> Based on the trade-off framework, the target leverage is proxied by the fitted value estimated from a conventional regression of leverage on commonly used determinants including tangibility, (log of) total assets, non-debt tax shields, growth opportunities and profitability (e.g. Titman and Wessels, 1988; Rajan and Zingales, 1995; see also Harris and Raviv, 1991 for a survey). See Appendix 2 for a detailed explanation.

<sup>9</sup> A recent dynamic model by Rampini and Viswanathan (2009) shows theoretically that tangibility is an important determinant of capital structure, and one that is able to explain the zero-leverage decision.

<sup>10</sup> Z-score is a measure of financial distress that was initially developed by Altman (1968). We adopt a U.K. version of this measure based on Taffler (1984). See Table 1 for the definition of the Taffler's z-score. We have also applied the modified Altman z-score and obtained qualitatively results.

costs, inconsistent with the hypothesis that these firms are ‘financially constrained’ and rationed by their lenders.

Zero-leverage firms have significantly higher cash balances than levered firms and control firms. For the former firms, cash and marketable securities represent 36% of their market value – more than three times that of an average control firm (11.5%) or an average non-zero-leverage firm (11.7%). Zero-leverage firms are also much more liquid as indicated by a considerably high liquidity ratio of nearly 4, more than two times the average liquidity ratio (1.57) of levered firms. Consistent with the previous evidence, zero-leverage firms have substantial cash balances and can be defined as ‘cash rich’ and ‘highly liquid’ (Harford, 1999; Opler et al., 1999; Minton and Wruck, 2001; Iona et al., 2004).<sup>11</sup> This characteristic is generally consistent with the firm’s strategy of preserving their financial flexibility (DeAngelo and DeAngelo, 2007).

Importantly, zero-leverage firms have considerably more valuable growth opportunities, as measured by the market-to-book ratio, than non-zero-leverage and control firms. The former firms have an average market-to-book ratio of 3.2, significantly higher than the mean of 1.9 for the latter firms. This finding suggests that high-growth firms adopt an extremely conservative debt policy and rely heavily on equity financing in order to alleviate the underinvestment problem (Myers, 1977; Myers and Majluf, 1984). There is, however, no significant difference in the share price performance (measured by stock return) of unlevered and levered firms; this finding is not in line with Baker and Wrugler’s (2002) market timing hypothesis.<sup>12</sup>

To the extent that zero-leverage firms do not take on any debt in order to mitigate underinvestment incentives, it can be predicted that, ex post, they will be able to take more growth options and make larger investments (Aivazian et al. 2005a, 2005b). The evidence on firm investment suggests that zero-leverage firms spend significantly more on capital expenditures than levered firms and control firms. Specifically, the ratio of capital expenditures to total assets for unlevered firms is 0.14, four times bigger than that for levered firms (0.03) and control firms (0.02). In

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<sup>11</sup> Almeida et al. (2006) argue that ‘cash-rich’ firms can be considered as relatively constrained because they build up their cash reserves as a means of precautionary savings, therefore avoiding the potential high costs of being constrained in the future.

<sup>12</sup> However, ultra-low leverage firms have significantly higher stock returns than proxy firms.

contrast, levered and control firms appear to spend significantly more on acquisitions and takeovers.

The average profit margin for zero-leverage firms is negative (-5%), and much lower than that for non-zero-leverage firms (2.1%) and control firms (1.1%). A similar pattern is found for the variable cash flow. The finding that an average zero-leverage firm makes a loss and cannot generate sufficient internal funds appears to be inconsistent with the pecking order theory. There is, however, an important difference between the zero-leverage firms that pay dividends and those that do not.<sup>13</sup> Unreported results show that among dividend-paying firms, zero-leverage firms are significantly more profitable than non-zero-leverage firms, broadly consistent with previous evidence on the low-leverage phenomenon (e.g. Minton and Wruck, 2001; Iona et al. 2004; Strebulaev and Yang, 2006). Thus, the finding that zero-leverage firms have lower profitability and cash flow is mainly driven by the large losses incurred by the zero-leverage firms that do not pay dividends.

Zero-leverage firms seem to have a considerably higher dividend payout ratio, as compared to non-zero-leverage and control firms. Firms with no debt rely on equity as the main external source of financing, and therefore have to make dividend payments to a larger base of equity-holders than the proxy firms. This empirical observation is in line with the view that dividend and debt are substitutes for mitigating the free-cash-flow problem (Easterbook, 1984), and that firms maintain high dividend payments and low leverage in order to build up financial flexibility and facilitate future access to equity (DeAngelo and DeAngelo, 2007).

Zero-leverage firms have significantly larger earnings' volatility and abnormal earnings (firm quality) than levered and proxy firms.<sup>14</sup> Given that these two variables capture the level of asymmetric information, the finding suggests that firms facing less favorable information environment are more likely to adopt extremely conservative debt policies.

Finally, unlevered firms enjoy significantly smaller debt tax shields and non-debt tax shields than levered firms and proxy firms. There is, however, no significant difference in the tax ratio between these firms. These results indicate that extreme

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<sup>13</sup> In unreported tests, we compare and contrast the characteristics of unlevered paying firms (non-payers) and levered paying firms (non-payers) and find results similar to those reported in Table 5 (except the results for profitability and cash flow as reported above).

<sup>14</sup> There is however no significant difference in abnormal earnings of ultra-low leverage firms and proxy firms.

debt conservatism is possibly not driven by tax considerations. Zero-leverage and ultra-low leverage firms have, on average, zero leases, suggesting they do not consider other substitutes for debt. Overall, these findings are not in line with the static trade-off theory explanation for the zero-leverage puzzle.

### ***3.4 Characteristics of Zero-Leverage and Ultra-Low Leverage Firms over Time***

Figure 2 demonstrates graphically the evolution of a number of key characteristics associated with zero-leverage firms identified in the previous subsection. Specifically, we examine the patterns of firm characteristics in the five years  $[t-5, t+5]$  around the event year,  $t$ , where a zero-leverage status is realized. We also compare and contrast these patterns with those of non-zero-leverage firms. Figure 3 replicates this exercise for ultra-low leverage firms. For brevity, the following analysis focuses on Figure 2 but it can be seen that both figures exhibit broadly similar patterns.

Figure 2.a shows that zero-leverage firms tend to maintain, on average, substantially lower leverage than non-zero-leverage firms during the  $\pm 5$  years around the event year where the leverage ratio of these firms reaches its trough. This finding provides further evidence for the persistence of extreme conservative debt policies. The patterns of net debt and equity issues reported in Figure 2.b and Figure 2.c shed further light on the external financing activities of zero-leverage firms. In particular, these firms visit the equity market frequently and consistently have much larger equity issues than non-zero-leverage firms. The size of the equity issues reaches its peak between  $t-3$  and  $t$  but gradually decreases afterwards. Importantly, zero-leverage firms are not inactive in the corporate debt market. They tend to retire the existing debt aggressively between  $t-3$  and  $t$  but reverse this financing pattern in the event year and subsequently have relatively large net debt issues in the next three years. This finding indicates that zero-leverage firms may not necessarily face financial constraints or distress that would otherwise prevent them from accessing the debt market in such an active manner. Overall, the graphical evidence on equity and debt issues indicates that the zero-leverage or ultra-low leverage policy is likely to be a strategic one rather than a consequence of limited exposure to financial markets.

Figure 2.d shows that zero-leverage firms, on average, gradually deviate away from the target leverage between  $t-5$  and  $t$ . The deviation from the target becomes the largest in the event year where these firms are significantly under-leveraged.



However, dynamic trade-off considerations appear to play an important role as these firms tend to close the deviation and revert back to the target in the following years.

The remaining graphical evidence on growth opportunities, cash holdings, the dividend payout ratio and firm investment is consistent with the analysis of the summary statistics in the previous subsection. Zero-leverage firms tend to have substantially larger cash balances and a moderately higher dividend payout ratio than levered firms. They also have consistently large growth options during the five-year period around the event year. Further, through heavy reliance on equity financing, these firms are able to spend substantially more on capital expenditures, especially after the event year. This finding provides further evidence for the underinvestment hypothesis.

## 4 Empirical Results

### 4.1 Logistic Regression of Zero-leverage and Ultra-low Leverage Decisions

In this section, we examine the firm characteristics that determine a decision to adopt a zero-leverage or ultra-low leverage policy. In Table 6, we employ a logistic regression approach and report the results for a zero-leverage decision in columns (1)-(3), and an ultra-low leverage decision in columns (4)-(6). The estimated logistic model is specified as:

$$\Pr(ZL_{i,t} = 1 | X_{it}) = \frac{1}{1 + e^{-(\alpha + X_{it}\beta)}} \quad (1)$$

where  $ZL_{it}$  is a binary variable taking the value 1 if firm  $i$  has zero-leverage (ultra-low leverage) in year  $t$ , and 0 otherwise.  $X_{it}$  is a vector of the firm characteristics that determine a zero-leverage or ultra-low leverage decision, and  $\beta$  is a vector of the coefficients. Based on our analysis of the firm characteristics in the previous subsection and a similar logistic regression by Minton and Wruck (2001), we consider as the determinants of a zero-leverage (ultra-low leverage) decision the following variables: cash flow, cash holdings, size, z-score, non-debt tax shields, growth, investment, dividend ratio, firm quality (abnormal earnings) and earnings' volatility. We further include a dummy variable on the past zero-leverage or ultra-low leverage policy to formally investigate the degree of persistence of extreme debt conservatism.

The results in Table 6 show that the coefficient on lagged zero-leverage or ultra-low leverage policies is significantly positive. Consistent with the previous

descriptive analysis, firms that have zero leverage or ultra-low leverage in any given year are more likely to maintain this extremely conservative debt policy in the following year. This provides further support for the view that debt conservatism is persistent and path-dependent.

The significantly positive coefficient on cash flow reported in columns (2)-(3) and (5)-(6) suggest that firms are more likely to use little or no debt when they have substantial internal funds; however, the coefficient on cash flow is insignificant in columns (1) and (4). Overall, these results are in line with the second rung of the pecking order of financing, whereby internal funds are preferred to external financing. To further investigate whether the behavior of zero-leverage firms also follows the second rung of the pecking order, we modify the empirical model developed by Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) and examine the relation between net equity issued and the cash flow (financing) deficit. The results in Appendix 4 show that for zero-leverage and ultra-low leverage firms, any financing surpluses or deficits are mainly offset by net equity issues. In contrast, firms adopting a less conservative debt policy appear to finance their surpluses or deficits by issuing both equity and debt. These financing patterns are not consistent with the pecking order theory prediction that debt is the preferred source of external financing.

The results show that non-debt tax shields have a significantly negative coefficient (except in column (1)), indicating that firms taking advantage of non-debt tax shields are less likely to have little or no debt. Less distressed firms (i.e. those with a high and positive z-score) are more likely to adopt a zero-leverage or ultra-low leverage policy. These empirical results are clearly in conflict with the static trade-off framework. Firm size, a potential measure of financial constraints, decreases with the likelihood of firms having extremely low leverage. However, size may also proxy for the degree of asymmetric information and agency problems facing the firm. Overall, these empirical results provide limited support for the static trade-off theory explanation for the zero-leverage puzzle.

The coefficient on cash holdings is found to be significant and positive, suggesting that firms with large cash reserves are more likely to adopt a zero-leverage or ultra-low leverage policy. This finding is consistent with previous research on low-leverage firms, e.g. Minton and Wruck (2001), Iona et al. (2004) and Devos et al. (2008), and generally supportive of the financial flexibility hypothesis. Firms holding substantial cash reserves are typically under-leveraged as they aim to preserve their

debt capacity for imperfectly anticipated future capital requirements (DeAngelo and DeAngelo, 2007).

Growth opportunities (market-to-book) are found to increase significantly with the propensity of firms to use little or no debt (except in column (1) where there is a possible correlation between growth and cash holdings). This lends strong support for the underinvestment hypothesis that firms with valuable growth opportunities mitigate the debt overhang problem by reducing leverage (Myers, 1977). Empirically, our finding is consistent with the previous capital structure literature (e.g. Rajan and Zingales, 1995; Barclay et al., 2003; Johnson, 2003) and recent research on low-leverage firms (e.g. Minton and Wruck, 2001; Iona et al., 2004).

To further examine the effectiveness of the extremely low-leverage policy in mitigating underinvestment incentives, we next examine the relationship between future investment and the firm's decision to eschew debt. In columns (1)-(2) and (5)-(6), future investment is positively related to the likelihood of firms adopting an extremely conservative debt policy. Consistent with our previous descriptive results, this finding suggests that using zero-leverage or ultra-low leverage is effective in controlling underinvestment problems and enables firms to undertake more investments in the future.<sup>15</sup>

The results show that firm quality and earnings' volatility are insignificant in the majority of the regressions, while the dividend payout ratio is always significantly positive. Theoretically, low abnormal earnings (firm quality) and earnings' volatility, and a high payout ratio can signal good quality so firms with those characteristics are expected to face less asymmetric information and use more debt. Our findings are clearly not consistent with these theoretical predictions.

#### ***4.2 Decisions to Switch to a Zero-leverage or Ultra-low Leverage Policy***

In this section, we study the probability of firms making a 'jump-down' decision to switch to a zero-leverage or ultra-low leverage policy. Formally, a firm is said to make this switch if it is in the proxy sample and has non-zero leverage in year  $t-1$  but becomes debt-free in year  $t$ . Similarly, for ultra-low leverage firms, a 'jump-down'

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<sup>15</sup> The pecking order model also implies that firm investment decreases with the propensity to adopt a zero-leverage or ultra-low leverage policy. Large capital expenditures cannot be funded fully by internal funds may require additional external financing, hence increasing the propensity to use debt (Minton and Wruck, 2001). However, since contemporaneous firm investment is potentially related to cash flow and growth opportunities, it is not included in our regression.

decision is defined as one where a proxy firm (without ultra-low leverage) in year  $t-1$  starts to adopt an ultra-low leverage policy in year  $t$ . Analyzing the ‘jump-down’ decision allows for an examination of the factors that trigger an important switch to extreme debt conservatism from normal debt policies. We consider the same set of firm characteristics used in the logistic regression model (1).<sup>16</sup>

The results in Table 7 show that the propensity to switch to an extremely conservative debt policy (zero-leverage or ultra-low leverage) is positively related to future investment spending, z-score and dividend payout ratio, and negatively related to growth opportunities, cash holdings, non-debt tax shields and firm size (the results for firm quality and earnings’ volatility are weak and inconclusive for all the four models). These findings are broadly consistent with the results reported in Table 6, and suggest that firms begin to adopt a conservative approach to debt financing mainly to build up financial slack and mitigate the underinvestment problem (Myers, 1977). On the other hand, the evidence on the static trade-off theory and asymmetric information-based explanations is weak and mixed. While large firms are less likely to make a ‘jump-down’ decision, firms with non-debt tax shields and low financial distress are more likely to have no (or little) debt, inconsistent with theory predictions.

#### ***4.3 Decisions to Drop a Zero-leverage or Ultra-low Leverage Policy***

We next study the ‘jump-up’ decision, whereby zero-leverage (ultra-low leverage) firms in year  $t$  take on more debt (with leverage increasing by at least 0.5%) in the following year, thereby dropping the zero-leverage (ultra-low leverage) policy in year  $t+1$ . In Table 8, we examine four factors that may trigger this change to a less conservative debt policy, including capital expenditures (firm investment), deviation from the target leverage, growth opportunities and firm size.

The financial flexibility hypothesis implies that zero-leverage and ultra-low leverage firms with valuable future growth opportunities and large capital expenditures made in year  $t$  should have an incentive to lever up to take advantage of their preserved borrowing power. However, in the presence of severe underinvestment incentives, these firms may not initiate debt but retain their extremely conservative debt policy. The results show that firms with valuable growth options and large

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<sup>16</sup> Strebulaev and Yang (2006) suggest using the firm characteristics in first differences to avoid an endogeneity problem. We follow Minton and Wruck (2001) and use the variables in levels.

investments in year  $t$  are less likely to lever up in year  $t+1$  (with a few exceptions in columns (1) and (3)), hence providing support for the underinvestment hypothesis.

Under the trade-off framework, zero-leverage and ultra-leverage firms, which are shown to be much under-leveraged, have an incentive to initiate debt and undertake adjustment toward the target leverage. Further, in dynamic trade-off models with the transaction costs (e.g. Fischer et al., 1989; Leary and Roberts, 2005), the likelihood that leverage adjustment takes place increases with the magnitude of the deviation from the target leverage. The results in column (1) and (3) of Table 8 provide some evidence for this conjecture. Zero-leverage and ultra-leverage firms drop their conservative approach to debt financing and adjust toward the target leverage when the (absolute) deviation becomes sufficiently large, at which point the benefits of being close to the target outweigh other considerations including transaction costs and underinvestment incentives.

Finally, unlike the findings reported in Table 6 and Table 7, the results in Table 8 show that firm size is insignificant in all the four models. Hence, there is no evidence for the size effect on the ‘jump-up’ decision.

#### ***4.4 Financial Conservatism, Financial Flexibility and Firm Investment***

Our analysis has thus far shown that maintaining financial flexibility is one of the plausible explanations for the zero-leverage puzzle. In this section, we conduct an additional test for the financial flexibility hypothesis by examining directly the relation between extreme debt conservatism and future investment for our sample of zero-leverage and ultra-low leverage firms. To this end, we follow an approach proposed by recent empirical research (Mura and Marchica, 2007; Arslan et al., 2008), and estimate a simple Tobin’s Q model of investment (e.g. Cleary, 1999; Aivazian et al., 2005a, 2005b):

$$\begin{aligned}
 Investment_{i,t+1} = & \alpha + \beta_{ULL} \times Cashflow_{it} \times D_{UL} + \beta_{NUL} \times Cashflow_{it} \times D_{NUL} \\
 & + \gamma_{ULL} \times Q_{it} \times D_{UL} + \gamma_{NUL} \times Q_{it} \times D_{NUL} + \varepsilon_{it}
 \end{aligned} \tag{2}$$

where  $D_{UL}$  is the dummy variable taking value 1 if the firm has zero leverage (or ultra-low-leverage) in year  $t$  and 0 otherwise;  $D_{NUL}$  is the dummy variable taking value 1 if the firm has non-zero-leverage (or non-ultra-low-leverage) in year  $t$  and 0

otherwise.<sup>17</sup>  $\varepsilon_{it}$  is the well-behaved error term. In the Tobin's  $Q$  model of investment, absent severe financial constraints, firms with high growth opportunities will be able to make more investments. The coefficient on cash flow represents the degree of cash flow sensitivity to investment and arguably measures of the degree of financial constraints (Fazzari et al., 1988); e.g. cash flow is insignificant if firms are financially unconstrained but significantly positive otherwise. This investment-type model allows for an examination of whether zero-leverage and ultra-low leverage firms with greater financial flexibility and less financial constraints are able to finance future investment opportunities more easily, thus enhancing their ability to invest.

The results in Table 9 are mixed and dependent on the estimation method employed. In the Pooled OLS estimations in columns (1) and (3), cash flow is insignificant for firms that have zero leverage or ultra-low leverage, while significant for the other firms. This finding shows that by employing an extremely low debt policy, firms do become less financially constrained and can make more capital expenditures in the future. However, in the fixed effects estimations in columns (2) and (4), the coefficient on cash flow is significant and positive for both types of firms. The results also reveal a stronger effect of growth opportunities (Tobin's  $Q$ ) on investment for zero-leverage and ultra-low leverage firms. However, the coefficient differential is only statistically significant in column (1). This is weakly supportive of the argument that financial flexibility enables zero-leverage and ultra-low leverage firms to raise finance more easily in order to take more investment opportunities in the future. Overall, our direct test based on model (2) provides inconclusive evidence on the financial flexibility hypothesis. One possible explanation for this mixed finding lies in the limitation of the Tobin's  $Q$  model of investment and importantly, the debatable interpretation of investment-cash flow sensitivities as a measure of financial constraints.<sup>18</sup>

#### **4.5 Robustness Tests**

We conduct several tests to check the robustness of our empirical findings. We have thus far examined firms that have zero leverage or ultra-low leverage ( $\leq 1\%$ ) in any

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<sup>17</sup> In a robustness test, we include a dummy variable to control for changes in the intercept term (in addition to changes in the slopes). The unreported results are qualitatively similar.

<sup>18</sup> See Kaplan and Zingales (1997), Cleary (1999), Fazzari et al. (2000), Kaplan and Zingales (2000) Cleary (2006) and Cleary et al. (2007) for interesting debate on this matter.

given year. To avoid a potential selection bias toward transitory low leverage policies, we consider a smaller sample of firms that have at least *two* consecutive years with either zero-leverage or ultra-low leverage (see Devos et al., 2008). The (unreported) results of this approach are broadly similar to our main empirical findings.

In a related robustness test, we consider an alternative threshold value used to categorize the ultra-low leverage policy. Note that in the empirical analysis above, ultra-low leverage firms are defined as those with market leverage of less than or equal to 1%. Our (unreported) robustness checks show that the results are generally robust to an alternative but otherwise even less extreme classification where ultra-low leverage is considered to be in the range of 0% and 3%.

In the logistic regression analysis based on model (1), we have followed previous research (Minton and Wruck, 2001) and adopted the pooled estimator as the main estimation methodology. In unreported robustness checks, we employ the fixed effects estimator to control for unobserved time-invariant firm and industry characteristics such as managerial ability and skills, the level of competition in the industry and the life cycle of products. We further include time dummies to allow for macro-economic effects including changes in the state of the economy, accounting standards and regulations that may affect the demand and supply of debt financing. The fixed effects estimates with time dummies are generally similar but less well-behaved than the pooled regression results.

## **5 Conclusions**

There is limited rigorous theoretical and empirical research on the new empirical observation that firms have no, or marginal, debt presence in their capital structure, i.e. the ‘zero-leverage puzzle’. This paper contributes to this growing literature by examining several potential theoretical reasons underlying the firm’s decision to adopt (or switch to) a zero-leverage or ultra-low leverage policy. Our chosen sample of U.K. firms is particularly appropriate for an examination of extreme debt conservatism because U.K. firms generally have the lowest leverage ratio compared to firms in other developed economies.

We show that debt conservatism is a common and persistent empirical regularity. Nearly 10% (18%) of U.K. firms have zero-leverage (ultra-low leverage). 22.3% (38.7%) of firms adopt the zero-leverage (ultra-low-leverage) policy at least once during the sample period. Further, 57% of firms with no debt in any given year

do not take on any new debt in the next year and more than a third retain this extremely conservative debt policy in the next three years.

Our results reveal that, on average, zero-leverage and ultra-low leverage firms are cash-rich and dependent heavily on equity financing to fund considerably valuable growth prospects. These firms are also smaller, younger, more liquid and less profitable but have a higher payout ratio than the other firms in the sample. These results are inconsistent with the pecking order theory, but generally supportive of the underinvestment hypothesis (Myers, 1977).

Our regression results provide further support for the underinvestment hypothesis as we find growth opportunities increase with the probability of firms adopting (or switching to) an extremely conservative debt policy. There is mixed evidence on the financial flexibility hypothesis that firms choose to have low leverage to stockpile debt capacity that is used to fund large capital expenditures in the future. We have shown that firms with little or no debt do build up cash reserves and financial slack. However, the decision to raise more debt is not driven by an increase in future investment spending as predicted by the financial flexibility hypothesis, but rather by dynamic trade-off models. Zero-leverage and ultra-low leverage firms undertake adjustment and revert back to a less conservative debt policy when they become sufficiently under-leveraged.

While our paper has uncovered some plausible explanations for the zero-leverage puzzle, it has not considered two potential factors affecting the firm's decision to eschew debt. Agency theory argues that managerial risk-aversion and managerial entrenchment may be an important reason as why firms adopt a low-leverage policy (Jensen and Meckling, 1976; Morellec, 2004; Morellec et al., 2008); though, empirically, Devos et al. (2008) does not find evidence to support this view. In a recent a dynamic trade-off model with market timing, Yang (2008) shows that when the firm's equity is overvalued and there is persistent difference between the manager and investors' beliefs, the former will take advantage of mispricing by issuing stock and retiring debt repeatedly, potentially leading to extremely low leverage. These interesting issues are left for future research.



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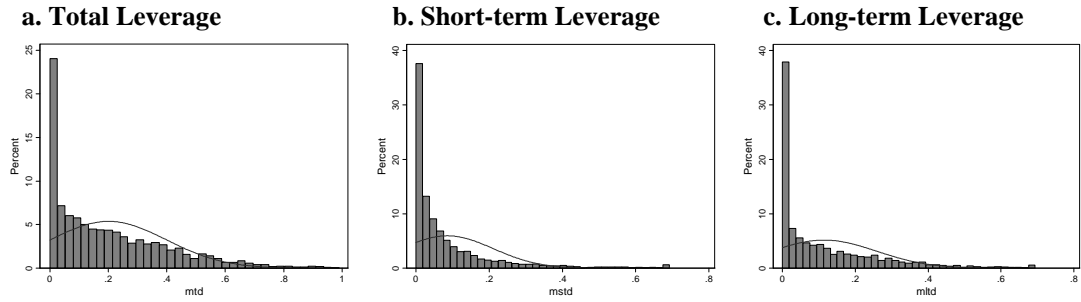
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### Figure 1. Empirical Distributions of Alternative Leverage Ratios

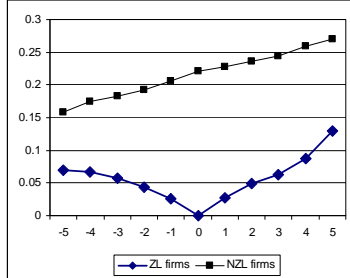
The following figures illustrate the empirical distributions of three alternative market-based leverage ratios, including total leverage, short-term leverage and long-term leverage. Total leverage (i.e. market leverage) is the ratio of total debt to the firm's market value, which is measured by the sum of the market value of equity plus book value of debt. Short-term leverage is ratio of short-term debt (due within 1 year) to the firm's market value as defined above. Long-term leverage is ratio of long-term debt that matures after 1 year to the firm's market value.



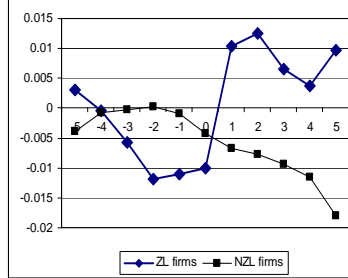
## Figure 2. Firm Characteristics around the Zero-Leverage Year

The following figures present an analysis of the evolution of several important firm characteristics of zero-leverage (ZL) firms and non-zero-leverage (NZL) firms, respectively within  $\pm 5$  years around the event year when a zero-leverage status is realized. See Table 1 for the definitions of the variables.

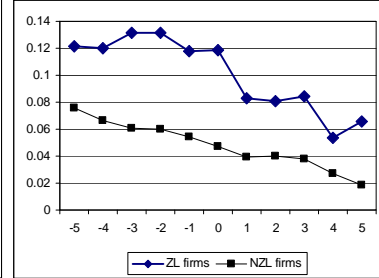
**a. Market Leverage**



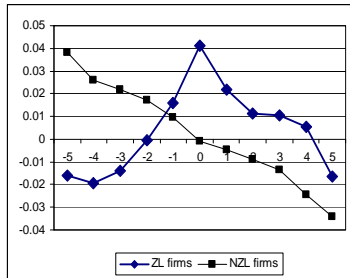
**b. Net Debt Issued**



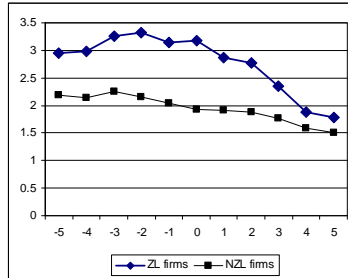
**c. Net Equity Issued**



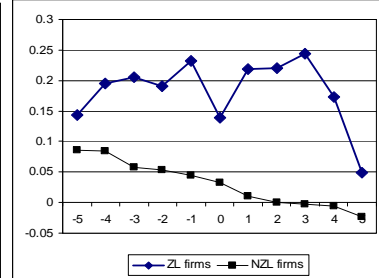
**d. Target Leverage Deviation**



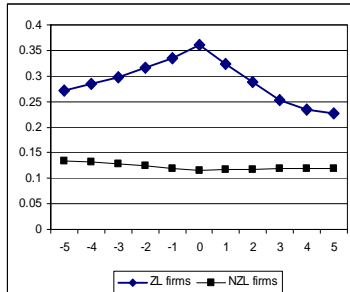
**e. Growth Opportunities**



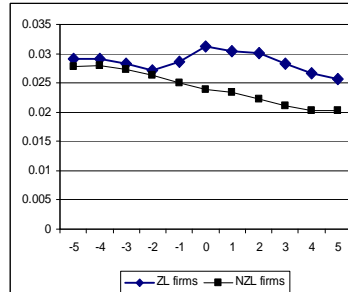
**f. Firm Investment**



**g. Cash Holdings**



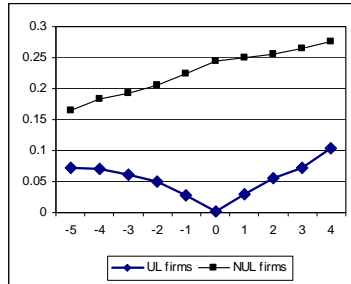
**h. Dividend Ratio**



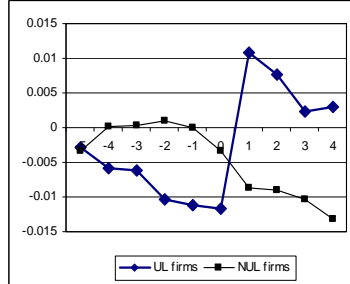
### Figure 3. Firm Characteristics around the Ultra-Low-Leverage Year

The following figures present an analysis of the evolution of several important firm characteristics of ultra-low-leverage (UL) firms and non-ultra-low-leverage (NUL) firms, respectively within  $\pm 5$  years around the event year when an ultra-low leverage status is realized (i.e. when market leverage  $\leq 0.01$ ). See Table 1 for the definitions of the variables

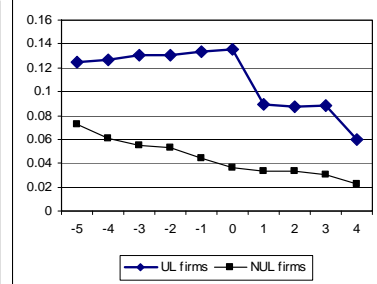
**a. Market Leverage**



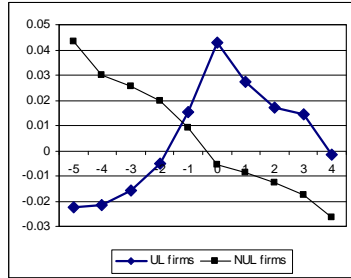
**b. Net Debt Issued**



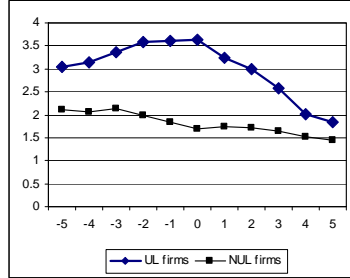
**c. Net Equity Issued**



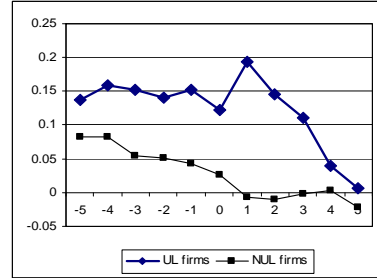
**d. Target Leverage Deviation**



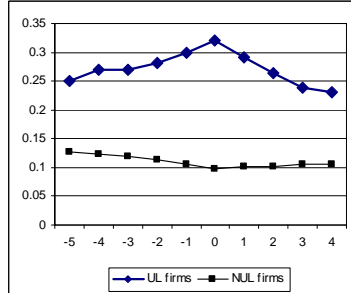
**e. Growth Opportunities**



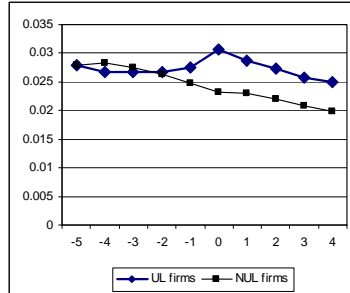
**f. Firm Investment**



**g. Cash Holdings**



**h. Dividend Ratio**





**Table 1. Variable Definitions**

This table describes the proxies for the variables being considered in the paper. The main data set is a panel of U.K. firms collected from Thompson *Datastream* and consists of 858 companies and 5,393 year-observations, with the longest time series of 8 years over the period 1996-2003.

<b>Variable</b>	<b>Proxy</b>
<i>Market leverage</i>	Total debt to the firm's market value, measured by the sum of the market value of equity plus book value of debt
<i>Market equity ratio</i>	Equity to the firm's market value
<i>Debt tax shields</i>	Interest payment to total assets
<i>Non-debt tax shields</i>	Depreciation to total assets
<i>Profitability</i>	Earnings Before Interest and Taxes (EBIT) to total assets
<i>Tax ratio</i>	Tax charges to profit before tax
<i>Dividend payout ratio</i>	Ordinary dividends to total assets
<i>Cash holdings</i>	Cash to total assets
<i>Tangibility</i>	Fixed assets to total assets
<i>Size</i>	Log of total assets in 1995 price
<i>Age</i>	The difference between the year of the observation and the founding year or incorporation year or the first year the firm appeared in <i>Datastream</i> (in that order of availability)
<i>Market lease</i>	Financial lease to the firm's market value
<i>Liquidity</i>	Current assets divided by current liabilities
<i>Growth opportunities</i>	Market value of equity plus book value of debt to total assets
<i>Investment</i>	Net investment, measured by capital expenditures less depreciation, divided by fixed assets <sup>19</sup>
<i>Acquisition</i>	Expenditures on acquisition to fixed assets
<i>Earnings' volatility</i>	Difference between the annual % change in EBITD and the average of this change
<i>Firm quality</i>	First difference of EPS in year $t+1$ and $t$ to share price in year $t$
<i>Stock return</i>	Capital gains (i.e. stock price change) plus cash dividends divided by past year stock price
<i>Cash flow</i>	EBITDA plus depreciation divided by total assets

<sup>19</sup> This measure is employed in Aivazian et al. (2005a, 2005b) and Firth et al. (2009). We have also considered an alternative measure in which investment is capital expenditures to fixed assets. The (unreported) results are qualitatively similar.

<b><i>Cash flow deficit</i></b>	Minus cash flow after tax plus net investment (incl. capital expenditures, acquisitions and disposals) plus equity dividends plus Net change in cash including change in working capital, all divided by the market value
<b><i>Gross debt issued</i></b>	Gross debt issued (including debt issued for cash and acquisitions) divided by the firm's market value
<b><i>Net debt issued</i></b>	Net debt issued to the firm's market value
<b><i>Gross equity issued</i></b>	Gross equity issued (including equity issued for cash and acquisitions) divided by the firm's market value
<b><i>Net equity issued</i></b>	Net equity issued to the firm's market value
<b><i>Z-score</i></b>	U.K. version of the Altman (1968) z-score based on Taffler (1984): $z = 3.20 + 12.18X_1 + 2.50X_2 - 10.68X_3 + 0.024X_4$ <p>where <math>X_1</math> is profit before tax to current liabilities, <math>X_2</math> the ratio of current assets to total liabilities, <math>X_3</math> the current liabilities to total assets and <math>X_4</math> the number of credit interval, measured by quick assets less current liabilities, all divided by the sum of sales less profit before tax less depreciation divided by 365. Firms with a positive (negative) z-score are classified as having potentially low (high) bankruptcy risk.</p>
<b><i>Target leverage deviation</i></b>	Target leverage minus actual leverage where target leverage is the fitted values obtained from a fixed effects regression of leverage on the control variables including, growth opportunities, non-debt tax shields, firm size, profitability and tangibility. See Appendix 2 for a detailed explanation.

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**Table 2. Summary of Descriptive Statistics**

This table provides standard summary statistics for the variables being considered in the paper. See Table 1 for the definitions of the variables.

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Median</b>	<b>Max</b>
<i>Market leverage</i>	0.200	0.199	0.000	0.146	0.990
<i>Book leverage</i>	0.188	0.175	0.000	0.157	1.000
<i>Market equity ratio</i>	0.369	0.298	-0.203	0.305	1.544
<i>Debt tax shields</i>	0.015	0.014	0.000	0.012	0.068
<i>Non-debt tax shields</i>	0.039	0.031	0.000	0.033	0.204
<i>Profitability</i>	0.014	0.266	-1.495	0.079	0.446
<i>Tax ratio</i>	0.187	0.232	-0.800	0.233	1.150
<i>Dividend payout ratio</i>	0.025	0.029	0.000	0.019	0.217
<i>Tangibility</i>	0.310	0.243	0.000	0.256	0.997
<i>Cash holdings</i>	0.138	0.176	0.000	0.073	0.919
<i>Firm size</i>	11.189	2.105	1.609	11.012	18.961
<i>Firm age</i>	21.270	12.374	5.000	18.000	43.000
<i>Market lease</i>	0.009	0.021	0.000	0.000	0.134
<i>Liquidity</i>	1.791	1.816	0.141	1.319	13.025
<i>Z-score</i>	0.751	12.638	-53.506	0.952	52.080
<i>Growth opportunities</i>	2.043	2.216	0.188	1.363	20.000
<i>Firm investment</i>	0.043	0.665	-3.710	0.022	3.840
<i>Acquisition</i>	0.222	1.367	-5.568	0.000	8.558
<i>Earnings' volatility (%)</i>	-0.140	4.647	-24.746	-0.057	23.344
<i>Firm quality</i>	0.629	1.655	-4.347	0.153	3.477
<i>Stock return</i>	0.125	0.733	-0.854	0.001	4.042
<i>Cash flow</i>	0.066	0.242	-1.202	0.118	0.490
<i>Cash flow deficit</i>	0.024	0.143	-0.690	0.001	0.645
<i>Gross debt issued</i>	0.045	0.091	0.000	0.000	0.606
<i>Net debt issued</i>	-0.005	0.097	-0.540	-0.001	0.358
<i>Debt issued for cash</i>	0.045	0.086	0.000	0.000	0.472
<i>Net equity issued</i>	0.054	0.169	-0.175	0.001	1.133

**Table 3. Distribution of Zero-Leverage and Ultra-Low Leverage Firms by Time and Industry**

This table summarizes the distribution of zero-leverage and ultra-low leverage firms by time and industry. Panel A lists the number and percentage of firms that have a zero-leverage status (i.e. firms that have zero leverage for at least one year) and ultra-low leverage status (i.e. firms that have market leverage  $\leq 0.01$  for at least one year). Panel B lists the number and percentage of ultra-low leverage firms by industry. ZL and UL denote zero-leverage and ultra-low leverage, respectively.

**Panel A – Distribution of ZL and UL Firms by Time**

<b>Year</b>	<b>All Sample</b>	<b>ZL</b>	<b>%</b>	<b>UL</b>	<b>%</b>
1996	169	10	5.92	21	12.43
1997	742	70	9.43	149	20.08
1998	832	76	9.13	154	18.51
1999	858	82	9.56	155	18.07
2000	858	75	8.74	163	19.00
2001	857	66	7.70	128	14.94
2002	831	87	10.47	144	17.33
2003	242	35	14.46	50	20.66
<b>Number of Obs</b>	<b>5389</b>	<b>501</b>	<b>9.30</b>	<b>964</b>	<b>17.89</b>
<b>Number of firms</b>	<b>858</b>	<b>191</b>	<b>22.26</b>	<b>332</b>	<b>38.69</b>

**Panel B – Distribution of ZL and UL Firms by Industry**

<b>Industry</b>	<b>All Sample</b>	<b>ZL</b>	<b>%</b>	<b>UL</b>	<b>%</b>
Oil & Gas	155	46	29.68	54	34.84
Basic Materials	226	21	9.29	33	14.60
Industrials	2008	112	5.58	225	11.21
Consumer goods	874	76	8.70	134	15.33
Health care	338	50	14.79	112	33.14
Consumer	1121	97	8.65	188	16.77
Telecommunications	100	2	2.00	10	10.00
Technology	567	97	17.11	208	36.68
<b>Number of Obs</b>	<b>5389</b>	<b>501</b>	<b>9.30</b>	<b>964</b>	<b>17.89</b>
<b>Number of firms</b>	<b>858</b>	<b>191</b>	<b>22.26</b>	<b>332</b>	<b>38.69</b>

**Table 4. Persistence of Zero-Leverage and Ultra-Low Leverage Policies**

This table analyzes the persistence of a zero-leverage policy and an ultra-low leverage policy. It presents the number and percentage of firms that have zero-leverage or ultra-low leverage for  $k$  consecutive years, where  $k = 1 \dots 8$ . A ‘zero-leverage’ status means firms have zero leverage (no debt) and an ‘ultra-low leverage’ status means firms have market leverage  $\leq 0.01$ . ZL and UL denote zero-leverage and ultra-low leverage, respectively.

<b>Number of Consecutive Years</b>	<b>ZL</b>	<b>%</b>	<b>UL</b>	<b>%</b>
1 Year	501	100.00	964	100.00
2 Years	284	56.69	568	58.92
3 Years	171	34.13	350	36.31
4 Years	98	19.56	206	21.37
5 Years	98	19.56	206	21.37
6 Years	53	10.58	113	11.72
7 Years	23	4.59	51	5.29
8 Years	0	0.00	12	1.24

**Table 5. Characteristics of Zero-Leverage and Ultra-Low Leverage Firms**

This table summarizes the characteristics of zero-leverage and ultra-low leverage firms, respectively. Panel A compares the mean firm characteristics of zero-leverage firms (firms with no debt) to those of non-zero-leverage firms. Panel B compares the mean firm characteristics of ultra-low leverage firms (i.e. firms with market leverage  $\leq 0.01$ ) to those of non-ultra-low leverage firms. Proxy samples for zero-leverage and ultra-low leverage firms include firm-year observations that are in the same year and industry, and have a comparable firm size, i.e., within  $\pm 10\%$  of the original firm size. See Table 1 for the definitions of the variables. ZL and NZL denote zero-leverage and non-zero leverage, respectively. UL and NUL denote ultra-low leverage and non-ultra-low leverage, respectively. \*, \*\* and \*\*\* indicate the coefficient differential significant at 10%, 5% and 1% levels, respectively.

**Panel A – Characteristics of ZL Firms**

Variable	ZL	NZL	T-statistic for diff. in means	Proxy Sample	T-statistic for diff. in means
<i>Market leverage</i>	0.000	0.221	-25.077***	0.216	-23.830***
<i>Equity ratio</i>	0.458	0.359	7.072***	0.401	3.124***
<i>Debt tax shields</i>	0.003	0.016	-20.375***	0.015	-17.300***
<i>Non-debt tax shields</i>	0.031	0.040	-5.928***	0.041	-5.721***
<i>Profitability</i>	-0.051	0.021	-5.833***	0.011	-3.862***
<i>Tax ratio</i>	0.187	0.187	-0.079	0.175	0.931
<i>Dividend payout ratio</i>	0.031	0.024	5.326***	0.023	4.846***
<i>Tangibility</i>	0.189	0.323	-11.880***	0.308	-9.946***
<i>Cash holdings</i>	0.360	0.115	32.325***	0.117	24.426***
<i>Size</i>	9.541	11.358	-19.008***	10.228	-10.893***
<i>Age</i>	16.375	21.772	-9.371***	19.282	-5.109***
<i>Market lease</i>	0.000	0.010	-9.605***	0.011	-10.914***
<i>Liquidity</i>	3.977	1.567	30.645***	1.648	19.653***
<i>Z-score</i>	6.436	0.168	10.684***	-0.170	7.867***
<i>Target leverage deviation</i>	0.041	-0.001	8.553***	0.002	7.451***
<i>Growth opportunities</i>	3.169	1.928	12.102***	1.905	9.308***
<i>Investment</i>	0.139	0.033	3.385***	0.022	2.663***
<i>Acquisition</i>	-0.008	0.246	-3.956***	0.242	-3.106***
<i>Earnings volatility</i>	0.368	-0.192	2.569***	-0.417	2.991***
<i>Firm quality</i>	0.776	0.614	2.080**	0.530	2.862***
<i>Stock return</i>	0.138	0.124	0.373	0.147	-0.169
<i>Cash flow</i>	-0.002	0.073	-6.648***	0.062	-4.435***
<i>Cash flow deficit</i>	0.026	0.024	0.340	0.025	0.167
<i>Gross debt issued</i>	0.001	0.049	-11.339***	0.040	-10.343***
<i>Net debt issued</i>	-0.010	-0.004	-1.244	-0.009	-0.135
<i>Equity issued</i>	0.118	0.047	9.013***	0.057	5.743***
<b>Number of Observations</b>	501	4888		1322	

**Panel B – Characteristics of UL Firms**

Variable	UL	NUL	T-statistic for diff. in means	Proxy Sample	T-statistic for diff. in means
<i>Market leverage</i>	0.002	0.244	-38.784***	0.244	-37.452***
<i>Equity ratio</i>	0.395	0.363	3.061***	0.391	0.305
<i>Debt tax shields</i>	0.003	0.017	30.297***	0.016	-26.890***
<i>Non-debt tax shields</i>	0.033	0.040	-6.838***	0.041	-6.361***
<i>Profitability</i>	-0.026	0.023	-5.270***	0.018	-3.898***
<i>Tax ratio</i>	0.187	0.187	0.040	0.181	0.704
<i>Dividend payout ratio</i>	0.031	0.023	7.157***	0.022	7.069***
<i>Tangibility</i>	0.196	0.336	-16.574***	0.320	-13.860***
<i>Cash holdings</i>	0.321	0.098	40.618***	0.095	32.766***
<i>Size</i>	9.854	11.480	-22.734***	10.566	-12.818***
<i>Age</i>	16.291	22.355	-14.034***	20.384	-9.279***
<i>Market lease</i>	0.000	0.010	-13.545***	0.012	-15.159***
<i>Liquidity</i>	3.375	1.446	32.713***	1.476	23.666***
<i>Z-score</i>	6.052	-0.404	14.655***	-0.771	11.942***
<i>Target leverage deviation</i>	0.043	-0.006	13.098***	-0.006	12.331***
<i>Growth opportunities</i>	3.633	1.696	26.090***	1.599	20.678**
<i>Investment</i>	0.122	0.026	4.100***	0.017	3.600***
<i>Acquisition</i>	0.116	0.245	-2.674***	0.251	-2.310***
<i>Earnings volatility</i>	0.077	-0.188	1.6025***	-0.254	1.725**
<i>Firm quality</i>	0.696	0.614	1.390	0.472	3.541***
<i>Stock return</i>	0.295	0.090	7.034***	0.091	5.715***
<i>Cash flow</i>	0.025	0.075	-5.839***	0.069	-4.221***
<i>Cash flow deficit</i>	0.030	0.023	1.4025	0.024	1.122
<i>Gross debt issued</i>	0.002	0.054	-16.529***	0.047	-15.695***
<i>Net debt issued</i>	-0.012	-0.003	-2.4061***	-0.008	-1.041
<i>Equity issued</i>	0.136	0.036	17.018***	0.040	12.445***
<b>Number of Observations</b>	964	4425		1920	

**Table 6. Logistic Regressions of the Zero-leverage and Ultra-low Leverage Decisions**

This table reports the results from the logistic regressions for zero-leverage and ultra-low leverage firms, respectively. ZL and UL denote zero-leverage and ultra-low leverage, respectively. In columns (1)-(3), the dependent variable is a zero-leverage indicator, which takes the value 1 if firms have zero debt (market leverage of 0), and 0 otherwise. In columns (4)-(6), the dependent variable is an ultra-low leverage indicator, which takes the value 1 if firms have market leverage  $\leq 0.01$  (1%), and 0 otherwise. See Table 1 for the definitions of the independent variables. Year dummies are not included in any models. Standard errors of coefficients are reported in parenthesis. \*, \*\* and \*\*\* indicate the coefficient significant at 10%, 5% and 1% levels, respectively.

<b>Independent Variable</b>	<b>ZL (1)</b>	<b>ZL (2)</b>	<b>ZL (3)</b>	<b>UL (4)</b>	<b>UL (5)</b>	<b>UL (6)</b>
<i>Ultra-Low leverage</i> ( $t-1$ )	3.558*** (0.175)	- -	- -	2.788*** (0.131)	- -	- -
<i>Investment</i> ( $t+1$ )	0.212** (0.095)	0.232*** (0.074)	- -	0.234*** (0.085)	0.232*** (0.070)	- -
<i>Cash flow</i> ( $t$ )	-0.140 (0.364)	-1.309*** (0.248)	-1.324*** (0.228)	0.020 (0.327)	-1.358*** (0.235)	-1.315*** (0.206)
<i>Growth</i> ( $t$ )	-0.016 (0.027)	0.081*** (0.018)	0.089*** (0.017)	0.220*** (0.027)	0.332*** (0.022)	0.332*** (0.021)
<i>Cash holdings</i> ( $t$ )	3.738*** (0.413)	- -	- -	3.560*** (0.362)	- -	- -
<i>Size</i> ( $t$ )	-0.382*** (0.058)	-0.549*** (0.039)	-0.546*** (0.035)	-0.369*** (0.041)	-0.478*** (0.030)	-0.476*** (0.027)
<i>Non-debt tax shields</i> ( $t$ )	-3.502 (3.238)	-15.427*** (2.426)	-14.451*** (1.499)	-10.316*** (2.603)	-15.854*** (2.002)	-14.386*** (1.729)
<i>Z-score</i> ( $t$ )	0.016*** (0.006)	0.045*** (0.004)	0.044*** (0.004)	0.039*** (0.006)	0.066*** (0.004)	0.064*** (0.004)
<i>Dividend ratio</i>	6.776*** (2.280)	13.088*** (1.596)	13.091** (1.499)	6.641*** (1.971)	12.393*** (1.486)	12.175*** (1.393)
<i>Quality</i> ( $t$ )	0.021 (0.084)	0.000 (0.048)	0.085*** (0.032)	0.108* (0.067)	0.035 (0.040)	0.093*** (0.027)
<i>Volatility</i> ( $t$ )	0.017 (0.015)	0.031*** (0.011)	0.025*** (0.010)	0.006 (0.012)	0.015 (0.010)	0.013 (0.009)
<b>Number of Observations</b>	3673	4531	5389	3673	4531	5389
<b>Log Likelihood</b>	-526.106	-1070.924	-1307.444	-830.690	-1507.987	-1830.479
<b>Pseudo R-squared</b>	0.514	0.220	0.216	0.509	0.293	0.277



**Table 7. Switching Decisions from Non-Zero-Leverage (Non Ultra-low Leverage) to Zero-Leverage (Ultra-low Leverage)**

This table reports the results from the logistic regressions for firms switching to a zero-leverage policy or an ultra-low leverage policy (i.e. leverage ‘jump-down’ decisions), respectively. ZL and UL denote zero-leverage and ultra-low leverage, respectively. In columns (1) and (2), the dependent variable is a jump-down decision to adopt a zero-leverage policy, which takes the value 1 if firms with non-zero leverage in time  $t-1$  switch to a zero-leverage policy in time  $t$ , and 0 otherwise. In columns (3) and (4), the dependent variable is a jump-down decision to adopt an ultra-low leverage policy (i.e. market leverage  $\leq 0.01$ ), which takes the value 1 if firms with non-ultra-low leverage in time  $t-1$  switch to an ultra-low-leverage policy in time  $t$ , and 0 otherwise. See Table 1 for the definitions of the independent variables. Year dummies are not included in any models. Standard errors of coefficients are reported in parenthesis. \*, \*\* and \*\*\* indicate the coefficient significant at 10%, 5% and 1% levels, respectively.

<b>Independent Variable</b>	<b>ZL (1)</b>	<b>ZL (2)</b>	<b>UL (3)</b>	<b>UL (4)</b>
<i>Investment</i> <sub>(t+1)</sub>	-	0.419***	-	0.487***
		(0.075)		(0.074)
<i>Cash flow</i> <sub>(t)</sub>	-1.332***	-	-1.447***	-
	(0.232)		(0.225)	
<i>Growth</i> <sub>(t)</sub>	0.099***	-	0.374***	-
	(0.018)		(0.025)	
<i>Cash holdings</i> <sub>(t)</sub>	-	4.388***	-	5.849***
		(0.282)		(0.294)
<i>Size</i> <sub>(t)</sub>	-0.620***	-0.536***	-0.558***	-0.527***
	(0.038)	(0.042)	(0.030)	(0.033)
<i>Non-debt tax shields</i> <sub>(t)</sub>	-17.582***	-	-17.608***	-
	(2.210)		(1.874)	
<i>Z-score</i> <sub>(t)</sub>	0.048***	0.025***	0.070***	0.035***
	(0.004)	(0.004)	(0.005)	(0.004)
<i>Dividend ratio</i>	14.419***	11.538***	13.652***	12.842***
	(1.598)	(1.602)	(1.538)	(1.552)
<i>Quality</i> <sub>(t)</sub>	0.106***	0.137**	0.098***	0.149***
	(0.033)	(0.058)	(0.028)	(0.046)
<i>Volatility</i> <sub>(t)</sub>	0.032***	0.031**	0.018**	0.016
	(0.010)	(0.012)	(0.009)	(0.010)
<b>Number of Observations</b>	4497	3655	4463	3630
<b>Log Likelihood</b>	-1174.778	-872.463	-1579.302	-1233.203
<b>Pseudo R-squared</b>	0.252	0.319	0.322	0.362

**Table 8. Switching Decisions from Zero-Leverage (Ultra-low Leverage) to Non-Zero-Leverage (Non-Ultra-low Leverage)**

This table reports the results from the logistic regressions for firms dropping a zero-leverage policy or an ultra-low leverage policy (i.e. leverage ‘jump-up’ decisions), respectively. ZL and UL denote zero-leverage and ultra-low leverage, respectively. In columns (1) and (2), the dependent variable is a jump-up decision from having zero leverage to having non-zero leverage, which takes the value 1 if firms with zero leverage in time  $t-1$  switch to a non-zero-leverage policy in time  $t$  and 0, otherwise. In columns (3) and (4), the dependent variable is a jump-up decision to have non-ultra-low leverage, which takes the value 1 if firms with ultra-low leverage (market leverage  $\leq 0.01$ ) in time  $t-1$  adopt a non-ultra-low leverage policy in time  $t$  (market leverage  $\geq 0.015$ ) and 0, otherwise. See Table 1 for the definitions of the independent variables. Year dummies are not included in any models. Standard errors of coefficients are reported in parenthesis. \*, \*\* and \*\*\* indicate the coefficient significant at 10%, 5% and 1% levels, respectively.

<b>Independent Variable</b>	<b>ZL (1)</b>	<b>ZL (2)</b>	<b>UL (3)</b>	<b>UL (4)</b>
<i>Investment<sub>(t)</sub></i>	-0.170** (0.084)	-0.206** (0.081)	-0.098 (0.073)	-0.157** (0.070)
<i>Deviation from Target Leverage<sub>(t)</sub></i>	8.667*** (1.774)	-	9.705*** (1.279)	-
<i>Growth<sub>(t)</sub></i>	-0.031 (0.030)	-0.055** (0.029)	-0.056*** (0.022)	-0.089*** (0.021)
<i>Size<sub>(t)</sub></i>	0.002 (0.069)	-0.029 (0.067)	0.038 (0.047)	0.021 (0.045)
<b>Number of Observations</b>	501	501	964	964
<b>Log Likelihood</b>	-313.491	-328.161	-583.889	-619.853
<b>Pseudo R-squared</b>	0.061	0.017	0.078	0.022

**Table 9. Investment Decisions of Zero-leverage and Ultra-low Leverage Firms**

This table reports the results for the Tobin's Q model of investment for firms with zero-leverage and ultra-low leverage, based on the following estimated model:

$$Investment_{i,t+1} = \alpha + \beta_{UL} \times Cashflow_{it} \times D_{UL} + \beta_{NUL} \times Cashflow_{it} \times D_{NUL} \\ + \gamma_{UL} \times Q_{it} \times D_{UL} + \gamma_{NUL} \times Q_{it} \times D_{NUL} + \varepsilon_{it}$$

The dependent variable is firm investment; the independent variables include cash flow and Tobin's Q. See Table 1 for the definitions of these variables. ZL and NZL denote zero-leverage and non-zero leverage, respectively. UL and NUL denote ultra-low leverage and non-ultra-low leverage, respectively. Columns (1) and (2) report the differential coefficients for zero leverage firms (where the dummy variable  $D_{UL}=1$ ), and for non-zero-leverage firms (where the dummy variable  $D_{NUL}=1$ ), respectively. Columns (3) and (4) report differential coefficients for ultra-low leverage firms (where the dummy variable  $D_{UL}=1$ ) and for non-ultra-low leverage firms (where the dummy variable  $D_{NUL}=1$ ), respectively, where ultra-low leverage is defined as market leverage of less than or equal to 0.01 (1%). Columns (1) and (3) adopt the Pooled OLS estimator and columns (2) and (4) the fixed effects (FE) estimator. Year dummies are not included in any models. Standard errors of coefficients are reported in parenthesis. \*, \*\* and \*\*\* indicate the coefficient significant at 10%, 5% and 1% levels, respectively.

Independent Variable	ZL (1)	ZL (2)	UL (3)	UL (4)
<i>Cash flow</i> $\times D_{UL}$	0.028 (0.162)	0.466** (0.205)	0.153 (0.105)	0.375*** (0.142)
<i>Cash flow</i> $\times D_{NUL}$	0.391*** (0.083)	0.423*** (0.205)	0.399*** (0.096)	0.444*** (0.119)
<i>Tobin's Q</i> $\times D_{UL}$	0.061*** (0.010)	0.058*** (0.013)	0.044*** (0.006)	0.049*** (0.008)
<i>Tobin's Q</i> $\times D_{NUL}$	0.034*** (0.005)	0.044*** (0.008)	0.032*** (0.009)	0.039*** (0.013)
<b>Number of Observations</b>	4531	4531	4531	4531
<b>Estimators</b>	OLS	FE	OLS	FE
<b>First differences</b>	No	Yes	No	Yes
<b>R-squared</b>	0.03	0.003	0.03	0.003
<b>Test</b> $\beta_{UL} = \beta_{NUL}$	4.23**	0.04	3.24*	0.16
<b>Test</b> $\gamma_{UL} = \gamma_{NUL}$	6.00**	1.12	1.82	0.70

## Appendix 1. Analysis of Zero-Leverage and Ultra-Low Leverage Policies over the Period 1980-2005.

**Table A-1. Distribution of Zero-Leverage and Ultra-Low Leverage Firms**

This table summarizes the distribution of zero-leverage (ZL) and ultra-low leverage (UL) firms by time and industry for a large panel of U.K. firms consisting of 14,522 observations and 988 firms over the sample period 1980-2005. Panel A lists the number and percentage of firms that have a zero-leverage status (i.e. firms that have zero leverage for at least one year) and ultra-low leverage status (i.e. firms that have market leverage  $\leq 0.01$  for at least one year). Panel B lists the number and percentage of ultra-low leverage firms by industry. ZL and UL denote zero-leverage and ultra-low leverage, respectively.

**Panel A – Distribution of ZL and UL Firms by Time**

<b>Year</b>	<b>All</b>	<b>ZL</b>	<b>%</b>	<b>UL</b>	<b>%</b>
1980	137	10	7.30	13	9.49
1981	281	30	10.68	36	12.81
1982	291	31	10.65	40	13.75
1983	302	28	9.27	35	11.59
1984	321	29	9.03	40	12.46
1985	342	29	8.48	38	11.11
1986	370	26	7.03	49	13.24
1987	399	26	6.52	61	15.29
1988	439	36	8.20	62	14.12
1989	473	28	5.92	54	11.42
1990	500	25	5.00	59	11.80
1991	506	31	6.13	54	10.67
1992	511	28	5.48	55	10.76
1993	530	41	7.74	75	14.15
1994	572	42	7.34	90	15.73
1995	616	51	8.28	102	16.56
1996	689	64	9.29	133	19.30
1997	777	77	9.91	158	20.33
1998	841	80	9.51	158	18.79
1999	879	86	9.78	163	18.54
2000	929	95	10.23	202	21.74
2001	980	95	9.69	184	18.78
2002	971	118	12.15	188	19.36
2003	713	99	13.88	145	20.34
2004	625	100	16.00	145	23.20
2005	558	82	14.70	132	23.66
<b>Number of Obs</b>	<b>14552</b>	<b>1387</b>	<b>9.53</b>	<b>2471</b>	<b>16.98</b>
<b>Number of firms</b>	<b>988</b>	<b>350</b>	<b>35.43</b>	<b>534</b>	<b>54.05</b>

**Panel B – Distribution of ZL and UL Firms by Industry**

<b>Industry</b>	<b>All</b>	<b>ZL</b>	<b>%</b>	<b>UL</b>	<b>%</b>
Oil & Gas	334	79	23.65	95	28.44
Basic Materials	2869	266	9.27	539	18.79
Industrials	4725	431	9.12	743	15.72
Consumer goods	2726	248	9.10	467	17.13
Health care	1196	113	9.45	167	13.96
Consumer	2059	196	9.52	342	16.61
Telecommunications	262	19	7.25	41	15.65
Technology	381	35	9.19	77	20.21
<b>Number of Obs</b>	<b>14552</b>	<b>1387</b>	<b>9.53</b>	<b>2471</b>	<b>16.98</b>
<b>Number of firms</b>	<b>988</b>	<b>350</b>	<b>35.43</b>	<b>534</b>	<b>54.05</b>

**Table A-2. Persistence of Zero-Leverage and Ultra-Low Leverage Policies**

This table analyses the persistence of a zero-leverage (ZL) policy and an ultra-low leverage (UL) policy for a large panel of U.K. firms consisting of 14,522 observations and 988 firms over the sample period 1980-2005. It presents the number and percentage of firms that have zero-leverage or ultra-low leverage for  $k$  consecutive years, where  $k = 1 \dots 10$ . A 'zero-leverage' status means firms have zero leverage (no debt) and an 'ultra-low leverage' status means firms have market leverage  $\leq 0.01$ . ZL and UL denote zero-leverage and ultra-low leverage, respectively.

<b>Number of Consecutive Years</b>	<b>ZL</b>	<b>%</b>	<b>UL</b>	<b>%</b>
1 Year	1387	100.00	2471	100.00
2 Years	893	64.38	1642	66.45
3 Years	603	43.48	1145	46.34
4 Years	421	30.35	823	33.31
5 Years	421	30.35	823	33.31
6 Years	295	21.27	597	24.16
7 Years	212	15.28	434	17.56
8 Years	158	11.39	324	13.11
9 Years	116	8.36	246	9.96
10 Years	90	6.49	188	7.61

## Appendix 2. Target Leverage Estimation

**Table A-3. Target Leverage Estimations**

This table reports the results for the estimation of the static model of leverage:

$$Leverage_{it} = \alpha + X\beta + \varepsilon_{it}$$

where leverage is the dependent variable;  $X$  is a vector of five independent variables including growth opportunities, non-debt tax shields, profitability, firm size and tangibility; and  $\beta$  is a vector of the coefficients.  $\varepsilon$  is an error component. See Table 1 for the definitions of the variables. Columns (1) and (2) adopt the Pooled OLS and Fixed Effects (FE) estimators, respectively. Hausman test is a test for potential significant differences in the random effects (RE) and FE estimations under the null of no difference. Year dummies are not included in any models. Standard errors of coefficients are reported in parenthesis. \*, \*\* and \*\*\* indicate the coefficient significant at 10%, 5% and 1% levels, respectively. Target leverage is proxied by the fitted values  $\hat{\alpha} + X\hat{\beta} + \mu_t$  where  $\mu_t$  is the firm fixed effects in the FE estimation.

Independent Variable	(1)	(2)
<i>Growth<sub>(t)</sub></i>	-0.027*** (0.001)	-0.010*** (0.001)
<i>Non-debt tax shields<sub>(t)</sub></i>	-0.273*** (0.089)	0.380*** (0.140)
<i>Profitability<sub>(t)</sub></i>	-0.134*** (0.011)	-0.134*** (0.014)
<i>Size<sub>(t)</sub></i>	0.015*** (0.001)	0.060*** (0.004)
<i>Tangibility<sub>(t)</sub></i>	0.200*** (0.013)	0.154*** (0.004)
<b>Number of Observations</b>	5389	5389
<b>Estimators</b>	OLS	FE
<b>R-squared</b>	0.213	0.115
<b>Hausman Test</b>	-	337.87(5)***

### Appendix 3. Zero-Leverage and Ultra-Low Leverage Firms and the Pecking Order Theory

**Table A-4. Zero-leverage and Ultra-Low Leverage Firms and the Pecking Order Theory**

This table reports the results for the modified pecking order model for firms with and without zero-leverage (ultra-low leverage):

$$\text{Equity issued}_{it} = \alpha + \beta_{UL} DEF_{it} \times D_{UL} + \beta_{NUL} DEF_{it} \times D_{NUL} + \varepsilon_{it}$$

The dependent variable is equity net issued; the independent variable  $DEF$  is cash flow deficit. See Table 1 for the definitions of the variables. Columns (1) and (2) present the differential coefficients for zero-leverage firms (where the dummy variable  $D_{UL}=1$ ) and for non-zero-leverage firms (where the dummy variable  $D_{NUL}=1$ ), respectively. Columns (3) and (4) present differential coefficients for ultra-low leverage firms (where the dummy variable  $D_{UL}=1$ ), and for non-ultra-low leverage firms (where the dummy variable  $D_{NUL}=1$ ), respectively, where ultra-low leverage is defined as market leverage of less than or equal to 0.01(1%). Columns (1) and (3) adopt the Pooled OLS estimator and columns (2) and (4) the fixed effects (FE). Year dummies are not included in any models. Standard errors of coefficients are reported in parenthesis. ZL and UL denote zero leverage and ultra-low leverage, respectively. \*, \*\* and \*\*\* indicate the coefficient significant at 10%, 5% and 1% levels, respectively.

Independent Variable	ZL (1)	ZL (2)	UL (3)	UL (4)
<i>Cash flow deficit</i> $\times D_{UL}$	1.211*** (0.142)	1.017*** (0.123)	1.350*** (0.116)	1.116*** (0.099)
<i>Cash flow deficit</i> $\times D_{NUL}$	0.536*** (0.027)	0.434*** (0.024)	0.449*** (0.025)	0.371*** (0.023)
<b>Number of Observations</b>	4531	4531	4531	4531
<b>Estimators</b>	OLS	FE	OLS	FE
<b>First differences</b>	No	Yes	No	Yes
<b>R-squared</b>	0.29	0.29	0.35	0.35