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Zero-Leverage Puzzle Revisited: Evidence from Acquisition Behaviors

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Abstract: The prevalence of zero-leverage firms is a puzzle in corporate finance. We analyze the acquisition behavior of zero-leverage firms and offer a new venue to the studies on zero-leverage puzzle and the interdependence of capital structures and investment decisions. The prior literature suggests three explanations regarding the zero-leverage puzzle: limited access to the debt market, managerial preference, and financial flexibility. While non-persistent zero-leverage firms show similar behavior as moderately leveraged firms, persistent zero-leverage firms are conservative in their acquisition behaviors. These firms are less likely to make acquisitions, acquire smaller targets, and are more likely to acquire zero-leverage targets than are moderately leveraged firms. Meanwhile, both persistent and non-persistent zero-leverage firms are not financially constrained, since they are likely to use cash in their offers, and they increase leverage post-acquisition. Overall, our evidence on persistent zero-leverage firms supports the managerial preference hypothesis, while the evidence on non-persistent zero-leverage firms is consistent with the financial flexibility hypothesis. Therefore, studies on corporate investment strategy should be aware of persistent firms' unique behavior of debt and investment conservatism that differentiates these firms from other under-leveraged firms and non-persistent zero-leverage firms.

Keywords: zero leverage; mergers and acquisitions; capital structure; financial flexibility; managerial preference

JEL Classification: G30; G31; G32; G34

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1. Introduction

Firms with almost zero leverage make up a significant proportion of US firms, and that proportion has persistently increased over the last three decades (Bessler et al. 2013; D'Mello and Gruskin 2014). The prevalence of zero-leverage (ZL) firms is not limited to the US, but rather is observed globally (Bessler et al. 2013; Cui 2019; Ghoul et al. 2018; Saona et al. 2019; Chung 2021). This prevalence of ZL firms contributes to the low-leverage puzzle, which refers to the stylized fact that firms, on average, have lower-than-optimal levels of leverage in their capital structure (Strebulaev and Yang 2013). Existing theories fail to explain the extremely conservative financing behavior of ZL firms. Previous empirical studies on the ZL phenomenon have shed light on this issue and have found that ZL firms are likely to be young high-growth companies, and that ZL policy is persistent. ZL firms are often financially constrained firms that are not able to raise debt, while there are still many large and dividend-paying "voluntarily" ZL firms (Byoun and Xu 2013; Devos et al. 2012; Strebulaev and Yang 2013; Chung 2021). Even if there is a consensus among prior works on the prevalence of ZL firms, they suggest different rationales and mixed empirical evidence about ZL policy.

We analyzed the acquisition behavior of zero-leverage firms, and in this paper, we offer a new venue to the studies on zero-leverage puzzle and the interdependence of capital

structures and investment decisions. Our study contributes to a better understanding of ZL firms by examining three existing hypotheses that could lead to the adoption of ZL policy in the context of ZL firms' acquisition behavior. The three (nonexclusive) hypotheses are as follows: the limited access to the debt market hypothesis, the managerial preference hypothesis, and the financial flexibility hypothesis. Under the limited access to the debt market hypothesis, ZL firms are forced to be ZL (see e.g., Bessler et al. 2013; Devos et al. 2012), and their ability to make acquisitions and use cash in acquisitions is constrained. Under the managerial preference hypothesis, firms deliberately follow ZL policy, even though they have access to debt market firms (see, for example, Byoun and Xu 2013; Devos et al. 2012; Strebulaev and Yang 2013). Therefore, they are selective in their acquisitions; however, they are more likely to use cash in their offers and maintain the ZL policy, even after large acquisition deals, if they make such large acquisition deals. In addition, we conjecture that these firms prefer ZL targets, since common ZL policy may serve as a proxy for a similar corporate culture of the acquirer and the target. Finally, under the financial flexibility hypothesis, firms become ZL for a short period of time to preserve their debt capacity for future profitable investment opportunities (Dang 2013; Bessler et al. 2013; Lotfaliei 2018; Miglo 2020). Given that these ZL firms have access to the debt market, they are no less likely to make acquisitions than moderately leveraged firms. Thus, they start to use debt again when they make acquisitions.

Since the investment decisions of firms closely interact with financing decisions, our analysis provides a better view concerning the reasons why some firms choose not to use debt, temporarily or persistently, by looking at the investment decisions of firms that are in line with their capital structure dynamics. Our focus was on acquisition decisions, which are major visible investment decisions that often involve a significant change in the firm's capital structure. We took advantage of acquisition data, given that they incorporate detailed information about deals such as target firm characteristics, transaction size, payment method, and announcement date. Specifically, our empirical approach to examining the three explanations of the ZL phenomenon was to analyze the acquisition behavior of ZL firms in comparison with under- and over-leveraged firms. Importantly, this approach helped us answer the question of whether ZL firms behave as an under-leveraged firm with sufficient debt capacity (financial flexibility hypothesis) or whether they form a unique group relative to other under-leveraged groups (limited access to the debt market or managerial preference hypothesis) in the realm of acquisition activities. Furthermore, if zero-leverage firms are facing a binding constraint of restricted access to debt financing (limited access to the debt market hypothesis), their acquisition behavior should be similar to over-leveraged firms that also lack debt capacity. Finally, if we observe a unique behavior that is neither consistent with under- or over-leveraged firms, we conclude that the result pertains to the managerial preference hypothesis.

We further analyzed differences in the acquisition behaviors of persistent and non-persistent ZL firms. Empirically, we used the persistence of ZL policy as a proxy for differentiating the financial flexibility hypothesis from the other two hypotheses. Dang (2013) and Bessler et al. (2013) found that there are firms that become ZL shortly before taking on valuable investment opportunities to preserve their debt capacity, while Strebulaev and Yang (2013) showed that many ZL firms persistently have zero leverage. Therefore, we expect that non-persistent ZL firms will show acquisition behavior that is consistent with the financial flexibility hypothesis, while the behavior of persistent ZL firms will support either the limited access to the debt market hypothesis or the managerial preference hypothesis.

In this study, we defined ZL firms as firms with a market leverage of less than 1 percent. Among ZL firms, we classified firms that have been ZL for three consecutive years as persistent ZL firms, and the remaining ZL firms as non-persistent ZL firms. We followed a two-step estimation procedure to examine the general effect of leverage deviation on acquisition behaviors. In the first step, we estimated the target leverage by running a tobit model used by Kayhan and Titman (2007) and defined under- and over-leveraged

firms based on the deviation from the predicted target leverage ratio. In the second-step regressions, we examined the effect of persistent and non-persistent ZL on acquisition choices in comparison with the effect of under- and over-leverage.

Using a sample of acquisition deals between 1990 and 2018, our results suggest the strongest evidence for the managerial preference hypothesis in the case of persistent ZL firms and supporting evidence for the financial flexibility hypothesis in the case of non-persistent ZL firms. There is only weak evidence for the limited access to the debt market hypothesis. Our regression results show that the likelihood of persistent ZL firms making an acquisition is lower, and the relative deal size of the acquisition is smaller than acquisitions made by moderately leveraged acquirers. This conservative behavior seems similar to financially constrained over-leveraged firms, as in Uysal (2011), but with respect to payment choice, persistent ZL firms are significantly more likely to use cash in their offers, indicating that they are not constrained in the use of debt. In contrast, we observed that over-leveraged firms with low debt capacity are significantly less likely to use cash in their offers. Overall, our analysis suggests that the acquisition behavior of persistent ZL firms support managerial preference hypothesis.

Additionally, we investigated a testable empirical implication of the managerial preference hypothesis by examining whether persistent ZL acquirers prefer ZL targets. In the summary statistics, we observed that both the persistent and non-persistent ZL acquirers are more likely to acquire ZL targets; however, as we performed rigorous regression analyses, the results indicated that only persistent ZL acquirers are more likely to acquire ZL targets. Strebulaev and Yang (2013) showed that ZL policy is, in part, driven by industry-specific factors, and there exist industries with a larger prevalence of ZL firms. Part of the tendency of non-persistent ZLs acquirers to acquire ZL targets is explained by the availability of ZL targets within the same industry of acquirers.

In the case of non-persistent ZL firms, the evidence supports the financial flexibility hypothesis. The likelihood of non-persistent ZL firms making an acquisition and the relative deal size of that acquisition are both similar to those made by moderately leveraged acquirers. Moreover, non-persistent ZL firms are significantly more likely to use cash in their offers as persistent ZL firms, while under-leveraged firms show no significant effect regarding the likelihood of using cash. These results suggest that the acquisition behavior of non-persistent ZL firms is similar to that of under-leveraged firms with sufficient debt capacity, thereby supporting the financial flexibility hypothesis.

The final result is related to the leverage dynamics around acquisition announcements. On average, both the persistent and non-persistent ZL acquirers initiate significant debt around their acquisition announcement. Moreover, the increase in leverage persists in the following years. These findings lend support to the financial flexibility hypothesis, especially for non-persistent ZL acquirers. We also document weak evidence supporting the managerial preference hypothesis for persistent ZL firms: more than half of persistent ZL acquirers remain ZL in two consecutive years, and the average increase in leverage post-acquisition is lower than that of non-persistent ZL acquirers. In the analysis of large acquisitions, an increase in leverage post-acquisition persists and is greater in magnitude than in the all-deals case, which is consistent with the limited access to the debt market hypothesis. Overall, these findings show that persistent ZL firms are not financially constrained around the acquisition event, in that they are able to finance the deal by using debt. The results also imply that acquisitions are major corporate investment decisions that may lead to a transition from a (persistent) ZL policy to a non-ZL policy.

In addition to the literature on the ZL phenomenon, our study is related to the literature on the interaction between financing policy and investment policy, particularly with respect to the literature concerning the effect of leverage on acquisition decisions. Harford et al. (2009) show that firms attempt to avoid deviating too far from their respective target leverage ratios around their acquisition events. Ghosh and Jain (2000) found empirical evidence that firms increase their financial leverage after an acquisition. Using the sample between 1990 and 2007, Uysal (2011) showed that financially constrained over-leveraged

firms are less capable of making acquisitions and pursue only the most value-enhancing acquisitions, compared to moderately leveraged or under-leveraged firms. Furthermore, their method of payment is affected by their limited debt capacity; thus, they are less likely to use cash in their offers. Over-leveraged firms also seek foreign acquisitions to mitigate their financial constraints (Ahmed and Elshandidy 2018). Our paper adds to the literature by exploring the effect of persistent and non-persistent ZL firms, apart from the effect of other (moderately) under-leveraged firms. Our findings show that, while non-persistent ZL firms' overall acquisition behavior is not very different from that of other under-leveraged firms in terms of the likelihood of an acquisition or relative deal size, persistent ZL firms show conservative behaviors. They are less likely to make acquisitions, and they acquire smaller targets than other moderately leveraged firms. Meanwhile, both persistent and non-persistent ZL firms are not financially constrained. They are significantly more likely to use cash in their offers than moderately leveraged firms, and they increase their leverage post-acquisition. Our evidence suggests that it is important to differentiate persistent ZL firms from other unleveraged firms and non-persistent ZL firms because persistent ZL firms' managerial preference toward debt conservatism is related to their investment conservatism. However, major investment decisions lead to significant changes in capital structure policies of even persistent ZL firms.

Finally, our findings add to the literature on financial flexibility, which suggests that the nature of investment opportunities affects capital structure decisions. Studies show that firms value financial flexibility and preserve debt capacity for future investment opportunities. Theoretically, Almeida et al. (2011), DeAngelo et al. (2011), and Miglo (2020) showed that firms choose lower leverage for future growth options. Empirically, De Jong et al. (2012), Marchica and Mura (2010), and Ferrando et al. (2017) showed that financial flexibility is a key driver of debt conservatism. Bessler et al. (2013) and Dang (2013) found evidence that unconstrained ZL firms deliberately become ZL for future investment opportunities. These studies investigated the effect of ZL and leverage dynamics on firms' investment behavior. We depart from these studies by analyzing the effect of persistent and non-persistent ZL compared to other under-leveraged firms, and by focusing on conditional cases where firms make acquisitions. We provide the strongest empirical evidence that is consistent with financial flexibility for non-persistent ZL firms among the three hypotheses on why firms adopt ZL policy. Moreover, one of our supporting results shows that, on average, both persistent and non-persistent ZL firms increase their leverage and switch to non-ZL post-acquisition.

The remainder of the paper is organized as follows. Section 2 motivates the argument for our empirical test and develops various hypotheses on zero-leverage policy. In Section 3, we describe the sample construction and methodology. Section 4 reports the empirical results on the hypotheses presented in Section 2. Section 5 concludes the paper.

2. Hypothesis Development

Although the zero-leverage phenomenon is not well-explained by theories, previous empirical studies have provided potential explanations for why firms become zero-leverage. Specifically, we considered the following three hypotheses: (i) the limited access to the debt market hypothesis, (ii) the managerial preference hypothesis, and (iii) the financial flexibility hypothesis. Given that the zero-leverage phenomenon might be affected by all of these nonexclusive potential explanations, we discuss how they are related and also differentiated in our empirical predictions so that we may find which hypothesis empirically dominates in terms of explaining the acquisition behavior of ZL firms. These predictions are summarized in Table 1.

Table 1. Summary of the empirical predictions of the three hypotheses we considered. In the table, "−" indicates that the prediction is not supported, and "+" indicates that it is supported.

Explanation for Zero-Leverage	Limited Access to Debt Market (Forced ZL)	Managerial Preference (Deliberately ZL)	Financial Flexibility (Deliberately ZL)
(i) Probability of acquisition is lower.	+	+	−
(ii) Relative deal size is smaller.	+	+	−
(iii) Cash component of acquisition offer is higher.	−	+	+
(iv) Acquiring zero-leverage target is more likely.	−	+	−
(v) Acquisition is most value-enhancing.	+	+	−
(vi) Leverage increases post-acquisition.	Only for large acquisitions	−	+

Our analysis examined the likelihood of acquisition, relative size, method of payment, leverage dynamics around an acquisition, and capital market reaction. First, previous empirical findings have suggested that some firms are forced to be zero-leverage because they are financially constrained and have limited access to the debt market. These firms are often young and small growth firms (Ortigueira-Sánchez et al. 2022). Devos et al. (2012) found that ZL firms conserve cash, and their line of credit includes stricter covenants and higher all-in costs compared to control firms. Byoun and Xu (2013) found that small zero-leverage firms raise equity and pay high dividends to build their reputation in the equity markets. We conjecture that, if zero-leverage firms have limited access to the debt market in general, their acquisition behavior would be similar to that of over-leveraged firms, which also have limited access to the debt market (Uysal 2011). We expect that these firms will have a lower probability of acquisition and a smaller relative deal size than comparable control firms. Since the cash components of acquisition offers are mostly financed by debt issuance, we predict that the cash component of acquisition offers will be lower for ZL firms. They will maintain ZL status prior to the acquisition (persistent ZL) and post-acquisition. They may make an acquisition (especially a large acquisition) only if they are able to obtain access to the debt market. Conditional on the large acquisition event, there is an increase in leverage and no reverse after a large acquisition.

Second, some firms deliberately maintain persistent zero-leverage, although they can increase their firm value by utilizing a tax shield of debt. The CEOs of these ZL firms may have a unique managerial preference toward strong debt conservatism; moreover, they may have high discretion to pursue their personal preferences toward corporate policy that are not necessarily value-maximizing (Barroso-Castro et al. 2022; Gormley and Matsa 2016; Opoku-Mensah and Yin 2021). Strebulaev and Yang (2013) showed that a ZL firm is more likely if the CEO has large ownership or a family firm with a less independent board. Kieschnick and Moussawi (2018) presented evidence implying that managerial risk preference affects firm capital structure when managers are free of discipline. For given firm age, they found that firms use less debt if insiders possess more power. If managers' debt conservatism extends to investment conservatism, we hypothesize that these CEOs will use little debt in their investment. Since acquisition often requires debt financing, we predict that these CEOs will be reluctant to make acquisitions, and if they do, they will make relatively small acquisitions.[1] Moreover, it is crucial for these CEOs to avoid dilution. Therefore, the acquisition deals will have a high cash component in terms of the acquisition payment method. These persistent ZL firms will remain ZL post-acquisition, or if they use debt, they will rebalance toward zero-leverage in subsequent years.

Another testable prediction related to managerial preference toward debt conservatism is that these CEOs prefer ZL targets. In general, the capital structure of the target firm is irrelevant since the acquirer must renegotiate the target firm's debt at the time of the acquisition. However, if the zero-leverage of a target firm proxies its corporate culture, leading to debt conservatism, we conjecture that ZL targets will have a similar corporate culture to that of the ZL acquirer. The previous literature provides evidence that corporate culture is one of the determinants of success in acquisitions because cultural similarities lower the integration cost post-acquisition (Ahmed et al. 2022; Bereskin et al. 2018; Chatterjee et al. 1992). We tested whether ZL firms are more likely to acquire ZL targets.

Finally, the financial flexibility hypothesis posits that some firms become deliberately ZL to keep their debt capacity for future investment opportunities. The nature of the investment affects the dynamics of the capital structure; thus, it is valuable for firms to build up unused debt capacity if they face high potential investment opportunities (DeAngelo et al. 2011; De Jong et al. 2012; Lotfaliei 2018; Marchica and Mura 2010; Marinakis and White 2022; Miglo 2020). Dang (2013) and Bessler et al. (2013) looked into the investments of ZL firms and found that firms that are non-constrained deliberately choose to be ZL in order to preserve their financial flexibility. These firms, often high-growth firms, maintain a ZL policy only for a short period time to preserve their debt capacity and lever up when they take on a valuable investment opportunity. The prior literature observed that firms secure financial flexibility around acquisitions. Uysal (2011) reports that over-leveraged firms that are likely to make acquisitions reduce their leverage deviation substantially to prepare for future debt use. Ghosh and Jain (2000) found empirical evidence that firms increase their financial leverage post-acquisition, which is partly due to past unused debt capacity. Morellec and Zhdanov (2008) show in their model that acquirers with the lowest leverage have a higher chance to win competed takeover bids; furthermore, they increase their leverage after the merger. Under the financial flexibility hypothesis, we predict that these non-persistent ZL firms will behave similarly to other under-leveraged firms. These firms are more likely to make acquisitions, and as they prepare for a substantial use of debt, the relative deal size will be larger. These firms reduce their leverage prior to an acquisition and increase their leverage post-acquisition. This increased leverage will not be reversed in the following years. The cash proportion of the payment will be larger, as they are able to make use of debt. However, we do not expect that these firms will prefer ZL targets because they are ZL for a relatively short period of time, prior to the acquisition.

3. Sample and Methodology

Our data on firm characteristics come from the Center for Research in Security Prices (CRSP) and Compustat during the period from 1990 to 2018. Utilities (SIC codes 4900-4999) and financial firms (6000-6999) are excluded from the sample. Firms with sales of less than 10 million dollars (in 1990 dollars, using the CPI index from the US Bureau of Labor Statistics) are also excluded. All variables, except for market leverage and all dummy variables, are winsorized at the upper and lower 1 percent to reduce the effect of outliers.

As in Strebulaev and Yang (2013), market leverage is defined by the following:

$$Market\ Leverage_t = \frac{DLTT_t + DLC_t}{DLTT_t + DLC_t + CSHO_t \times PRCC\_F_t}, \quad (1)$$

Moreover, non-debt liabilities, such as accounts payable, are not considered in defining market leverage, since this study focused on capital structure choices based on financing considerations, and not day-to-day business operations.

To disentangle the behavior of ZL firms from that of under- and over-leveraged firms, we first define ZL firms and then classify them among the rest of the firms as under- and over-leveraged firms based on their leverage deviation from the target leverage. We build these independent variables as lagged variables to mitigate possible endogeneity issues. First, we define firms as ZL firms if their $Market\ Leverage_{t-1}$ is less than 1 percent. Previous studies suggest that persistent ZL firms and non-persistent ZL firms have different motivations to become ZL. Thus, our paper defines persistent ZL in year t to be those firms that have been ZL for three consecutive years (Year $t-2$, $t-1$, and t). The remaining ZL firms in year t are defined as being non-persistent ZL firms in year t. Next, to classify

under- and over-leveraged firms, we estimate the target leverage of the observations by estimating a tobit model, following Kayhan and Titman (2007):

$$\begin{aligned} &Market\ Leverage_t \\ &\quad = \alpha_0 + \beta_1 SALES_{t-1} + \beta_2 Market\ to\ Book \\ &\quad + \beta_3 R\&D/Total Asset_{t-1} + \beta_4 Selling Expences/SALES_{t-1} \\ &\quad + \beta_5 Tangible\ Assets/Total Asset_{t-1} + \beta_6 Stock\ Return \\ &\quad + \beta_7 Free\ cash\ flow/Total Asset_{t-1} \\ &\quad + \beta_8 Market\ Leverage_{t-1} + \beta_9 (R\&D\ dummy)_{t-1} \\ &\quad + \beta_{10} (Industry\ dummies) \\ &\quad + \epsilon_t. \end{aligned} \tag{2}$$

Industry effects are controlled by using Fama and French's 48 industry classifications. The value of predicted leverage is constrained to be between 0 and 1, and we take the predicted leverage as the target leverage ratio. Table 2 provides coefficient estimates of the target leverage regressions.

Table 2. Predicting target capital structure. We used tobit regression of market leverage in fiscal year t on SALES, MTB, R&D/TA, selling exp./sales, tangible assets/TA, stock return, market leverage, R&D dummy, and FCF/TA in fiscal year $t-1$ to predict target capital structure. The value of predicted market leverage is restricted to be between 0 and 1. Variable definitions are described in Appendix A. The table shows the coefficient estimates and reports their corresponding p-values in parentheses. The symbol *** denotes statistical significance at the 1%.

Variable	Market Leverage_t
SALES_{t-1}	0.002 ***
	(0.000)
MTB_{t-1}	−0.003 ***
	(0.000)
$\text{R\&D/TA}_{t-1}$	−0.148 ***
	(0.000)
$\text{Selling Exp/Sales}_{t-1}$	−0.014 ***
	(0.001)
$\text{Tangible Assets/TA}_{t-1}$	0.040 ***
	(0.000)
$\text{Stock Return}_{t-1}$	0.008 ***
	(0.000)
$\text{Market Leverage}_{t-1}$	0.887 ***
	(0.000)
$\text{R\&D dummy}_{t-1}$	0.007 ***
	(0.000)
FCF/TA_{t-1}	−0.049 ***
	(0.000)
Industry FE	YES

We define *Leverage Deviation* as the firm's actual market leverage less its predicted target leverage and divide the observations into firms with positive $Leverage\ Deviation_{t-1}$ and negative $Leverage\ Deviation_{t-1}$. The upper half of the group with positive $Leverage\ Deviation_{t-1}$ is defined as over-leveraged firms, while the lower half of the group with negative $Leverage\ Deviation_{t-1}$ is defined as under-leveraged firms. We construct the indicator variables for each category, zero-leverage, under-leveraged, and over-leveraged, which take the value of 1 if a firm is a ZL firm, an under-leveraged firm, or an over-leveraged firm, respectively, and zero otherwise.

The data on completed acquisition deals in the US are from the Securities Data Corporation (SDC) database. We extracted deals that are categorized as mergers, acquisitions of majority interest, asset acquisitions, or acquisitions of certain assets that have transaction values greater than $1 million. When matching the firm characteristic data from CRSP

and Compustat with the acquisition deal's data, we lagged the firm data one year so that the year $t-1$ firm conditions are matched to the year t deal announcements. Following Moeller et al. (2004), we used deals if the ratio of the transaction value to the total assets of the acquirer is greater than 1 percent. This procedure generated 58,342 sample firm-year observations and 10,485 acquisitions. In this matched sample, we have 10,313 ZL firm-year observations, 14,980 under-leveraged firm-year observations, and 8.659 over-leveraged firm-year observations. Some firms make multiple acquisitions in a given fiscal year. If we aggregate the acquisitions for each firm-year, we have 8397 acquiring firm-years during the sample period.

Table 3 provides the descriptive statistics of the firms in our main data. Panel A, reporting firm characteristics, is based on the full sample. Panel B shows the acquirer statistics for the firm-years in which the firm makes at least one acquisition. Panel C reports the statistics of the deal characteristics. ZL firms are compared in relation to firms with debt, and persistent ZL firms with non-persistent ZL firms in each panel. Panel A reflects the fact that zero-leverage firms tend to be smaller growth firms with higher previous stock returns and comprise 10,313 firm-years among the 58,342 full sample firm-years. Within 10,313 ZL firm-years, there are 4939 persistent ZL firm-years, and 5374 non-persistent ZL firm-years. The average market leverage increases from 0.240 to 0.291 if we exclude ZL firms. The average leverage deviation of ZL firms is -0.119, which is significantly lower than the average deviation of non-ZL firms, -0.013. The average of dummy variable acquisition, which represents the probability of an acquisition, is 15.7% for ZL firms, which is higher than 14.1% of non-ZL firms. However, persistent ZL firms show different acquisition behaviors compared to non-persistent ZL firms. The average of the dummy variable acquisition is lower, being 13.6% for persistent ZL firms, while the average is 17.7% for non-persistent ZL firms. These results with regard to acquisition behavior are consistent with the limited access to the market hypothesis and the managerial preference hypothesis for persistent ZL firms, and with the financial flexibility hypothesis for non-persistent ZL firms. In the meantime, persistent ZL firms are larger ($770 mil vs. $604 mil in total assets), more profitable (exp(5.201) vs. exp(4.953) in sales; 12.7% vs. 11.1% in EBITDA/TA), and have lower growth opportunities (2.473 vs. 2.61 in market-to-book) than non-persistent ZL firms, thereby indicating that persistent ZL firms are not very debt constrained.

Panel B compares the firm characteristics, conditional on the acquisition announcements. The total assets and sales of both ZL and non-ZL acquirers are larger than the unconditional mean. Acquiring firms experience high past 12-month stock returns. These firms have a higher market-to-book ratio. The market leverage is lower, and the leverage deviation becomes more negative, suggesting that acquirers are relatively under-leveraged compared to the unconditional mean. We have 1623 ZL acquiring firm-years (15.7% of total ZL firm-years), while there are 6774 non-ZL acquiring firm-years (14.1% of total ZL firm-years). Without any control, the descriptive statistics show that ZL firms, in general, are more active acquirers than non-ZL firms. However, persistent and non-persistent ZL firms differ in terms of their acquisition behaviors. Persistent ZL firms are less likely to make acquisitions than non-persistent ZL firms. Only 13.6% (672 observations) of total persistent ZL firm-years are acquiring firm-years compared to 17.7% (951 observations) of total non-persistent ZL firm-years being acquiring firm-years. Compared to non-persistent ZL acquirers, persistent ZL acquirers are larger in size and have lower past 12-month stock returns and a lower market-to-book ratio. The acquirer characteristics suggest that persistent ZL acquirers are more established firms than non-persistent ZL acquirers; moreover, they are likely to be voluntarily ZL, which is inconsistent with the limited access to the debt market hypothesis. Overall, the evidence of persistent ZL is more supportive of the managerial preference hypothesis, and the evidence of non-persistent ZL is consistent with the financial flexibility hypothesis.

Panel C reports the deal characteristics of persistent ZL, non-persistent ZL, and non-ZL firms. The transaction values of ZL firms relative to the size of the acquirer are, on average, 24% of the ZL acquirers' book assets, and this is larger than the average relative deal size of

the non-ZL acquirers (17% of book assets). Notably, ZL firms are more likely to make large acquisitions (deals that the market value of the target firm to the acquirer's assets being at least 20%). We observe that 31.5% of ZL acquirers' deals are large acquisitions, while 23.0% of non-ZL acquirers' deals are large acquisitions. These results on the deal size remain the same for both persistent and non-persistent ZL firms, and, thus, they support the financial flexibility hypothesis. However, they are not consistent with the limited access to the debt market or the managerial preference hypotheses. ZL firms, especially the persistent ZL firms, are more likely to make all-cash deals and are more likely to have a higher cash proportion. This result is consistent with the managerial preference and financial flexibility hypotheses, while is not consistent with the limited access to the debt market hypothesis. ZL acquirers are more likely to acquire private targets and within-industry targets as compared to non-ZL acquirers.

Table 3. Descriptive statistics. Panel A, reporting firm characteristics, is based on the full sample. Panel B shows the acquirer statistics for the firm-years in which the firm makes at least one acquisition. Panel C reports the statistics of the deal characteristics. Variable definitions are in the Appendix A. The *t*-test reports the differences in means between ZL observations and non-ZL observations. The symbols ***, **, and * denote statistical significance for two-tailed *t*-tests at the 1%, 5%, and 10%, respectively.

Panel A. All firm-years							
	All (obs = 58,342)		**ZL (obs = 10,313)**		**Non-ZL (obs = 48,029)**		***t*-Test**
Variable	**Mean**	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**ZL–Non-ZL**
TA (in $mil)	3093	17528	684	4680	3610	19157	−2926 ***
SALES	5.905	1.845	5.072	1.452	6.084	1.871	−1.012 ***
Stock Return	0.163	0.635	0.263	0.718	0.142	0.613	0.121 ***
MTB	1.765	1.161	2.545	1.680	1.598	0.934	0.947 ***
EBITDA/TA	0.111	0.135	0.119	0.166	0.110	0.127	0.009 ***
Tangible Assets/TA	0.279	0.220	0.165	0.150	0.303	0.225	−0.138 ***
Selling Exp./SALES	0.266	0.198	0.372	0.241	0.243	0.179	0.129 ***
R&D/TA	0.033	0.061	0.067	0.082	0.025	0.052	0.042 ***
Market Leverage	0.240	0.233	0.001	0.002	0.291	0.226	−0.290 ***
Leverage Deviation	−0.031	0.125	−0.119	0.044	−0.013	0.128	−0.106 ***
Acquirer	0.144	0.351	0.157	0.364	0.141	0.348	0.016 ***
	Persistent ZL (obs = 4939)		**Non-Persistent ZL (obs = 5374)**				***t*-Test**
Variable	**Mean**	**Std.**	**Mean**	**Std.**			**Persistent ZL–Non-Persistent ZL**
TA (in $mil)	770	5208	604	4134			166
SALES	5.201	1.434	4.953	1.459			0.248 ***
Stock Return	0.171	0.588	0.347	0.811			−0.176 ***
MTB	2.473	1.616	2.61	1.734			−0.137 ***
EBITDA/TA	0.127	0.159	0.111	0.172			0.016 ***
Tangible Assets/TA	0.164	0.145	0.167	0.155			−0.004
Selling Exp./SALES	0.361	0.221	0.382	0.257			−0.022 ***
R&D/TA	0.064	0.077	0.07	0.086			−0.006 ***
Market Leverage	0.001	0.002	0.002	0.003			−0.001 ***
Leverage Deviation	−0.11	0.009	−0.127	0.06			0.017 ***
Acquirer	0.136	0.343	0.177	0.382			−0.041 ***

Table 3. *Cont.*

Panel B. Acquirer characteristics							
	All Acquirer-Year (obs = 8397)		**ZL Acquirer (obs = 1623)**		**Non-ZL Acquirer (obs = 6774)**		***t*-Test**
Variable	**Mean**	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**ZL–Non-ZL**
TA (in $mil)	3476	13867	893	3872	4095	15258	−3202 ***
SALES	6.174	1.789	5.276	1.436	6.389	1.799	−1.113 ***
Stock Return	0.276	0.654	0.350	0.770	0.258	0.622	0.092 ***
MTB	2.010	1.259	2.918	1.811	1.793	0.966	1.125 ***
EBITDA/TA	0.132	0.113	0.135	0.133	0.132	0.108	0.003
Tangible Assets/TA	0.251	0.221	0.137	0.131	0.279	0.229	−0.142 ***
Selling Exp./SALES	0.269	0.195	0.398	0.235	0.238	0.171	0.160 ***
R&D/TA	0.035	0.059	0.078	0.081	0.025	0.048	0.053 ***
Market Leverage	0.191	0.193	0.001	0.002	0.236	0.189	−0.235 ***
Leverage Deviation	−0.052	0.105	−0.116	0.037	−0.037	0.110	−0.079 ***
	Persistent ZL Acquirer (obs = 672)		**Non-Persistent ZL Acquirer (obs = 951)**				***t*-Test**
Variable	**Mean**		**Std.**	**Mean**		**Std.**	**Pers. ZL Acquirer–Non-Pers. ZL Acquirer**
TA (in $mil)	1271		5315	625		2339	646 **
SALES	5.450		1.508	5.153		1.371	0.297 ***
Stock Return	0.199		0.595	0.457		0.857	−0.258 ***
MTB	2.787		1.748	3.010		1.85	−0.223 *
EBITDA/TA	0.139		0.133	0.132		0.133	0.007
Tangible Assets/TA	0.138		0.129	0.136		0.133	0.002
Selling Exp./SALES	0.401		0.219	0.396		0.246	0.004
R&D/TA	0.076		0.074	0.079		0.085	−0.004
Market Leverage	0.001		0.002	0.002		0.003	−0.001 ***
Leverage Deviation	−0.107		0.008	−0.122		0.047	0.015 ***
Panel C. Deal characteristics							
	All Acquisitions (obs = 10,485)		**ZL (obs = 1991)**		**Non-ZL (obs = 8494)**		***t*-Test**
Variable	**Mean**	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**ZL–Non-ZL**
Acquisition Value/TA	0.182	0.441	0.238	0.612	0.169	0.390	0.070 ***
Large Deals	0.246	0.431	0.315	0.465	0.230	0.421	0.085 ***
All Cash	0.320	0.467	0.334	0.472	0.317	0.465	0.017
Cash	46.13	45.37	48.01	45.12	45.69	45.42	2.319 *
Public target	0.161	0.368	0.136	0.342	0.167	0.373	−0.032 ***
Private target	0.493	0.500	0.617	0.486	0.464	0.499	0.152 ***
Within-Industry Acquisitions	0.491	0.500	0.528	0.499	0.482	0.500	0.046 ***
	Persistent ZL (obs = 750)		**Non-persistent ZL (obs = 1117)**				***t*-Test**
Variable	**Mean**		**Std.**	**Mean**		**Std.**	**Pers. ZL–Non-Pers. ZL**
Acquisition Value/TA	0.208		0.35	0.257		0.751	−0.049
Large Deals	0.301		0.459	0.318		0.466	−0.016
All Cash	0.375		0.484	0.305		0.461	0.069 **
Cash	52.055		45.42	44.804		44.781	7.251 ***
Public target	0.137		0.344	0.13		0.336	0.008
Private target	0.576		0.495	0.645		0.479	−0.069 **
Within-Industry Acquisitions	0.524		0.5	0.523		0.500	0.001

4. Empirical Results

4.1. Acquisition Decision

How is ZL policy related to acquisition activity? Both the limited access to the debt market and managerial preference hypotheses imply that ZL firms are less likely to make acquisitions and that the relative deal size is small. On the other hand, the financial flexibility hypothesis predicts that ZL firms are not less likely to make acquisitions, and that the relative deal size is larger than that of comparable firms.

In the analysis, we controlled for firm characteristics and industry M&A market conditions that affect the decision to make acquisitions. Specifically, we included sales to control for the effect of firm size, as large firms are more likely to be acquirers. Stock return and market-to-book ratios are included to control for the effect of overvaluation and growth opportunities. FCF/total asset is included to control for cash availability. Industry M&A liquidity controls for the M&A wave within an industry. Since a highly concentrated industry has fewer potential targets within an industry, we include the Herfindahl Index to control for the effect of industry concentration on acquisition activity.[2] In addition, year fixed effects are controlled, whereas industry fixed effects are subsumed by the industry M&A liquidity and Herfindahl Index.

Table 4 presents the ZL effects on the likelihood of acquisition. The probit analysis on the likelihood of acquisition shows that ZL firms have no significant effect on these dependent variables (Column (1)). However, the separate analysis on persistent and non-persistent ZLs found statistically significant effects in opposite directions. Persistent ZLs are 2.1% less likely to make acquisitions (Column (2)), as is consistent with the limited access to the debt market hypothesis and the managerial preference hypothesis. In contrast, non-persistent ZLs are 2.2% more likely to make acquisitions (Column (3)), thus supporting the financial flexibility hypothesis.

These behaviors of persistent and non-persistent ZL firms are unique since they are not in line with the negative relationship between the leverage deviation and the likelihood of acquisition documented in Columns (4)–(6). A higher leverage deviation is associated with a lower probability of acquisition, and the effect is derived from the lower probability of acquisition of over-leveraged firms. This result is consistent with Uysal (2011), who found that over-leveraged firms tend to take on only very promising acquisition opportunities due to their constrained debt capacity under financial friction.

Table 5 shows the ZL effects on the relative deal size. In tobit regressions, the dependent variable is acquisition value/total assets, which measures the size of the acquisition deal relative to total assets. The dependent variable is censored at zero. Column (1) of Table 5 indicates that ZL firms again show no significant effects on these dependent variables. As in Table 4, persistent and non-persistent ZL firms have offsetting effects on the relative deal size (Columns (2) and (3)). Persistent ZL firms have a smaller deal size relative to total assets. Along with the lower likelihood of acquisition in Table 4, this evidence is consistent with the limited access to the debt market hypothesis and the managerial preference hypothesis. Conversely, non-persistent ZL firms engage in relatively larger deals, thereby lending support to the financial flexibility hypothesis, as shown in the analysis in Table 4.

Consistent with the results in Table 4, the general association between the leverage deviation and the relative deal size does not apply to the cases of persistent and non-persistent ZL firms. The leverage deviation decreases the relative deal size of the acquisition, and the effect is statistically significant. This result is driven by the statistically significant effect of over-leveraged firms. The relative deal size of over-leveraged firms is smaller than that of comparable firms.

Table 4. The effect of leverage deviation on the likelihood of acquisitions. This table presents the results of probit regressions examining the effect of ZL, persistent ZL, non-persistent ZL, under-Leveraged, over-Leveraged, and leverage deviation on the likelihood of acquisitions. The dependent variable is the indicator variable for being an acquirer. All variables are defined in Appendix A. The average marginal effects of probit regressions are reported. Each regression includes year dummies. The *p*-values reported in parenthesis are based on standard errors clustered by 3-digit SIC industry. The symbols *** and ** denote statistical significance at the 1% and 5%.

Variable	Acquirer					
	(1)	(2)	(3)	(4)	(5)	(6)
ZL	0.003					
	(0.789)					
Persistent ZL		−0.021 ***				
		(0.007)				
Non-Persistent ZL			0.022 **			
			(0.035)			
Under-Leveraged				0.002		
				(0.556)		
Over-Leveraged					−0.044 ***	
					(0.000)	
Leverage Deviation						−0.102 ***
						(0.000)
SALES	0.011 ***	0.011 ***	0.012 ***	0.011 ***	0.011 ***	0.012 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock Return	0.024 ***	0.023 ***	0.024 ***	0.024 ***	0.019 ***	0.017 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MTB	0.014 ***	0.015 ***	0.013 ***	0.015 ***	0.013 ***	0.013 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FCF/TA	0.177 ***	0.180 ***	0.175 ***	0.177 ***	0.162 ***	0.166 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry M&A Liquidity	0.136 ***	0.136 ***	0.137 ***	0.136 ***	0.135 ***	0.136 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Herfindahl Index	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	58,342	58,342	58,342	58,342	58,342	58,342
Pseudo R^2	0.028	0.029	0.029	0.028	0.030	0.029

Table 5. The effect of leverage deviation on the relative deal size. This table presents results of tobit regressions examining the effect of ZL, persistent ZL, non-persistent ZL, under-leveraged, over-leveraged, and leverage deviation on the relative acquisition deal size. The dependent variable in the columns is the ratio of acquisition value over total assets. The dependent variable of tobit model is censored at 0. All variables are defined in Appendix A. The average marginal effects of tobit regressions are reported. Each regression includes year dummies. The *p*-values reported in parenthesis are based on standard errors clustered by 3-digit SIC industry. The symbol *** denotes statistical significance at the 1%.

Variable	Acquisition Value/Total Asset					
	(1)	(2)	(3)	(4)	(5)	(6)
ZL	0.008					
	(0.758)					
Persistent ZL		−0.073 ***				
		(0.002)				
Non-Persistent ZL			0.074 ***			
			(0.003)			

Table 5. *Cont.*

Variable	Acquisition Value/Total Asset					
	(1)	(2)	(3)	(4)	(5)	(6)
Under-Leveraged				0.007		
				(0.592)		
Over-Leveraged					−0.111 ***	
					(0.000)	
Leverage Deviation						−0.276 ***
						(0.000)
SALES	0.022 ***	0.020 ***	0.024 ***	0.022 ***	0.021 ***	0.023 ***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Stock Return	0.064 ***	0.061 ***	0.064 ***	0.062 ***	0.052 ***	0.044 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MTB	0.056 ***	0.060 ***	0.052 ***	0.057 ***	0.053 ***	0.054 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FCF/TA	0.452 ***	0.464 ***	0.446 ***	0.453 ***	0.418 ***	0.424 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry M&A Liquidity	0.435 ***	0.435 ***	0.437 ***	0.435 ***	0.433 ***	0.436 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Herfindahl Index	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	58,342	58,342	58,342	58,342	58,342	58,342
Pseudo R^2	0.027	0.028	0.028	0.027	0.029	0.028

The estimates of other explanatory variables in Tables 4 and 5 indicate significant effects on acquisition activities. For example, firms with a larger size, growth opportunities (market-to-book), free cash flows (FCF/total assets), and possible overvaluation (stock return) are more likely to undertake acquisitions and engage in larger deals. Industry M&A liquidity has positive effects on the likelihood of acquisitions and the relative deal size, while the Herfindahl Index has negative effects.

4.2. Payment Methods

Next, the hypotheses deliver different predictions regarding the method of payment. If ZL firms have limited access to the debt market, these firms are more likely to use equity than cash in their acquisitions (limited access to the debt market hypothesis). On the other hand, the managerial preference and financial flexibility hypotheses predict that ZL firms are more likely to use cash to equity in their acquisitions. Under the managerial preference hypothesis, if debt conservatism extends to the acquisition decision, we conjecture that these firms will make acquisition deals only if they have enough cash holdings for payment with little external financing. Furthermore, if debt conservatism is due to the ZL firm being a family firm or large ownership of the CEO, these ZL firms will have incentives to avoid ownership dilution caused by equity payments. The financial flexibility hypothesis implies that firms will reduce their leverage prior to an acquisition opportunity to increase their debt capacity and make use of this preserved debt capacity for an acquisition. This enables ZL firms to make more cash payments.

Table 6 reports the probit analysis regarding the likelihood of an all-cash payment and the tobit analysis on the proportion of cash used in the acquisition deal. We include stock return and market-to-book to control for the potential effects of overvaluation and growth options on the method of payment (Martin 1996; Shleifer and Vishny 2003). Sales, FCF/AT, and the relative deal size of the acquirer control for the cash availability of the acquirer. Deal characteristics (within-industry characteristics, public target, private target, and competition) and the M&A market condition of the industry (industry M&A liquidity and the Herfindahl Index) are also taken into account.

Table 6. The effect of leverage deviation on the method of payment. This table reports the results of probit (Columns (1)–(4)) and tobit (Columns (5)–(8)) regressions investigating the effect of zero-leveraged, under-leveraged, over-leveraged, and leverage deviation on the likelihood of making an all-cash offer and cash proportion of deal, respectively. The dependent variable in Columns (1)–(4) ((5)–(8)) is the indicator variable for making an all-cash offer (the percentage of cash offered). The dependent variable in tobit model in Columns (5)–(8) is censored at 0 and 100. All variables are defined in Appendix A. The average marginal effects of probit (Columns (1)–(4)) and tobit (Columns (5)–(8)) regressions are reported. Each regression includes year dummies. The *p*-values reported in parenthesis are based on standard errors clustered by 3-digit SIC industry. The symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Variable	All Cash			Cash		
	(1)	(2)	(3)	(4)	(5)	(6)
ZL	0.055 ***			23.144 ***		
	(0.001)			(0.000)		
Persistent ZL		0.057 *			23.570 *	
		(0.062)			(0.052)	
Non-Persistent ZL			0.032 **			14.356 *
			(0.032)			(0.069)
SALES	0.022 ***	0.021 ***	0.020 ***	7.865 ***	7.114 ***	7.097 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock Return	−0.024 **	−0.024 ***	−0.027 ***	−5.812 *	−6.056 *	−7.142 **
	(0.011)	(0.008)	(0.005)	(0.098)	(0.072)	(0.043)
MTB	−0.002	0.002	0.002	−6.956 **	−5.286 *	−5.152
	(0.781)	(0.822)	(0.749)	(0.020)	(0.055)	(0.101)
FCF/TA	0.349 ***	0.349 ***	0.350 ***	119.116 ***	119.820 ***	121.355 ***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)
Relative Deal Size	−0.036 ***	−0.035 ***	−0.035 ***	0.614	0.768	0.755
	(0.000)	(0.000)	(0.000)	(0.814)	(0.772)	(0.773)
Within-Industry Acquisitions	−0.019	−0.019	−0.019	−8.203	−8.362	−8.303
	(0.150)	(0.153)	(0.157)	(0.161)	(0.165)	(0.168)
Public Target	−0.043 **	−0.042 **	−0.043 **	−13.507 *	−13.193 *	−13.482 *
	(0.018)	(0.020)	(0.019)	(0.056)	(0.061)	(0.056)
Private Target	−0.124 ***	−0.122 ***	−0.123 ***	−31.704 ***	−30.911 ***	−31.339 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Competed	0.071	0.072	0.071	48.402 ***	48.697 ***	48.376 ***
	(0.143)	(0.143)	(0.143)	(0.005)	(0.005)	(0.005)
Industry M&A Liquidity	0.079	0.078	0.079	18.057	16.750	18.662
	(0.314)	(0.322)	(0.310)	(0.546)	(0.566)	(0.528)
Herfindahl Index	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.873)	(0.826)	(0.789)	(0.990)	(0.933)	(0.907)
Observations	10,130	10,130	10,130	10,130	10,130	10,130
Pseudo R^2	0.070	0.069	0.069	0.020	0.020	0.020

The results (reported in Table 6) show that both the persistent and non-persistent ZL firms are more likely to make all-cash offers and to use greater proportions of cash components in their acquisition deals than other firms, as is consistent with the managerial preference and financial flexibility hypotheses. ZL firms are significantly more likely (+5.5%) than other firms to make all-cash offers (Column (1)), and they use 23.1% more cash in their offers (Column (4)). This tendency is more apparent in persistent ZL firms, as they are 5.7% more likely to offer all-cash deals and have 23.6% more cash in their offers than in non-persistent firms, which are 3.2% more likely to make all-cash deals and have 14.4% more cash in their offers. This evidence is inconsistent with the view of the limited access to the debt market hypothesis, which posits that ZL firms are financially constrained. In this sense, when viewed collectively with the earlier results in Tables 4 and 5, the findings with regard to the payment method of persistent ZL firms support the managerial preference

hypothesis. In the case of non-persistent ZL firms, the results are consistent with the financial flexibility hypothesis, as in the earlier results.

In the unreported analysis on the effects of leverage deviation and the method of payment, leverage deviation has a negative and statistically significant relationship with the likelihood of all-cash offers, as well as with the proportion in cash payments in acquisition deals. This negative relationship is driven by ZL and over-leveraged firms, while under-leveraged firms show no statistically significant effect.[3]

Other variables also significantly affect payment methods. Large firms (measured by sales), which have greater cash availability, and firms with higher FCF/AT are significantly more likely to make all-cash deals and pay more cash in their offers. Acquirers are more likely to use stock when it is overvalued. When there are multiple bidders (competed), deals tend to include more cash, and all-cash deals become more likely.

4.3. Preference toward ZL Targets

In this subsection, we test an additional implication of the managerial preference hypothesis in terms of whether ZL firms are more likely to acquire ZL targets. Our conjecture is that the debt conservatism of ZL firms is a proxy of the corporate culture, and the CEO's preference toward debt conservatism extends to preference toward ZL targets, which may have a similar corporate culture. Accordingly, only persistent ZL firms will show preference toward ZL targets. Non-persistent ZL firms will not show such a preference since they are ZL for a relatively short period of time, and the ZL policy is not their inherent corporate culture.

Panel A of Table 7 reports the acquisitions of ZL targets and non-ZL targets by market leverage group. The first two columns (Group 0) are ZL firms, which are further divided into persistent and non-persistent ZL firms. Non-ZL firms are categorized into four groups by leverage deviation quartiles. Group 1 has the lowest leverage deviation and is defined as under-leveraged, while Group 4 has the largest leverage deviation and is defined as over-leveraged. The first two rows indicate the number of ZL and non-ZL target acquisitions, respectively, made by persistent and non-persistent ZL, under-leveraged, and over-leveraged firms. The third row shows the percentage of ZL target acquisitions. Overall, the acquisitions of ZL targets comprise 17% of total acquisitions. This number is comparable to the unconditional percentage of ZL firm constitutions, which is 17.8% of full sample firm-years. Therefore, the probability of being a target appear to be similar for ZL and non-ZL firms. However, we observe that the percentage of ZL target acquisitions for persistent ZL firms is 40% and that for non-persistent ZL firms is 36%, both of which are significantly higher than those for non-ZL groups. The percentage of acquisitions for other groups ranges from 7% to 16%. The descriptive statistics support the empirical implication of the managerial preference hypothesis, in that ZL acquirers are more likely to acquire ZL targets.

Because the univariate analysis does not account for the factors that may affect the likelihood of ZL target acquisitions, we ran a probit regression of a zero-leverage (target) and tobit regressions of the targets' leverage deviation (dependent variable censored at -1 and 1) on the acquirers' ZL status, leverage deviation, deal characteristics, and acquirers' firm characteristics. We define zero-leverage (target) as a dummy variable that takes the value of 1 if the *Market Leverage*$_{t-1}$ of a target firm is less than 1 percent, and 0 otherwise. Since calculating the leverage of a target firm requires coverage by CRSP and Compustat, our sample is reduced to 1000 acquisitions and 938 acquisitions, respectively, in the probit and tobit analysis. The probability of ZL acquisition increases with the percentage of ZL firms within an acquirer's industry. Strebulaev and Yang (2013) document that some industries, such as healthcare and IT, have more ZL firms, and that ZL firms are less common in other industries, such as manufacturing. If acquisitions are taken within an industry, ZL firms in the industry populated with more ZL firms are more likely to acquire ZL firms because there are more ZL potential targets within the industry. We define a variable zero-leverage ratio as the ratio of the number of ZL firms to the number of all firms

in the acquirer's SIC 2-digit industry. The regression models include the variables zero-leverage ratio, within-industry acquisition, and their product to control for the different populations of ZL firms across industries. Previous studies have shown that ZL firms tend to be small growth firms with high free cash flows. We included the variables sales, market-to-book, and FCF/total asset to control for these acquirer characteristics.

Table 7. The preference toward ZL targets. Panel A reports the number of ZL targets and non-ZL targets across different leverage deviation groups. Panel B shows the results of probit regressions, examining the effect of acquirer's zero-leverage, under-leveraged, over-leveraged, and leverage deviation on the target's zero-leverage and leverage deviation, respectively. The dependent variable in Columns (1)–(3) is the indicator variable for the target being ZL. All variables are defined in Appendix A. The average marginal effects of probit regressions are reported. Each regression includes year dummies. The *p*-values reported in parenthesis are based on standard errors clustered by 3-digit SIC industry. The symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A.

Acquirer Leverage Deviation Groups		0 (Zero-Leverage)		1 (Under-Leveraged)	2	3	4 (Over-Leveraged)	Total
		Pers. ZL	Non-Pers. ZL					
Target	ZL	23	29	44	58	17	5	176
	Non-ZL	35	51	269	296	126	62	839
% of ZL Targets		0.40	0.36	0.14	0.16	0.12	0.07	0.17
Total		58	80	313	354	143	67	1015

Panel B.

Variable	Zero-Leverage (Target)		
	(1)	(2)	(3)
ZL	0.064 *		
	(0.058)		
Persistent ZL		0.059 *	
		(0.088)	
Non-Persistent ZL			0.040
			(0.276)
Zero-Leverage Ratio	0.475 ***	0.488 ***	0.504 ***
	(0.000)	(0.000)	(0.000)
Zero-Leverage Ratio * Within-Ind. Acq.	0.214 *	0.219 *	0.208
	(0.083)	(0.082)	(0.110)
Within-Industry Acquisitions	−0.048	−0.049	−0.047
	(0.163)	(0.155)	(0.175)
SALES	0.002	−0.001	−0.000
	(0.785)	(0.845)	(0.978)
Market-to-Book	0.023 *	0.027 **	0.027 **
	(0.050)	(0.021)	(0.014)
Free Cash Flow/Total Asset	−0.029	−0.018	−0.009
	(0.845)	(0.903)	(0.951)
Observations	1000	1000	1000
Pseudo R^2	0.211	0.209	0.208

In Panel B of Table 7, only ZL firms are 6.4% more likely to acquire ZL firms (Column (1))[4]. This positive effect of ZL on the likelihood of ZL target acquisition is mainly driven by persistent ZL firms. These persistent ZL firms are 5.9% more likely to acquire ZL targets, and the effect is statistically significant (Column (2)), whereas the effect of non-persistent ZL firms is not (Column (3)). A higher proportion of ZL firms within an acquirer's industry (zero-leverage ratio) is related to a higher probability of ZL target acquisition. Furthermore, if firms are acquiring targets within an industry with a higher ZL

proportion, the probability of acquiring ZL targets also increases. Firms with high growth opportunities, represented by high market-to-book, are more likely to acquire ZL firms.

In contrast to the univariate analysis results, the regression results show evidence supporting the managerial preference hypothesis only for a persistent ZL firm, as is consistent with the empirical implication of the hypothesis. The regression results suggest that the higher likelihood of non-persistent ZL acquirers acquiring ZL targets in the univariate analysis is partly driven by the effect of ZL population differences across industries and the growth firm effect.

4.4. Leverage Dynamics around the Acquisition Announcement

This subsection tracks the leverage changes of ZL acquirers around the acquisition announcement. The limited access to the debt market hypothesis implies that ZL firms only make relatively small acquisitions and have to remain as a ZL firm post-acquisition in general. However, those ZL firms that have been previously constrained but become able to access the debt market would initiate debt and take on large acquisitions and would consequently increase their leverage post-acquisition. The managerial preference hypothesis implies that ZL firms acquire targets only if they are able to (deliberately) remain ZL post-acquisition. An empirical prediction is that the leverage of these firms does not change around the event of the acquisition. If the leverage increases at the time of the acquisition, it will move back to zero-leverage in the following years. Finally, the financial flexibility hypothesis implies that firms reserve their debt capacity prior to profitable acquisition opportunities and make use of preserved debt capacity when they engage in acquisition deals. Therefore, the leverage of these firms will decrease in the preparation period prior to the acquisition, and the leverage will increase and remain high for a while post-acquisition.

Table 8 reports the evolution of the market leverage of ZL acquirers around the acquisition announcements, from years -5 to +5. For a year-to-year comparison, we restrict our sample to include only the acquisitions made by acquiring firms that remain on Compustat at least from years -1 to 5. If a firm makes multiple acquisitions during the sample period, we use the firm-year observation of its first acquisition in our sample period. Following Harford et al. (2009), large deals are defined as acquisition deals whose relative size of the market value of the target's assets to the acquirer's assets is at least 20%. If an acquirer makes multiple large deals during the sample period, the firm-year of the first large deal in our sample period is chosen for the analysis.

Panel A of Table 8 documents the mean statistics of the year-to-year changes of the market leverage over the period from years -5 to 5 around the acquisitions. The leverage of persistent ZL firms, on average, decreases in the magnitude of 1.2 percent points, ~2.9 percent points during the -5~-3 period. The changes become 0 percent points in years -2 and -1 by the definition of persistent ZL firms. In the year of the acquisition, the leverage increases by 4.5 percent points on average and continues to increase on average by a magnitude of 0 percent point~1.8 percent points during the years +1~+5 post-acquisition period. In the case of large deals, the market leverage decreases, on average, in a similar magnitude to the all-deals case during the -5~-3 period. The market leverage, however, increases in a larger magnitude, by 8.2 percent points on average, in the year of the acquisition. After the spike in year 0, the market leverage increases in a comparable magnitude on average to the all-deals case in the subsequent +1~+5 post-acquisition years. These results are inconsistent with the empirical implication of the managerial preference hypothesis, which is supported by earlier evidence of persistent ZL firms. We interpret that, even for persistent ZL firms, acquisitions are major corporate investment decisions that may lead to a transition from a ZL policy to a non-ZL policy.

Table 8. Leverage dynamics around acquisitions by ZL acquirer. Panels A, B, and C report the average leverage change (as compared to the previous year level), market leverage level, and leverage deviation around acquisition year, respectively. Results are only presented for acquisitions in which the acquiring firm remains in Compustat from years −1 to +5 around the acquisition year, where year 0 is the fiscal year that includes the announcement date of acquisition. Large deals are defined as acquisition deals whose relative size of the market value of the target's assets to the acquirer's assets is at least 20%. Panel A shows two-sided test that leverage change is zero, and the symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Leverage change											
	Year relative to acquisition: All deals										
	−5	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
Persistent ZL	−0.012	−0.029 ***	−0.015 ***	−0.000 ***	0.000	0.045 ***	0.016 ***	0.018 ***	0.015 **	0.000	0.015 **
	128	157	200	200	200	200	200	200	200	200	200
Non-Persistent ZL	0.005	−0.024 *	−0.052 ***	−0.042 ***	−0.033 ***	0.055 ***	0.022 ***	0.016 ***	0.028 ***	0.008	0.012 *
	114	132	158	221	300	300	300	300	300	300	300
	Year relative to acquisition: Large deals										
	−5	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
Persistent ZL	−0.011	−0.019 ***	−0.013 ***	0.000	0.000	0.082 ***	0.014	0.012	0.018 *	0.008	0.004
	60	77	95	95	95	95	95	95	95	95	95
Non-Persistent ZL	0.013	−0.017	−0.052 ***	−0.044 ***	−0.030 ***	0.087 ***	0.033 ***	0.011	0.029 ***	0.013	−0.003
	49	55	65	93	125	125	125	125	125	125	125
Panel B: Market leverage level											
	Year relative to acquisition: All deals										
	−5	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
Persistent ZL	0.044	0.014	0.001	0.001	0.001	0.046	0.062	0.080	0.095	0.095	0.110
	155	191	200	200	200	200	200	200	200	200	200
Non-Persistent ZL	0.172	0.147	0.082	0.035	0.002	0.057	0.079	0.095	0.123	0.131	0.143
	136	153	214	288	300	300	300	300	300	300	300
	Year relative to acquisition: Large deals										
	−5	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
Persistent ZL	0.032	0.014	0.001	0.001	0.001	0.082	0.096	0.108	0.127	0.135	0.139
	77	94	95	95	95	95	95	95	95	95	95
Non-Persistent ZL	0.154	0.136	0.078	0.030	0.002	0.089	0.122	0.133	0.162	0.175	0.173
	58	64	90	117	125	125	125	125	125	125	125
Panel C: Leverage deviation											
	Year relative to acquisition: All deals										
	−5	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
Persistent ZL	−0.094	−0.119	−0.115	−0.108	−0.108	−0.064	−0.070	−0.063	−0.060	−0.070	−0.054
	128	157	200	200	200	200	200	200	200	200	200
Non-Persistent ZL	−0.040	−0.064	−0.104	−0.114	−0.126	−0.054	−0.062	−0.060	−0.042	−0.052	−0.046
	114	132	158	221	300	300	300	300	300	300	300
	Year relative to acquisition: Large deals										
	−5	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
Persistent ZL	−0.098	−0.111	−0.112	−0.108	−0.108	−0.026	−0.058	−0.055	−0.044	−0.047	−0.051
	60	77	95	95	95	95	95	95	95	95	95
Non-Persistent ZL	−0.031	−0.059	−0.108	−0.116	−0.122	−0.021	−0.038	−0.048	−0.025	−0.032	−0.046
	49	55	65	93	125	125	125	125	125	125	125

Non-persistent ZL firms show a similar pattern of movement in leverage, but in larger magnitude, both pre- and post-acquisition, than persistent ZL firms. We observe that, on average, the leverage of non-persistent ZL firms decreases in the magnitude of 2.4 percent points~5.2 percent points during the −4~−1 period and starts to increase by 5.5 percent points, on average, in the year of the acquisition announcement. Since we define ZL firms as those firms with a market leverage of less than 1 percent, the market

leverage decreases more than 1 percent point prior to the acquisition event, and it increases more than 1 percent point in the year of the acquisition, thus implying that the average non-persistent ZL acquirers become ZL in year −1 and move back to non-ZL in the year of the acquisition. The market leverage of the firm continues to increase, following the acquisition event. The market leverage increases by 2.2 percent points in the years +1, by 1.6% percent points in the year +2, and by 2.8 percent points in the year +3. The result supports the financial flexibility hypothesis, in that firms preserve their debt capacity prior to profitable acquisition opportunities. The analysis on large deals shows similar results. The market leverage decreases, on average, in similar magnitude to the all-deals case prior to the acquisition. The market leverage increases in a larger magnitude, by 8.7 percent points on average, in the year of the acquisition. In the subsequent +1~+3 years, the market leverage increases in a comparable magnitude, on average, to the all-deals cases.

Panel B of Table 8 reports the evolution regarding the level of market leverage around the acquisition event. In line with the results in Panel A, the Panel B results show that, on average, persistent ZLs have not been ZL but almost ZL, with the market leverage being less than 5% in the years −5 and −4, prior to becoming ZL in year −3. They start using debt in the year of the acquisition announcement, and the average leverage continues to increase up to 11% by year +5. In the case of large deals, the prior acquisition market leverage is similar to that of the all-deals case. The average market leverage post-acquisition is higher than that of the all-deals case, which starts to increase from 8.2% in year 0 to 13.9% in year +5. We confirm the findings in Panel A that acquisition decisions are major investment decisions that may bring about changes to the capital structure policy, even leading persistent ZL firms to switch to non-ZL firms.

Panel B also shows that the average market leverage of non-persistent ZL acquirers decreases from 17.2% in year −5 to 0.2% in year −1. Consistent with the result in Panel A, we find that the average non-persistent ZL acquirers have relatively low leverage prior to the acquisition event, but only become ZL in year −1. On average, non-persistent ZL acquirers move back to non-ZL firms in year 0, and the average market leverage becomes 5.7%. The average market leverage continues to increase in subsequent years, reaching 14.3% in year +5. Non-persistent ZL acquirers have similar market leverage to that of persistent ZL acquirers right before the acquisition (i.e., year −1), but they end up with higher leverage than persistent ZL acquirers in the following years. The findings are supportive of the financial flexibility hypothesis, as the non-persistent ZL group shows relatively stronger consistency with this hypothesis than the persistent ZL group. We observe similar evolutions of market leverage around large deals. The non-persistent ZL acquirers making large deals have a market leverage of 15.4 percent points, on average, in year −5. On average, they become ZL in year −1, with the average market leverage being 0.2%. In the year of a large acquisition deal, the average market leverage increases to 8.9%, which is larger than the all-deals case. The average market leverage is higher than the all-deals case in the following years, increasing to 17.3% in year +5.

In Panel C, we investigate the change in the leverage deviation from the target leverage around the acquisition event. Since the acquirer firms may go through major changes in their firm characteristics due to acquisition, the post-acquisition increases in market leverage that we find in Panels A and B could be driven by the increases in target leverage, while the acquirers are as under-leveraged as before. We observe that both the persistent and non-persistent ZL acquirers are under-leveraged throughout the −5~+5 period; however, the persistent ZL acquirers are, in general, more under-leveraged than non-persistent ZL acquirers. When non-persistent ZL acquirers become ZL shortly before the acquisition event in year −1, they are more under-leveraged than persistent ZL acquirers, implying that their target leverages are higher than those of persistent ZL acquirers.

The average leverage deviation of persistent ZL acquirers is stable at around −11% prior to the acquisition in years −5~−1. The leverage deviation increases to −6.4% in the year of the acquisition and stays within the range from −5.4% to −7.0% in the following +1~+5 years. The average leverage deviations prior to the large acquisition deals are similar

to the all-deals case. The average leverage deviation becomes −2.6% in the year of the acquisition, but it increases to the range from −4.4% to −5.8% in the following +1~+5 years, making it slightly closer to zero than in the all-deals case. In Panels A and B, persistent ZL acquirers increase their leverage in larger magnitude post-acquisition in large deals compared to the all-deals case. Nevertheless, the Panel C result implies that this larger increase is mostly due to the increase in target leverage, and they are as under-leveraged as in the all-deals case. Overall, the Panel C result of persistent ZL acquirers is supportive of the financial flexibility hypothesis in that these firms employ unused debt capacity when making acquisitions; however, this result is also consistent with the managerial preference hypothesis in that persistent ZL acquirers choose a similar conservative debt policy post-acquisition, regardless of the acquisition deal size.

On the other hand, the average leverage deviation of non-persistent ZL acquirers starts from −4.0% in year −5 and decreases further to −12.6% in year −1. The average leverage deviation moves back to −5.4% in the year of the acquisition announcement and remains within the range from −4.2% to −6.2% in the following +1~+5 years. This result is also supportive of the financial flexibility hypothesis, in that firms preserve their debt capacity prior to profitable acquisition opportunities and use their preserved debt capacity when making acquisitions. The analysis on large deals shows similar results for the all-deals case. The average leverage deviation prior to the acquisition is similar in magnitude for the all-deals case. The leverage deviation in the year of the acquisition announcement and the following years is larger than it is in the all-deals cases, implying that these firms move closer to the target leverage ratios post-acquisition.

Finally, Table 9 reports the year-to-year transition of the firms' ZL status: from ZL to ZL, from ZL to non-ZL, from non-ZL to ZL, and from non-ZL to non-ZL. While Table 8 describes the average leverage evolution of ZL acquirers around the acquisition event, this analysis captures more detailed movement of the ZL acquirers. Since the ZL status transitions of persistent ZL firms prior to acquisition are regulated by the definition of persistent ZL firms, we focus our analysis on the post-acquisition transitions for these firms. The analysis of persistent ZL firms shows mixed results. First, we observe in Panel A of Table 9 that 64.5% of persistent ZL acquirers are in the "from ZL to ZL" category in the year of the acquisition announcement, even though we observe a significant increase in the average leverage in Table 8. This number is comparable to 61%, which is an unconditional rate of ZL firms that continue to be ZL in the next year, as reported by Strebulaev and Yang (2013). Furthermore, this proportion in year +1 is approximately 80% (104 out of 129 firms), which is much higher than the unconditional rate. These results are consistent with both the limited access to the debt market hypothesis and the managerial preference hypothesis.

The empirical implications of these two hypotheses differ in the large-deals case. We predict that firms that are forced to remain ZL (the limited access to the debt market hypothesis) are not able to make large deals in general, and they only do so when they have access to the debt market. These firms will become non-ZL and remain as non-ZL when they make large deals. Under the managerial preference hypothesis, we predict that the leverage does not change around the event of the acquisition. Alternatively, if the leverage increases at the time of the acquisition, it will move back to zero-leverage in the following years. We find that, in both the all-deals and large-deals cases, an increasing number of firms become non-ZL and remain as such during the +1~+5-year period, and the tendency is more apparent in the large-deals case. This post-acquisition leverage behavior cannot be empirically distinguished from that predicted by the financial flexibility hypothesis. However, along with the earlier results that persistent ZL firms have conservative acquisition behaviors, this evidence in the large-deals case supports the limited access to the debt market hypothesis.

Table 9. Year-to-year ZL status transitions around acquisitions by ZL acquirer. This table presents the number (proportion) of firms transiting from ZL (or non-ZL) in the previous year to ZL (or non-ZL) in the current year for the acquirers which are ZL as of the fiscal year that includes the announcement date of acquisition (i.e., year 0). Results are only presented for acquisitions in which the acquiring firm remains in Compustat from years −1 to +5 around the acquisition year. Panel A and B report the ZL status transition rates for all acquisition deals and large deals, respectively. Large deals are defined as acquisition deals whose relative size of the market value of the target's assets to the acquirer's assets is at least 20%.

Panel A: All deals											
	Year relative to acquisition										
Persistent ZL	**−5**	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
ZL–ZL	43	73	120	200	200	129	104	96	88	79	78
(%)	33.59	46.5	60	100	100	64.5	52	48	44	39.5	39
ZL–Non-ZL	5	5	0	0	0	71	25	21	18	20	11
(%)	3.91	3.18	0	0	0	35.5	12.5	10.5	9	10	5.5
Non-ZL–ZL	31	45	80	0	0	0	13	10	11	10	14
(%)	24.22	28.66	40	0	0	0	6.5	5	5.5	5	7
Non-ZL–Non-ZL	49	34	0	0	0	0	58	73	83	91	97
(%)	38.28	21.66	0	0	0	0	29	36.5	41.5	45.5	48.5
Total	128	157	200	200	200	200	200	200	200	200	200
Non-Persistent ZL	**−5**	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
ZL–ZL	7	9	10	4	100	168	125	110	94	90	88
(%)	6.14	6.82	6.33	1.81	33.33	56	41.67	36.67	31.33	30	29.33
ZL–Non-ZL	4	1	9	16	0	132	43	34	35	22	18
(%)	3.51	0.76	5.7	7.24	0	44	14.33	11.33	11.67	7.33	6
Non-ZL–ZL	4	10	9	92	200	0	19	19	18	16	20
(%)	3.51	7.58	5.7	41.63	66.67	0	6.33	6.33	6	5.33	6.67
Non-ZL–Non-ZL	99	112	130	109	0	0	113	137	153	172	174
(%)	86.84	84.85	82.28	49.32	0	0	37.67	45.67	51	57.33	58
Total	114	132	158	221	300	300	300	300	300	300	300
Panel B: Large deals											
	Year relative to acquisition										
Persistent ZL	**−5**	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
ZL–ZL	23	37	62	95	95	50	36	37	30	29	27
(%)	38.33	48.05	65.26	100	100	52.63	37.89	38.95	31.58	30.53	28.42
ZL–Non-ZL	1	3	0	0	0	45	14	5	11	3	5
(%)	1.67	3.9	0	0	0	47.37	14.74	5.26	11.58	3.16	5.26
Non-ZL–ZL	16	25	33	0	0	0	6	4	2	3	6
(%)	26.67	32.47	34.74	0	0	0	6.32	4.21	2.11	3.16	6.32
Non-ZL–Non-ZL	20	12	0	0	0	0	39	49	52	60	57
(%)	33.33	15.58	0	0	0	0	41.05	51.58	54.74	63.16	60
Total	60	77	95	95	95	95	95	95	95	95	95
Non-Persistent ZL	**−5**	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**5**
ZL–ZL	2	5	4	3	49	60	37	33	29	30	30
(%)	4.08	9.09	6.15	3.23	39.2	48	29.6	26.4	23.2	24	24
ZL–Non-ZL	1	0	6	7	0	65	23	14	11	7	6
(%)	2.04	0	9.23	7.53	0	52	18.4	11.2	8.8	5.6	4.8
Non-ZL–ZL	3	6	5	43	76	0	10	7	8	6	8
(%)	6.12	10.91	7.69	46.24	60.8	0	8	5.6	6.4	4.8	6.4
Non-ZL–Non-ZL	43	44	50	40	0	0	55	71	77	82	81
(%)	87.76	80	76.92	43.01	0	0	44	56.8	61.6	65.6	64.8
Total	49	55	65	93	125	125	125	125	125	125	125

In comparison, Panel A reports that, among 300 non-persistent ZL acquirers, 200 firms become ZL only by year −1, and 132 firms turn into non-ZL firms in the year of the acquisition announcement. The number of firms that have been non-ZL and remain as such increases in larger magnitude during the post-acquisition period. This pattern is more apparent in the large-deals case in Panel B. Among the 125 non-persistent ZL acquirers making large deals, 76 firms become ZL only by year −1, while 65 firms increase their leverage and become non-ZL firm in the year of the acquisition announcement. In the following years +1~+4, a greater number of firms are reported to be in the "from non-ZL to

non-ZL" category than the all-deals case. These findings are consistent with the financial flexibility hypothesis.

4.5. Acquisition Performance

We investigated whether ZL firms engage in the most profitable acquisitions by examining the market reactions to acquisition announcements (unreported). Both the limited access to the debt market and managerial preference hypotheses predict that ZL firms make acquisitions only when the acquisition opportunities are the most value-enhancing. A testable hypothesis is that the acquisition announcement cumulative abnormal returns (CARs) of ZL acquirers are higher than those of non-ZL acquirers. In addition, the managerial preference hypothesis suggests that the acquisitions of ZL targets by ZL acquirers are more likely to be successful than the acquisitions of non-ZL targets. We test whether the acquisitions of ZL targets by ZL acquirers show a higher CAR than other acquisition deals. Finally, we did not expect more favorable market reactions for the acquisition announcements of ZL acquirers under the financial flexibility hypothesis. Under the financial flexibility hypothesis, ZL firms are not further restricted from making acquisitions compared to non-ZL firms. This implies that the acquisition announcement CARs of ZL acquirers are comparable to those of non-ZL acquirers.

In an unreported analysis, we found the insignificant effects of the acquirer's zero-leverage on the CAR of the acquisition announcement. We constructed the dependent variable CAR to the acquirer over the period $(-1, +1)$, one day before and one day after the acquisition announcement date.[5] The benchmark returns are based on the market model, where the coefficients are estimated over a $(-250, -2)$ estimation window. Both the persistent and non-persistent ZL acquirers show an insignificant effect. The effect of the leverage deviation is positive and significant, but we observed that this positive association is due to higher CARs to over-leveraged acquirers, as we disentangled the effects of zero-leverage, under-leveraged, and over-leveraged firms.

We further tested whether the CARs of ZL acquirers acquiring ZL targets are higher than other acquisitions, as implied by the managerial preference hypothesis. As we collected the data on the target leverage, the sample size was reduced to 976 firm-years. The incremental effect of the interaction term of the persistent ZL acquirer dummy and the ZL target dummy is positive (0.027), as predicted by the managerial preference hypothesis, is statistically insignificant.

The estimated coefficients of the control variables in these regressions are consistent with previous studies. CAR decreases with firm size (Moeller et al. 2004) and the market-to-book ratio (Masulis et al. 2007). Public targets have lower CARs (Fuller et al. 2002; Conn et al. 2005), while all-cash deals have higher CARs (Loughran and Vijh 1997; Savor and Lu 2009). Finally, the relative deal size is positively associated with CAR (Asquith et al. 1983; Uysal 2011).

5. Conclusions

This paper contributes to studies on the zero-leverage phenomenon, which is not well explained by standard theories of capital structures. Previous studies offer a number of explanations regarding why firms choose such an extreme capital structure policy, whether their choice is voluntary or not, and what the characteristics are of these firms. In this paper, we investigated the ZL phenomenon in light of the interdependence of capital structures and investment decisions. Specifically, we studied the relation between persistent and non-persistent ZL policy and acquisition behavior, and we empirically evaluated some of the proposed explanations on the ZL phenomenon. Our paper suggests three testable hypotheses: (i) the limited access to the debt market hypothesis, which proposes that ZL firms are constrained from issuing debt and are selective in their acquisitions; (ii) the managerial preference hypothesis, which conjectures that ZL firms are selective in their acquisitions to deliberately maintain ZL prior to acquisition and post-acquisition and prefer ZL targets to non-ZL targets; and (iii) the financial flexibility hypothesis, which suggests

that firms become ZL to reserve their debt capacity prior to an acquisition opportunity and increase their leverage post-acquisition.

Our primary findings are as follows. First, persistent ZL firms are conservative in their acquisition behaviors such that they are less likely to make acquisitions, and they make smaller deals than moderately leveraged acquirers. In contrast, non-persistent ZL firms are more likely to make acquisitions, and they make larger deals than moderately leveraged acquires. Both the persistent and non-persistent ZL firms use more cash components in their acquisition offers. Collectively, persistent ZL firms' behavior is more consistent with the managerial preference hypothesis, while non-persistent ZL firms' behavior is best explained by the financial flexibility hypothesis.

Second, we found evidence that persistent ZL acquirers prefer ZL targets, as is proposed by the managerial preference hypothesis, while non-persistent ZL firms show little evidence of such. The results from the summary statistics suggest that both the persistent and non-persistent ZL acquirers are more likely to acquire ZL targets; however, rigorous analyses reveal that only persistent ZL acquirers are more likely to acquire ZL targets. The results in the summary statistics of non-persistent ZL acquirers are partly due to the effect of the availability of ZL targets within the same industry of ZL acquirers. These results are consistent with the empirical implications of the managerial preference hypothesis.

Finally, the empirical evidence on the leverage dynamics around acquisition announcements implies that ZL firms are not financially constrained, given that they make acquisitions; and this strongly supports the financial flexibility hypothesis. However, we also found some evidence for the limited access to the debt market and managerial preference hypotheses. On average, both the persistent and non-persistent ZL acquirers become non-ZL in the year of the acquisition announcement, and they continue to increase their leverage in the following years. Nevertheless, more than half of the persistent ZL acquirers remain ZL in two consecutive years following the acquisition announcement. This pattern weakens in the large-deals case in which many persistent ZL firms start using debt and remain non-ZL when they make large acquisitions. Overall, these results suggest that acquisitions are major corporate investment decisions that may lead even persistent ZL firms to start using debt.

In sum, we added new insights to why it is important to differentiate between the persistent ZL group and the non-persistent ZL group by showing that they have dissimilar investment behaviors and, arguably, different motivations to maintain the ZL policy. Studies on corporate investment strategy should especially be aware of persistent firms' unique behavior of debt and investment conservatism that differentiates these firms from other under-leveraged firms and non-persistent ZL firms. For example, the persistent ZL firms' preference toward ZL targets suggests that such an association between debt and investment conservatism has potential effects on integration costs and synergy post-acquisition. The prevalence of ZL firms is a global phenomenon, so we believe that, while our analysis is based on US data, our intuition about acquisition behavior of ZL firms applies to other countries with well-developed capital markets and corporate takeover markets.

One caveat in interpreting our results is that we cannot rule out the presence of additional unobservable confounding factors affecting both the ZL choice and acquisition behaviors. For example, product market competition may induce a firm to maintain a conservative capital structure (e.g., Faure-Grimaud 2000; Maksimovic 1988). At the same time, product market competitors become competing bidders in acquisition events, thereby driving the firm to use more cash payments in acquisition offers (e.g., Berkovitch and Narayanan 1990). In our study, we used various industry-level variables (e.g., within-industry acquisitions, industry M&A activity, and Herfindahl Index) and firm-level variables (e.g., market-to-book and stock return), along with year fixed effects to control for possible omitted variables, including the product market competition effect. In the case of the product market competition effect, the Herfindahl Index is a time-varying proxy for competition at the industry level that isolates the observed effects from the unobservable product market competition effect.

Thus, we expect that further studies that construct empirical tests based on exogenous shocks will shed additional light on the endogenous relationship between debt conservatism and firms' investment decisions. For instance, exogenous shocks to investment opportunity sets may yield identification strategies to test whether firms adopt ZL to preserve their ability to finance the (increased) investment opportunities (i.e., financial flexibility hypothesis). In the same vein, exogenous shocks to managerial ownership (or characteristics) and credit ability, for example, may be exploited to explore the managerial preference hypothesis and the limited access to the debt market hypothesis, respectively.

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Appendix A. Variable Definitions

Variable	Description
	Firm characteristics (CRSP/Compustat)
CAR	Cumulative abnormal return to acquirers over a three-day event window (one day before and one day after the announcement date). The benchmark returns follow market model where estimation window is (−250, −2).
EBITDA/TA	Operating income before depreciation (OIBDP)/TA (as defined below).
FCF	Operating income before depreciation (OIBDP) − income taxes (TXT) + change in deferred taxes and investment tax credit (TXDITC) − interest expense (XINT) − dividend preferred (DVP) - dividend common (DVC).
FCF/TA	FCF (defined above)/TA.
Industry dummies	48 indicator variables according to Fama–French 48 industry classification.
Market leverage	(Long-term debt (DLTT) + debt in current liabilities (DLC))/(long-term debt (DLTT) + debt in current liabilities (DLC) + price close (PRCC_F) ∗ common shares outstanding (CSHO)).
MTB (market-to-book)	(Liabilities (LT) − deferred taxes and investment tax credit (TXDITC) + preferred stock (as defined below))/(liabilities (LT) − deferred taxes and investment tax credit (TXDITC) + preferred stock (as defined below) + price close (PRCC_F) ∗ common shares outstanding (CSHO)).
Non-persistent ZL	Indicator variable: 1 if market leverage is less than 1% for this year but market leverage has not been less than 1% for three consecutive years, and 0 otherwise.
Over-leveraged	Indicator variable: 1 if leverage deviation locates in upper 50% of the group with positive leverage deviation, and 0 otherwise.
Persistent ZL	Indicator variable: 1 if market leverage has been less than 1% for three consecutive years, and 0 otherwise.
Preferred stock	Preferred stock is equal to liquidating value (PSTKL) if possible, or else redemption value (PSTKRV) if possible, or else carrying value (PSTK).
R&D dummy	Indicator variable: 1 if R&D expenses (XRD) is missing, and 0 otherwise.
R&D/TA	R&D expenses (XRD)/TA (as defined below).
SALES	Natural logarithm of sales (SALE) in 1990 dollars using CPI index adjustment.
Selling exp./SALES	Selling general and administrative expense (XSGA)/sales (SALE).
SIC3	The first three digits of sic code.
Stock return	Stock return is annual cumulative stock returns over the previous 12 months.
TA	Total assets (AT).
Tangible assets/TA	Total property plant and equipment (PPENT)/TA (as defined above)
Under-leveraged	Indicator variable: 1 if leverage deviation locates in lower 50% of the group with negative leverage deviation, and 0 otherwise.
ZL (zero-leveraged)	Indicator variable: 1 if market leverage is less than 1%, and 0 otherwise.

Variable	Description
	Deal characteristics (SDC database)
Acquirer	Indicator variable: 1 if the firm is reported to undertake total acquisitions (as defined below), and 0 otherwise.
Acquisitions	Acquisitions listed as an asset acquisition, acquisition of certain assets, an acquisition of majority interest, or merger in the SDC database.
Acquisition value/TA	The entire transaction values of total acquisitions (as defined below)/the acquirer's TA (as defined above)
All cash	Indicator variable: 1 if the deal is paid with all-cash, and 0 otherwise.
Cash	The percentage of cash offered in the deal.
Large deals	Acquisition deals whose relative size of the market value of the target's assets to the acquirer's assets is at least 20%.
Premium	Premium (%) of the offer price to target's stock price 4 weeks prior to the announcement date (PREM4WK in the SDC database).
Relative size	Natural logarithm of acquisition value/TA (as defined above).
Within-industry acquisition	Indicator variable: 1 if the acquirer and target share the same SIC3 (as defined above), and 0 otherwise.
	Industry characteristics
Herfindahl	Sum of the squares of the ratios of sales (sales) of each firm to sum of sales (sales) of firms sharing the same SIC3 (as defined above) with the firm.
Industry liquidity	Ratio of acquisition value for each year and SIC3(as defined above) to TA (as defined above) of all Compustat firms in the same year and SIC3 (as defined above).
Zero-leverage ratio	Ratio of the number of ZL firms to the number of all firms in the acquirer's SIC 2-digit industry.

Notes

[1] Although managers of ZL firms tend to have high discretion and free of discipline of debt, there is little empirical evidence supporting management entrenchment or weak internal/external governance.

[2] We note that the traditional Herfindahl Index we used here can be a biased measure of industry concentration or product market competition. See Boubaker et al. (2018, 2022) for alternative measures of competition.

[3] The effect of ZL on both the likelihood of making all-cash offers and amount of cash in offers is significantly positive, whereas that of being under-levered is not. This implies that ZL firms behave as a corner case of under-leveraged firms with regard to payment method, as explained by the managerial preference or financial flexibility hypotheses.

[4] In an unreported analysis, we showed that the likelihood of acquiring ZL targets is significantly negatively associated with the leverage deviation. Although the effects are statistically insignificant, both the under-leveraged and over-leveraged firms are less likely to acquire ZL targets.

[5] There are various parametric and non-parametric tests to examine the statistical significance of CAR. See Boubaker et al. (2014, 2015) for more details.

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