Competition and Debt Conservatism

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Abstract

Exploiting changes in countries' competition laws, we find that competition increases firms' propensity to use zero leverage (ZL). We test the financial-flexibility, financial-constraint and quiet-life explanations for this result, concluding that desire for flexibility is the one most likely. The relation between competition and ZL strengthens with cash-flow volatiliy, which supports the flexibility motive. Adoption of ZL by firms is accompanied by increases in payouts, so it is unlikely that ZL adopters are constrained. Proxies for governance have no effect on the relation between competition and ZL, suggesting that desire for a quiet life is not the explanation either.

***Keywords*:** Zero-Leverage Puzzle; Competition; Competition Law Index; Financial Constraint; Financial Flexibility; Managerial Quiet Life.

***JEL Classification*:** K21; G32; G38.

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I. Introduction

A well-known puzzle in the finance literature is that firms are on average under-leveraged in relation to their optimal debt ratios based on traditional capital-structure models, and some even use zero leverage (ZL). In the U.S., the proportion of ZL public firms was 13.6% during 1987-2009 (Strebulaev and Yang (2013)). Over a similar period, El Ghoul, Guedhami, Kwok, and Zheng (2018) find that the average proportion of ZL firms across 72 countries (excluding the U.S.) is 12.0%. A substantial portion of firms do not use debt, and such extreme debt conservatism appears to be a global phenomenon.

A growing body of research examines what determines firms' decisions to use ZL. These factors include CEO ownership and family control (Strebulaev and Yang (2013)), and limited debt capacity (Devos, Dhillon, Jagannathan, and Krishnamurthy (2012)). Other evidence concerns the role of external factors in shaping firms' ZL decisions. For instance, Devos et al. (2012) show that the ZL phenomenon is influenced by country institutions relating to investor and creditor protection. El Ghoul et al. (2018) find that firms' debt conservatism is shaped by national cultures. In this study, we examine an important external factor—competition—and investigate the economic mechanism(s) through which competition affects firms' ZL policies.

Competition is one of the most important and extensively studied economic forces (e.g. Vickers (1995)). The finance literature shows that competition, proxied by features such as product uniqueness (Titman and Wessels (1988)) or industry structure (MacKay and Phillips (2005)), influences firms' capital-structure choices. More recent studies exploit specific empirical settings and use exogenous variation in competition for identification. For instance, Xu (2012) finds that reductions in industry import tariffs result in increases in competition, and lead to lower leverage. Despite this growing body of research, the role of competition in explaining

extreme debt conservatism has been little studied, and the question of *how* competition affects firms' decisions to use zero debt has not been answered.[1] Our study fills this gap.

Competition may affect firms' debt conservatism through at least three mechanisms. First, some argue that ZL arises because firms are reluctant or unable to obtain costly debt finance. Due to market frictions, firms face a considerable wedge between the costs of external and internal finance. They may avoid costly debt finance and decide to use no debt, due to financial constraint (Devos et al. (2012) and Bessler, Drobetz, Haller, and Meier (2013)). Competition reduces firms' pledgeable income and raises their cash-flow risk (Valta (2012)), which in turn increases the cost of debt and reduces target leverage, according to the trade-off theory (e.g., Xu (2012)). Competition also reduces firms' liquidation value through influencing the number and financial strength of potential buyers, and thus the asset liquidity of an industry. With lower liquidation value, lenders recover less from a default, which raises firms' costs of liquidation and results in lower debt capacity and higher borrowing costs.[2] Overall, competition raises the cost of debt and induces firms to move to ZL due to decreased ability to obtain debt finance, implying a *positive* relation between competition and ZL. We denote this view the *financial-constraint hypothesis*.

Second, another prevalent view is that firms maintain low leverage to preserve unused debt capacity that can quickly be deployed when investment opportunities arise (DeAngelo, DeAngelo, and Whited (2011), Strebulaev and Yang (2013), and DeAngelo, Gonçalves, and Stulz (2018)). If a firm is already highly levered, it may be costly or impossible to raise external

[1] An exception is Chen, Li, Li, and Matousek (2022) who study the effect of R&D intensity on firms' propensity to use ZL. The authors find that competition increases ZL only among firms with non-zero R&D expenditure. Their argument is that since R&D investment creates intangible capital with a lack of collateral, firms with R&D expenditure face higher financial constraints and thus hold less debt.

[2] Under a more competitive environment, firms would also be less willing to disclose private information to other competing firms (e.g., Verrecchia (1983); Janssen and Roy (2015); Huang, Jennings, and Yu (2017)). The exacerbated information asymmetry further raises the cost of external finance.

funds due to market frictions such as adverse selection, credit rationing by lenders, and transactions costs (Leary and Roberts (2005)). Though firms will borrow at times, they then tend to delever substantially, to ensure that sufficient unused debt capacity can be employed in the future. As competition heightens, firms face riskier and more uncertain business environments and cash flows, which increase the value of financial flexibility, especially for firms facing higher costs of external finance and more volatile investment shocks (Gamba and Triantis (2008) and DeAngelo et al. (2011)). Hence, under this view, competition induces firms to restore financial flexibility and implement conservative debt policies, again implying a *positive* relation between competition and ZL. We call this the *financial-flexibility hypothesis*.

A third view is the *quiet-life hypothesis*. Agency theory posits that corporate managers are risk-averse and seek to minimize financial risk, i.e., they pursue a 'quiet life' (Jensen and Meckling (1976) and Bertrand and Mullainathan (2003)). They are incentivized to eschew debt, to reduce the chance of financial distress, and to avoid the monitoring activities of creditors, making a quiet life easier (Strebulaev and Yang (2013)). Since competition increases cash-flow risk, quiet-life managers are more inclined to refrain from borrowing and keep their firms unlevered, implying again a *positive* relation between competition and ZL.[3]

On the other hand, competition makes it harder for firms to survive, thereby increasing incentives for managers to work hard and perform well (Rhoades and Rutz (1982) and Hart (1983)). Facing greater competition, managers may find it more difficult to pursue the quiet life they desire. They will be more willing to raise debt and move away from ZL, which implies a

[3] The quiet-life hypothesis can be viewed as part of the financial-flexibility hypothesis because greater unused debt capacity and financial flexibility make it easier for managers to pursue a quiet life, as they would be subject to less market discipline. We test the quiet-life hypothesis in Section IV.C.

negative relation between competition and ZL. The overall impact of competition depends on the relative importance of the above two effects, which is an empirical question.

To test our hypotheses, we compile a large international sample of 25,784 publicly listed firms from 58 countries (including the U.S.), using data from the Compustat Global and North American Fundamental Annual databases. Over the period 1988 to 2010, approximately 11.7% of our sample consists of ZL firms. The statistics by country resemble prior studies (e.g., Bessler et al. (2013), Strebulaev and Yang (2013), and El Ghoul et al. (2018)), and they show that ZL is a global phenomenon.

Our identification relies on within-country variation in competition provided by staggered changes in the stringency of competition laws across countries and over time. Competition laws are statutes passed by national governments to regulate competition through provisions prohibiting firms from gaining dominance and/or engaging in market-abusive or anticompetitive activities. Bradford and Chilton (2018) code more than 700 competition laws from 123 countries over the period 1889-2010. They construct a competition law index (CLI) that gauges the country-level degree of regulatory risk firms face when competing with others. A higher value of the index indicates more stringent competition laws, and thus greater competition.

Our baseline regressions reveal a positive and significant relation between competition and firms' propensity to use ZL, controlling for a wide array of firm and country characteristics and firm and industry-year interacted fixed effects. A one-standard-deviation increase in the CLI raises the probability that a firm uses ZL by 0.99 percentage points, or by 8.5% relative to the unconditional mean. A positive and significant relation between competition and ZL is consistent with all three hypotheses: financial-constraint, financial-flexibility, and quiet life. We perform extensive tests to explore which is most likely to be the explanation.

We start by confirming that competition increases firms' future cash-flow volatility, as each hypothesis assumes, and that competition increases the sensitivity of cash holdings to cash flow, which each hypothesis predicts. Theoretical work (e.g. DeAngelo et al. (2011)) shows that firms facing more volatile investment (or profitability) shocks have stronger incentives to preserve debt capacity for future funding needs. Such firms are also more likely to become constrained. Hence, if competition induces firms to move to ZL, for either flexibility or constraint reasons, the positive effect of competition on ZL should be stronger among firms with more volatile cash flows. We find that the positive effect of competition increases with cash-flow volatility, and it is stronger for more constrained firms, lending support to both hypotheses.

To help distinguish between them, we conduct an event analysis on all ZL events in our sample, studying several financial policies around the time they move to ZL.[4] We observe that moving to ZL is accompanied by gradual but noticeable increases in cash holdings, dividend payout, and share repurchases. Increases in cash and payout suggest that firms choose to repay debt and adopt ZL when they have surplus cash flow and are able to build flexibility. Increases in payout by firms around the time that they adopt ZL are not consistent with the view that such firms are constrained. Furthermore, the increases in cash surrounding the ZL events are in part driven by increases in competition.

As a further test of the flexibility hypothesis, we make use of the findings of DeAngelo et al. (2018) that, after reaching a peak leverage ratio, firms tend to delever substantially, to build up unused debt capacity for future investment opportunities. With this in mind, we construct a 'deleveraging subsample' by retaining up to 10 years of observations after a firm's historical

[4] To avoid capturing ZL policies that are transient, a firm is defined as having a ZL event if its debt-to-asset ratio is positive in the past consecutive three years (i.e., years $t - 3$, $t - 2$, and $t - 1$), but it becomes zero in years t and continue to have a ZL in the next two consecutive years (i.e., years $t + 1$ and $t + 2$).

peak leverage ratio. The effect of competition on ZL, if any, can be more confidently attributed to their desire for flexibility in this subsample than in the full sample. Among the 1,614 firms that reach ZL, the process takes on average 3.3 years. From peak to trough, we not only observe a large decrease in average debt-to-assets ratio (by 33.0 percentage points) but also a marked increase in cash holdings (by 8.8 percentage points), and moderate increases in dividend payout, share repurchases, and equity issuance. Our duration tests show that firms reach ZL sooner as competition becomes more intense, lending support to the flexibility hypothesis.

Next, we look more closely at the constraint hypothesis by testing whether competition raises firms' cost of debt and, if so, whether a higher cost of debt could explain firms' adoption of ZL. That is, we ask whether the cost of debt *mediates* the relation between competition and ZL. We find that competition is indeed associated with a higher cost of debt, but that the higher cost does not influence firms' ZL policies. This insignificant mediating role of the cost of debt is not consistent with the constraint hypothesis.

We also examine whether firms adjust their payout policies in ways consistent with being more financially constrained when competition increases. If the constraint argument is true, competition should induce firms to cut payouts to shareholders, especially via share repurchases, which are an increasingly prevalent and flexible way to pay out cash (e.g., Floyd, Li, and Skinner, (2015)). But we find that competition does not affect share repurchases, which again is inconsistent with the constraint hypothesis.

Finally, we test the version of the quiet-life hypothesis which posits that quiet-life managers prefer zero debt to avoid any chance of financial distress. If this is the case, the positive relation between competition and ZL would be stronger among firms characterized by weaker governance or more managerial entrenchment. Our tests show that the relation depends

neither on shareholder rights, nor on the threat of being a takeover target, nor on institutional ownership. These results are inconsistent with the quiet-life hypothesis. They suggest that the desire to restore flexibility when competition increases is unlikely to represent managerial desire for a quiet life.

Our study contributes to the growing literature on why some firms operate with no debt. Several firm and country characteristics have been shown to determine firms' use of zero debt, including CEO ownership, family control, board independence, cultural traits, investor protection, etc. (e.g., Devos et al. (2012), Bessler et al. (2013), Strebulaev and Yang (2013), and El Ghoul et al. (2018)). Contemporaneous work by Chen et al. (2022) documents that greater competition, caused by reductions in import tariffs, is conducive to ZL among firms with R&D investment, arguing that they have more intangible capital, greater financial constraint, and thus lower leverage. Our study complements existing work by documenting new, international evidence that competition significantly influences firms' ZL policies. Our extensive mechanism tests show that, while firms' cost of debt increases with competition, firms' increased preference for ZL is likely to result from a desire to restore debt capacity to meet future funding needs, rather than from a decline in their ability to borrow. We also find that restoring debt capacity is unlikely to be motivated by managerial desire for a quiet life.

Our evidence adds to the literature on the effect of competition on the decisions of corporate managers (e.g., Rhoades and Rutz (1982), Li (2010), Flammer (2015), Levine, Lin, Wei, and Xie (2020), Ding, Levine, Ling, and Xie (2022), Chen, Su, Tian, Xu, and Zhang (2024), and Chung, Hasan, Hwang, and Kim (2024)). The literature shows that competition, captured by product uniqueness, industry structure, etc., shapes firms' capital-structure decisions (e.g., Titman and Wessels (1988) and MacKay and Phillips (2005)). Recent studies exploit exogenous variation

in competition provided by reductions in industry import tariffs, the passage of the Federal Trademark Dilution Act, and changes in national competition laws (e.g., Xu (2012), Levine et al. (2020), Ding et al. (2022), and Heath and Sertsios (2023)). Our research extends this line of inquiry, showing that more stringent competition laws promote debt conservatism. This effect appears to be incremental to that of profitability in explaining leverage.[5]

Our work also relates to the growing literature which documents that financial flexibility, in the form of surplus or alternative funding sources, has an important role in corporate financing policies (e.g., Graham and Harvey (2001), Brounen et al. (2004), Gamba and Triantis (2008), DeAngelo et al. (2011), Denis and McKeon (2012), Jang (2017), DeAngelo et al. (2018), Fahlenbrach, Rageth, and Stulz (2021), Barry, Campello, Graham, and Ma (2022), and DeAngelo, Gonçalves, and Stulz (2022)). Our study augments this line of research by disentangling predictions from the desire-for-flexibility, financial-constraint and quiet-life hypotheses about why competition should influence ZL decisions. We thereby establish that desire for flexibility is the most likely explanation for the effect of competition on debt conservatism.

II. Data and Variable Construction

A. Data

We compile a global sample of listed firms using several databases. For non-U.S. firms, we download their accounting and stock information from the Compustat Global Fundamental and Security Monthly databases from 1988 onward. The variables are translated into U.S. dollars

[5] The ZL phenomenon cannot readily be explained by the trade-off theory, because leverage targets for profitable ZL firms are well above zero (Graham (2000) and Strebulaev and Yang (2013)). Different explanations for ZL status are therefore required. We test competing explanations for ZL status, that are distinct from the negative effect of competition on target leverage predicted under trade-off, due to reduced expected profitability.

using exchange rates from Thomson Reuters or the Bank of England (whichever is available). For U.S. firms, we obtain their accounting and security data from the CRSP/Compustat Merged database. The CLI is compiled by Bradford and Chilton (2018) through collecting, analyzing, and coding more than 700 competition laws.[6] The index captures competition-related regulations in 123 countries over the period 1889-2010. We download country macroeconomic variables from the World Bank and from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008), deal-level data on mergers and acquisitions (M&As) from SDC Platinum, and institutional ownership data from FactSet (formerly Lionshares).

Financial firms are excluded from the sample because of their heavily regulated and highly leveraged nature. After merging the various datasets and discarding observations with missing values in the main variables, we further exclude countries for which there are fewer than 10 companies. Our final sample consists of 169,571 firm-year observations from 25,784 unique firms in 58 countries (including the U.S.) over the period 1988 to 2010.

B. The Competition Law Index (CLI)

We exploit variation in competition provided by staggered changes in competition laws across economies and over time. Specifically, following recent research (e.g., Levine et al. (2020) and Ding et al. (2022)), we use the CLI which gauges the degree of 'regulatory risk' firms face when competing in any given economy. The index is calculated from the equal-weighted average of two component indexes: the authority index (*Authority*) and substance index (*Substance*). *Authority* captures the authority granted by governments, i.e. provisions on who can enforce the laws, and limits to their application. *Substance* captures the substantive rules

[6] We thank Professors Anu Bradford and Adam S. Chilton (2018) for making the CLI publicly available. The index along with documentation can be downloaded via: www.comparativecompetitionlaw.org.

regulating competition and is computed as the equal-weighted average of three subcomponents: *Merger control*, *Abuse of dominance*, and *Anticompetitive agreements*. Appendix A.1 describes the CLI and its components in more detail.

C. Descriptive Statistics

Table 1 provides a sample breakdown by country. The top five countries in terms of firm-years are the U.S. (53.5%), Japan (13.9%), China (6.7%), United Kingdom (3.2%), and Malaysia (3.2%). In terms of mean CLI, we find that Japan (0.99), Israel (0.88), Slovenia (0.87), Ireland (0.85) and Brazil (0.84) have the most stringent competition laws, whereas six countries, including Bahrain, Oman, Nigeria, United Arab Emirates, Bangladesh and Kuwait, have no competition laws over the entire sample period.

Insert Table 1 and Table 2 about here

Table 2 reports summary statistics for our main variables, at firm and country levels. The full-sample mean of the ZL dummy variable (*ZL*) is 11.7%. An average firm in our sample has a debt-to-assets ratio of 23.0%, market capitalization of $1.8 billion, market-to-book equity ratio of 1.28, ROA of 7.8%, proportion of net property, plant, and equipment (PPE) in total assets of 31.1%, dividend-to-assets ratio of 1.2%, R&D-to-sales ratio of 10.0%, capital expenditure-to-assets ratio of 6.0%, cash-to-assets ratio of 16.6%, income tax-to-assets ratio of 2.0%, and proportion of non-debt tax shield in total assets of 4.2%. These statistics resemble those reported in prior studies, such as El Ghoul et al. (2018).

At the country level, the annual percentage growth rates in CPI and GDP average at 3.9% and 3.6%, respectively. For an average country, credit provided by banks to the private sector is 83.6% of GDP; the value of stocks traded amounts to 45.3% of GDP; stock market capitalization

is about 72.6% of GDP. Pairwise correlations of the variables can be found in Online Appendix A.

III. Empirical Results

A. Competition and ZL Policies

To examine the relation between competition and firms' ZL policies, we estimate linear probability regressions that model firms' ZL status as a function of *CLI*, firm and country control variables, and firm and industry-year interacted fixed effects:[7]

$$(1) \qquad ZL_{ijt} = \beta_1 CLI_{jt} + \delta \cdot X_{ijt-1} + \gamma \cdot V_{jt-1} + Firm\ FE + Industry \times Year\ FE + \varepsilon_{ijt},$$

where *i*, *j* and *t* denote a firm, country and year. The vector X_{it-1} contains a set of lagged firm-level control variables, which are shown to determine firms' ZL status in the prior literature (El Ghoul et al. (2018)), including log market capitalization (*ln(Size)*), market-to-book equity ratio (*Market-to-book ratio*), operating profitability (*ROA*), asset tangibility (*Asset tangibility*), dividend-to-assets ratio (*Div/TA*), R&D intensity (*R&D/Sales*), capital investment (*Capx/TA*), cash holdings (*Cash/TA*), income tax liability (*Tax/TA*), and non-debt tax shield (*Non-debt tax shield/TA*). The above variables are also well-known determinants of leverage according to traditional trade-off and pecking order theories (see review by Graham and Leary (2011)).

To ensure that the CLI is not picking up the effect of other macroeconomic factors, we include six lagged country macroeconomic variables, namely annual growth in CPI and GDP (*ΔCPI* and *ΔGDP*), log GDP per capita (*ln(GDP per capita)*), the ratio of bank credit to private sector to GDP (*Private credit/GDP*), the ratio of stocks traded to GDP (*Stocks traded/GDP*), and

[7] Prior studies (e.g., Levine et al. (2020) and Ding et al. (2022)) examine the contemporaneous effect of competition on firm outcomes such as corporate innovation and social responsibility. We likewise study the contemporaneous relation between competition and firms' ZL policies. Our results are robust to using lagged *CLI* as the main independent variable. These results are available on request.

the ratio of market capitalization to GDP (*Market capitalization/GDP*). Detailed definitions of all variables can be found in Appendix A.2.

Firm fixed effects are included in the model to account for the effects of any time-invariant unobserved firm characteristics on ZL policies, such as national and firm-level cultural attributes as well as differences in ESG preferences between countries (Ding et al. (2022)). Industry-year interacted fixed effects are included to sweep out all unobserved heterogeneities at the industry-year level. With the inclusion of firm and industry-year fixed effects, identification relies on within-firm variation in competition and ZL. As *CLI* varies only at the country-year level, we cluster standard errors at the country level, following Bertrand, Duflo, and Mullainathan (2004).

Insert Table 3 about here

Table 3 reports the estimation results. In column 1, only *CLI* and the fixed effects are included. The coefficient on *CLI* is 0.026 and significant at the 1% level. In column 2, our results are unchanged after adding the lagged firm control variables. In column 3 the full model is estimated; the estimate on *CLI* remains similar in both magnitude (coefficient = 0.036) and significance. Based on the estimates in column 3, a one-standard-deviation increase in *CLI* increases the probability that a firm has ZL by 0.99 percentage points (= 0.275 × 0.036), or by 8.5% (= 0.0099/0.117) relative to the unconditional mean value of *ZL* (0.117).

Most of the firm-level controls have signs that are consistent with those reported by prior studies such as El Ghoul et al. (2018), and are significant, although our model specification differs from theirs due to the inclusion of firm fixed effects. None of the macroeconomic variables except *Market capitalization/GDP* is significant in determining ZL status.

Our results are robust to alternatives for industry classification, ZL measure, fixed effects, clustering of standard errors, and to dropping U.S. firms (see Online Appendix B). We also verify that the CLI is indeed related to market competition, i.e., the inclusion condition (see Online Appendix C). Overall, competition is shown to be conducive to debt conservatism.

B. Endogeneity Concerns

The competition-ZL relation is subject to potential endogeneity concerns. For instance, if unlevered firms actively lobby governments for or against competition laws, our estimates would be biased due to reverse causality.[8] Also, our model can be viewed as a staggered difference-in-differences (DiD) model with a continuous treatment-assignment variable (Atanasov and Black (2016)). Recent studies such as Goodman-Bacon (2021) and Baker, Larcker, and Wang (2022) show that, if the treatment effect is heterogeneous across groups and time periods, a staggered DiD model may give misleading estimates.[9] We perform several tests to alleviate concerns related to reverse causality and potential bias in staggered DiD models. These tests are presented in Online Appendices D to F. However, our estimation is still subject to potential endogeneity arising due to unobserved or omitted variables. For this reason, the main contribution of our paper is not to settle the case that competition has a causal effect on ZL policies. Rather, we strengthen the case for this causal link and show that (assuming causality) the link operates through a traditional financial flexibility channel as opposed to financial constraints or managerial quiet life.

[8] For instance, under the agency theory, unlevered firms whose managers enjoy a quiet life and dislike competition may lobby governments against statutes that encourage competition. Likewise, unlevered firms may be active in lobbying the governments in favor of such statutes, for reasons such as to avoid being abused and/or acquired by more dominant firms with more debt financing capacity.

[9] The reason is that the staggered DiD estimate is a weighted average of treatment effects across groups and time periods. Negative effects may arise when control groups used in one period are treated in another period, thus biasing the estimate of the average treatment effect (De Chaisemartin and D'Haultfœuille (2020)).

C. Component Analysis

As discussed in Appendix A.1, the CLI comprises two component indexes, *Authority* and *Substance*, with the latter consisting of *Merger control*, *Abuse of dominance*, and *Anticompetitive agreements*. In this section, we estimate our baseline models using the component and subcomponent indexes.

Insert Table 4 about here

In column 1 of Table 4, the estimate on *Authority* is 0.021 and significant at the 10% level. Column 2 shows that *Substance* enters the model positively (coefficient = 0.043) and significantly (at the 5% level). In column 3 with both component indexes included, only the positive estimate on *Substance* is significant (at the 5% level), whereas that on *Authority* is small and insignificant, suggesting that the positive effect of competition laws on *ZL* stems from the substantive provisions regulating competition. Replacing *Substance* with its underlying three subcomponents, column 4 shows that the estimate on *Merger control* is positive (0.037) and highly significant, whereas those on *Abuse of dominance* and *Anticompetitive agreements* are small and insignificant.

Overall, firms' ZL policies respond to changes in provisions relating to merger control but not to those regulating abusive behaviors by dominant firms or firms' anticompetitive agreements. Our evidence suggests that acquisitions are one of the most effective ways through which firms gain dominance and competition is lessened.[10]

[10] The curbing of firms' capacity to increase their market power through merger could inhibit the development of oligopolies, in which competition is limited via tacit agreements between firms.

An alternative explanation for our results is that the effect of competition laws on ZL is through the effect on firms' M&A incentives as opposed to through changes in competition.[11] Prior studies show that managers consider deviations from target capital structure when making or planning acquisitions; over-levered (under-levered) firms are less (more) likely to make acquisitions and finance them with debt (e.g., Harford, Klasa, and Walcott (2009) and Uysal (2011)). Increased merger control, induced by competition laws, might discourage firms from engaging in M&As, many of which would have been funded by debt. In this case, firms would borrow less than before and remain under-levered for longer, which could explain our results. This alternative view predicts that our results concentrate on firms with current and/or future acquisitive activities and on those with a higher propensity to acquire. We find no evidence supporting the alternative explanation (see Online Appendix G).

IV. Plausible Mechanisms

Our results show that competition increases firms' propensity to adopt a conservative debt policy. Such behavior could be explained by the financial-constraint, financial-flexibility, and/or quiet-life hypotheses, as explained in the Introduction. The first subsection below presents results that are consistent with both the constraint and flexibility hypotheses. The second subsection reports results that either support flexibility, or do not support constraint, or both. The final subsection presents a test to distinguish between preference for flexibility and preference for a quiet life as explanations for our baseline evidence. The results support preference for flexibility.

[11] We are grateful to an anonymous reviewer for suggesting this alternative explanation.

A. Evidence Consistent with both the Constraint and Complexity Hypotheses

1. Competition and Future Cash-flow Risk

The underlying theoretical motivation for all three hypotheses is that competition makes firms' cash flows riskier and more uncertain. We therefore start with evidence confirming that competition raises future cash-flow volatility. We estimate the baseline model (equation 1) with firms' cash-flow volatility (*ROA* σ) as the dependent variable. *ROA* σ is defined as the standard deviation of firms' ROA estimated using all quarterly observations during years $t + 1$ to $t + 3$ (we require at least four available observations). In Table 2, the mean (median) of quarterly ROA volatility is 3.1% (1.3%).

Insert Table 5 about here

The results are reported in Table 5. As column 1 shows, the estimate on *CLI* is 0.0053 and significant at the 5% level. A one-standard-deviation increase in *CLI* is associated with an increase in ROA volatility of 14.6 basis points (= 0.275 × 0.0053) over the next three years, corresponding to a 4.7% (0.00146/0.031) increase in *ROA* σ relative to its sample mean. Column 2 reports the baseline model estimated in yearly changes and with firm fixed effects dropped, again finding similar results. To mitigate the effects of outliers, in columns 3 and 4, we use a rank variable of *ROA* σ (*ROA* σ_{Rank}), constructed by dividing firms into 100 groups, assigning them rank value, and then dividing the rank variable by 100. Column 4 reports the model estimated in yearly changes. The results are qualitatively similar.

2. Competition and Sensitivity of Cash to Cash Flow

Next, we examine the effect of competition on firms' propensity to save cash from cash flows. This evidence helps reinforce cash-flow risk as the main channel through which

competition drives firms' ZL policies. As competition intensifies, firms facing costlier debt financing likely find balance-sheet liquidity more valuable and are more prone to saving cash out of cash flow (the constraint hypothesis; Almeida, Campello, and Weisbach (2004)). Deleveraging to restore financial flexibility is typically accompanied by decisions to increase cash holdings, as more unused debt capacity and cash holdings are imperfect substitutes. Increased competition-induced cash-flow risk induces firms to restore financial flexibility, and saving cash is part of such restoration efforts (the flexibility hypothesis) (DeAngelo et al. (2011) and DeAngelo et al. (2018)). The stockpiling of cash induced by competition, if any, is also consistent with managers seeking to minimize financial risk through building financial slack (the quiet-life hypothesis). Therefore, all three hypotheses point to a positive effect of competition on firms' cash-saving propensity, as captured by a higher sensitivity of cash holdings to cash flow. Following Almeida et al. (2004), we estimate the following regression:

$$\Delta Cash/TA_{ijt} = \beta_0 + \beta_1\, Cash\ flow/TA_{ijt} + \beta_2\, CLI_{jt} + \beta_3\, Cash\ flow/TA_{it} \times CLI_{it} + \delta \cdot Z_{ijt-1} + \lambda \cdot V_{jt-1} + Firm\ FE + Industry \times Year\ FE + \varepsilon_{ijt}, \quad (2)$$

where $\Delta Cash/TA_{ijt}$ is firm i's change in cash holdings from year $t-1$ to year t divided by total assets in year t; $Cash\ flow/TA_{ijt}$ is firm i's income before extraordinary items and depreciation and amortization divided by total assets in year t; and Z_{it-1} is a vector containing lagged Tobin's q, the natural log of total assets, capital expenditure, and acquisition expenditure, as well as yearly changes (from year $t-1$ to year t) in net working capital and short-term debt. The coefficient of interest is β_3, which gauges the extent to which the sensitivity of cash holdings to cash flow changes with competition.

Insert Table 6 about here

We report the results in Table 6. In column 1, only cash flow, the CLI, their interaction, and industry fixed effects are included. The estimate on *Cash flow/TA* is 0.127 and significant at the 1% level. This suggests that an average firm saves about 12.7% of its cash flow. Importantly, the estimate on *Cash flow/TA* × *CLI* is 0.129 and significant, consistent with our prediction that the sensitivity of cash holdings to cash flow increases with competition.

In columns 2 and 3, we include lagged firm and country control variables, and the results remain similar. In column 4, we further include firm fixed effects, again finding similar results: the estimate on *Cash flow/TA* increases to 0.221, suggesting that an average firm saves slightly below one-fourth of its cash flow,[12] while that *Cash flow/TA* × *CLI* reduces to 0.103. Both remain significant at the 1% level. The significant interaction term implies that when *CLI* moves from the 25th (= 0.517) to the 75th percentile (= 0.782), the coefficient on *Cash flow/TA* increases from 0.274 (= 0.517 × 0.103 + 0.221) to 0.302 (= 0.782 × 0.103 + 0.221), i.e., an increase in cash savings by 2.73 percentage points, or by $42.8 million at the $1,567.8 million sample mean of total assets.

3. Competition, Cash-Flow Volatility, and ZL Policies

The flexibility hypothesis recognizes that firms face an economically meaningful opportunity cost of borrowing, as the decision to raise debt in the current period reduces the debt capacity available to meet their future funding needs. Firms whose investment shock has higher volatility thus have stronger incentives to preserve debt capacity and to accumulate higher cash balances to meet their potentially substantial funding needs upon the arrival of future investment shocks (see Table 3 of DeAngelo et al. (2011)). This reasoning suggests that the value of

[12] This magnitude is remarkably close to that documented by Frésard (2012), who finds a 0.21 sensitivity for U.S. firms during 1970-2006.

financial flexibility increases with the volatility of the investment shock, proxied by cash-flow volatility. Accordingly, if the positive competition-ZL relation is indeed due to firms' wish to replenish debt capacity, the relation should be more pronounced among firms with more volatile cash flows.[13]

We measure firms' cash-flow volatility (*ROA* σ) as the standard deviation of firms' ROA estimated using all available quarterly observations over a 3-year period from year $t-3$ to $t-1$, requiring a minimum of 4 available observations. To mitigate the effect of outliers, we also make use of an alternative rank variable of cash-flow volatility (*ROA* σ_{Rank}), constructed by dividing the firms into 100 groups based on *ROA* σ, assigning them their rank value, and then dividing the rank variable by 100. We interact the two cash-flow volatility variables with *CLI* to explain firms' ZL policies using our baseline model.

Insert Table 7 about here

In column 1 of Table 7, the estimate on *CLI* × *ROA* σ is 0.936, significant at the 1% level. Moving from the 25th (0.0066) to 75th (0.0320) percentiles in *ROA* σ, the implied coefficient on *CLI* increases from 0.016 (= 0.010 + (0.0066 × 0.936)) to 0.040 (= 0.010 + (0.0320 × 0.936)), corresponding to an increase in firms' probability of using ZL by 0.44 (= 0.016 × 0.275) and 1.1 percentage points (= 0.040 × 0.275), respectively. The results are qualitatively similar in column 2, using *ROA* σ_{Rank}.

Our finding that the competition-ZL relation increases with cash-flow volatility supports the flexibility hypothesis. Note, however, that it could support the constraint hypothesis, since increased cash-flow risk might increase the cost of debt and the probability that the firm becomes constrained, and could also support the quiet-life hypothesis, if managers are averse to risk. Later

[13] We thank an anonymous reviewer for pointing us to the important role of cash-flow risk in testing the flexibility hypothesis.

we examine whether either of these alternative explanations is likely to explain why the competition-ZL relation increases with cash-flow volatility.

4. Heterogeneity Tests According to Financial Constraint

The value of financial flexibility is likely greater among more constrained firms, which face a higher cost of external financing (e.g., Gamba and Triantis (2008)). Also, under the constraint hypothesis, more constrained firms should face greater difficulty in raising external capital. Hence, according to either view, more constrained firms are more likely to move to ZL when competition heightens. To test this prediction, we perform heterogeneity tests based on two proxies. The first is based on whether the firm pays dividends. Non-dividend-paying firms tend to face more external-finance constraints (e.g., Fazzari, Hubbard, and Petersen (1987), Campello, Graham, and Harvey (2010), and Farre-Mensa and Ljungqvist (2015)). The second proxy is the Whited and Wu (2006) index of financial constraint (*WW*), computed as a linear combination of six firm characteristics, including cash flow, a dividend indicator, long-term leverage, log total assets, industry and firm sales growth. A higher value of *WW* indicates more constraint. A firm is defined as constrained if it is not a dividend payer, or if its *WW* value is above the sample median in each country-year bin.

Insert Table 8 about here

Table 8 reports the results. In columns 1 and 2, the positive relation between competition and ZL is significantly stronger for firms that are non-dividend payers and have an above-median *WW* value. The estimate on *CLI* is small and insignificant among the less-constrained firms. Overall, constraint or cost of external financing play a significant mediating role in the relation

between competition and ZL status. This is consistent with both the constraint and flexibility hypotheses.

B. Evidence Rejecting the Constraint Hypothesis or in Favor of the Flexibility Hypothesis

1. Competition and Corporate Policies Surrounding ZL Events

We now focus on ZL events in our sample, to better understand the reasons why firms move to ZL. The evidence in this and the next section (Section IV.B.2) supports the flexibility hypothesis uniquely. We define a ZL event for a firm in year *t* as positive *Debt/TA* during years *t* – 3 to *t* – 1), and zero during years *t* to *t* + 2, which excludes ZL policies that are short-lived. There are in total 709 ZL events in 16 countries. We estimate a logit regression using the full sample, modelling the likelihood of ZL events as a function of our lagged baseline firm and country controls, and industry and year fixed effects, from which obtain estimated propensity scores.

In each year with at least one ZL event, we retain all firms with no missing observations over the six-year event window from year *t* – 3 to *t* + 2. We exclude potential control firms which have no ZL event in the event year, but have at least some years of ZL within the six-year window. We then match each treated firm (a ZL firm) with the firm from the same country which has the closest propensity score in the event year (the absolute difference in propensity score must not exceed 1%). This procedure yields a six-year-long subsample or cohort consisting of treated firms and matched control firms. We stack the observations across the cohorts and analyze five corporate policies around the ZL events, including debt (*Debt/TA*), cash holdings

(*Cash/TA*), dividend payout (*Div/TA*), repurchases (*Repur/TA*), and equity issuance (*EIS/TA*). There are in total 691 matched pairs of firms, spanning 15 countries.

Insert Table 9 about here

In Panel A of Table 9, we report the means of *Debt/TA*, *Cash/TA*, *Div/TA*, *Repur/TA*, and *EIS/TA* for the treated and control firms in event time. We observe noticeable increases in cash holdings, dividend payout, and share repurchases among the treated firms over the 6-year window, but no such trends in these variables for the control firms. For the treated (control) firms, the post-minus-pre changes in *Debt/TA*, *Cash/TA*, *Div/TA*, *Repur/TA*, and *EIS/TA* are 8.8 (0.3), 6.0 (-0.9), 0.2 (0.1), 0.8 (0.3), and -0.4 (-0.9) percentage points, respectively, and the difference-in-differences for *Debt/TA*, *Cash/TA*, *Div/TA*, and *Repur/TA* are significant at the 1% level. These statistics indicate that ZL events coincide with increases in cash holdings, dividend payout, and share repurchases.

The increases in cash holdings are as expected, if firms move to ZL for either constraint or flexibility reasons. But the increases in dividend payout and repurchases are not as expected, if firms move to ZL because they are constrained and unable to continue borrowing. Rather, the evidence suggests that firms which choose ZL have surplus cash flow, which enables them both to repay debt and to increase their cash holdings and payout. This is in line with flexibility reasons for adoption of zero debt—firms choose to repay debt when it is feasible and convenient. They could have carried on borrowing had they wished to.

In Panel B, we perform tests examining whether the post-minus-pre-event changes in the above corporate policies are explained by changes in competition.[14] For each matched pair, we

[14] An alternative approach is to estimate full-sample baseline tests that regress the above corporate policies on the CLI, control variables and fixed effects. However, in the full-sample estimation, it is uncertain whether any changes in corporate policies in response to competition can be related to the increase in ZL we document. Our analysis

compute the *abnormal* changes in *Cash/TA*, *Div/TA*, *Repur/TA*, and *EIS/TA* as the differences in the changes between treated and the matched control firms, i.e., the DiD for the four variables ($\Delta Cash/TA_{DiD}$, $\Delta Div/TA_{DiD}$, $\Delta Repur/TA_{DiD}$, and $\Delta EIS/TA_{DiD}$). After aggregating the data to pair level, we estimate the following regression:

$$(3) \qquad \Delta Corporate\ policy_{DiD\ ijt} = \beta_0 + \beta_1 \Delta CLI_{jt} + \delta \cdot Z_{ijt-1} + \lambda \cdot V_{jt-1} + Industry \times Year\ FE + \varepsilon_{ijt},$$

where $\Delta Corporate\ policy_{DiD\ ijt}$ is one of the four abnormal policy variables, and ΔCLI_{jt} is the change in *CLI* from event year $t - 1$ to event year t. The same set of lagged firm and country control variables is included in the model. Standard errors are clustered at the country level.

The estimation of equation (3) is reported in Panel B of Table 9. In columns 1 to 4, changes in *CLI* are positively and significantly associated with abnormal changes in cash holdings ($\Delta Cash/TA_{DiD}$),[15] whereas there is no relation between the index and abnormal changes in dividend payout, share repurchase, and equity issuance. The results suggest that ZL firms accumulate more cash when competition increases, but they do not decrease their dividends or share repurchases. The results do not support the financial-constraint view, as we would expect some constrained firms to cut their payout as competition increases. Hence, our event-based evidence is more consistent with the flexibility hypothesis.

2. Competition and the Timing of ZL Policies

around the ZL events allows us to establish a more direct link between ZL, changes in corporate policies, and changes in competition.

[15] Our results that changes in cash respond positively to changes in *CLI* surrounding the ZL events are entirely consistent with DeAngelo et al. (2022) who find that firms' leverage dynamics are shaped by their desire to hold cash for financial-flexibility reasons.

In this section, we offer further evidence that competition induces firms to move to ZL due to a desire to preserve financial flexibility. Testing this idea is difficult because 'desire for flexibility' is hard to measure. However, we draw on recent evidence in DeAngelo et al. (2018) that a substantial portion of firms delever to near-zero levels after reaching a historical peak leverage ratio, presumably to free-up debt capacity for future investment opportunities. Motivated by this evidence, we gather a 'deleveraging sample' in which firms are most likely to delever for flexibility motives, and we perform duration analysis on this subsample. Specifically, for each firm we identify the year in which its *Debt/TA* is the highest over the entire sample period, i.e., the peak year, and then retain its observations in the post-peak period for up to ten years, or up to the year in which the firm's *Debt/TA* reaches zero. Firms with *Debt/TA* of zero in their peak year are excluded.

Insert Table 10 about here

Panel A of Table 10 reports descriptive statistics for the deleveraging subsample. There are in total 11,965 firms from 57 countries in the subsample, of which 1,614 firms from 33 countries reach ZL within the 10-year window, taking on average about 3.3 years. We also report the means of *Debt/TA*, *Cash/TA*, *Div/TA*, *Repur/TA*, and *EIS/TA* for both the peak and ZL years, for the ZL firms. Notably, mean *Debt/TA* declines by 33.0 percentage points, while mean *Cash/TA* increases by 8.8 percentage points. We observe a moderate increase in dividend payout (0.1 percentage points), share repurchase (0.4 points), and equity issuance (3.0 points). These statistics resemble those based on the U.S. sample of DeAngelo et al. (2018), and are consistent with our earlier event analysis (Section IV.B.1) documenting an increase in cash and payout surrounding ZL events.

In this deleveraging subsample, we estimate a Cox (1972) proportional hazards model to examine whether changes in *CLI* affect the timing of firms' adoption of ZL. Analyzing this subsample allows us to more confidently attribute the effect of competition on ZL, if any, to firms' delevering for financial-flexibility reasons. Moreover, firms that succeed in delevering persistently over time are less likely to be constrained than other firms that choose ZL. The regression is written as follows:

$$\Pr(ZL) = \beta_0 + \beta_1 \Delta CLI_{jt-1} + \delta \cdot \Delta X_{ijt-1} + \gamma \cdot \Delta V_{jt-1} + Country\ FE + Industry\ FE + \varepsilon_{ijt}. \quad (4)$$

We estimate equation (4) using a Cox (1972) proportional hazard model, which flexibly accommodates for the fact that a firm's hazard rate, i.e., the probability that the firm reaches ZL, is a function of the number of years following the peak year, the changes in competition and control variables, and country and industry fixed effects.[16]

In column 1 of Panel B of Table 10, with all variables and industry fixed effects included, the estimate on *ΔCLI* is positive and significant at the 5% level. In column 2, we further include country fixed effects, finding qualitatively similar results. Based on the estimates in column 2, a one-standard-deviation increase (0.062) in *ΔCLI* is expected to raise the likelihood of ZL by 10.6 percentage points (= $\exp^{(0.062 \times 1.628)}$), implying that greater competition induces firms to move to ZL sooner. Overall, our duration analysis on the deleveraging subsample supports the view that competition induces firms to move to ZL for financial-flexibility motives.

3. Competition, Cost of Debt, and ZL Policies

[16] Firm fixed effects are not included in the model as high-dimensional fixed effects may lead to the typical incidental-parameter problem, widely discussed in the econometrics literature (e.g., Ai and Norton (2003); Greene (2010)).

In this section, we take a closer look at the financial-constraint hypothesis and examine (1) the effect of competition on firms' cost of debt and (2) whether increases in the cost of debt explain firms' decisions to move to ZL.[17] Following prior studies (e.g., Chui, Kwok and Zhou (2016)), we measure a firm's cost of debt as the ratio of total interest expense to total debt (*Interest expense/Debt*).[18] According to Chui et al. (2016), this measure is advantageous for three reasons. First, as interest expense is paid on debt raised in different years, the measure captures a firm's overall cost of debt. Second, it captures the cost of both public and private debt. Finally, since it is recorded in Compustat's databases, it is available for most of our sample firms.

Insert Table 11 about here

In Panel A of Table 11, we estimate the baseline model with *Interest expense/Debt* as the dependent variable. As column 1 shows, the estimate on *CLI* is 0.015, significant at the 5% level. A one-standard-deviation increase in *CLI* is associated with an increase in the interest-expense ratio of 41.3 basis points (= 0.275 × 0.015), which is equivalent to an increase of 5.3% (= 0.00413/0.078) relative to its mean value of 0.078. Column 2 presents the same model but in yearly changes and with firm fixed effects dropped, showing that the results are qualitatively similar. The results from Panel A suggest that competition indeed increases the cost of debt.

In Panel B, we test whether the competition-induced increase in the cost of debt *mediates* the positive relation between competition and ZL. Since the cost of debt for ZL firms is unobserved, we are unable to directly relate competition, interest expense, and ZL to one another within a set of mediating tests. To circumvent this issue, we instead construct an industry-level

[17] We thank an anonymous reviewer for suggesting that we examine firms' response to higher costs of debt induced by competition.

[18] The interest expenses item in Compustat could include other finance-related costs unrelated to borrowing, e.g., costs associated with seasoned equity offerings. As a value of cost of debt of more than 50% is unlikely to be plausible, we only include observations in which *Interest expense/Debt* lies between 0 and 50% in the analysis. In unreported robustness analysis, we restrict the sample to observations in which *Interest expense/Debt* is between 0 and 100%, finding qualitatively similar results. These results are available upon request.

cost of debt, defined as the average of *Interest expense/Debt* within a country-industry-year bin, based on 3-digit SIC industries (*Interest expense/Debt*$_{SIC3}$).[19] In other words, we proxy for a firm's cost of debt by using the average cost among its industry peers. Specifically, we examine whether competition increases an industry's cost of debt, and then whether firms in the industry respond to the increase by moving to ZL. We report the results in Panel B.

In column 1 of Panel B, we regress *Interest expense/Debt*$_{SIC3}$ on *CLI* and our baseline controls and fixed effects. The estimate on *CLI* is 0.010, significant at the 10% level, consistent with our results from Panel A, though somewhat smaller in size and significance. In column 2, we estimate the baseline model of equation (1), with *ZL* as dependent variable, on the same sample as in column 1. In column 3, we control for the mediating variable, i.e., *Interest expense/Debt*$_{SIC3}$. We find a negligible change in the estimate on *CLI*, after controlling for *Interest expense/Debt*$_{SIC3}$, and the estimate on *Interest expense/Debt*$_{SIC3}$ is small and insignificant. The Sobel test statistic for a mediation relation is 0.203, and the *p*-value of 0.839 is not significant.

Overall, although competition appears to increase the cost of debt, as expected, such increases do not explain firms' decisions to adopt ZL; there is an insignificant mediating effect. This result is inconsistent with the constraint hypothesis.

4. Competition and Payout

As a further test of the constraint hypothesis, we examine whether firms adjust their payout policies following changes in competition as we would expect if they were more constrained. We focus on firms' decisions to buy back shares. Prior studies (e.g., Floyd et al.

[19] Results are qualitatively similar if we instead aggregate *Interest expense/Debt* within each country-industry-year bin using the Fama-French 48-industry classification.

(2015)) show that share repurchases represent an increasingly important and flexible method for firms to distribute cash back to shareholders, compared with dividend payout. Hence, if competition indeed makes firms increasingly unable to borrow, and inclined towards ZL, we should find that they cut their payouts to shareholders, especially via share repurchases. To test this, we estimate the baseline model replacing the dependent variable with the ratio of share repurchases in total assets (*Repur/TA*).

Insert Table 12 about here

The results are reported in Table 12. In column 1, the estimate on *CLI* is 0.001 and insignificant. Column 2 reports results from a change regression, again finding similar results. Firms do not reduce repurchases when competition increases, which is inconsistent with the constraints story.

C. Evidence Inconsistent with Managerial Quiet Life

Finally, an important question is whether firms' desire to restore financial flexibility represents an agency problem. To address this question, we perform heterogeneity tests according to three proxies of governance quality and managerial entrenchment. The first is the revised country-level shareholder-rights index compiled by Djanov et al. (2008), which measures how well minority shareholders are protected by law from expropriation (e.g., pursuing self-interest, diversion of corporate assets, shirking, etc.) by the managers and controlling shareholders. In countries with weaker investor protection, managers likely find it easier to pursue a quiet life and self-interest (La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000) and DeFond and Hung (2004)).

The second proxy is a dummy variable equal to one if a firm is defined as an expected target based on the estimated probability of being a takeover target, and zero otherwise.[20] The finance literature acknowledges that the threat of takeover is an effective corporate governance mechanism which disciplines managers.[21] Following the approach in prior studies (e.g., Palepu (1986) and Harford (1999)) to estimate the probability of takeover, we first estimate a probit model that a firm is taken over in year *t* as a function of our baseline firm controls, industry M&A liquidity, industry sales concentration, and country, industry, and year fixed effects. Using the model-fitted probability, we construct intervals in increments of 0.01 from 0 to the maximum probability and calculate the percentages of targets and non-targets for each interval. This results in two empirical distributions of target and non-target percentages between zero and the maximum expected probability. The crossover point of the two distributions is defined as the cutoff point for the expected targets, which is 0.06. We then define a firm as an *expected* target if its expected probability is larger than the cutoff point and as an unexpected target otherwise (*Expected target*). Because expected target firms are subject to a greater threat of takeover, their managers are under more pressure to perform well and would find it harder to pursue a quiet life.

The third proxy is the percentage ownership by institutional investors (*Institutional ownership*). Prior literature documents that institutional investors are sophisticated and play a significant role in monitoring firms and improving corporate governance (e.g., Gillan and Starks

[20] An alternative proxy for takeover threat is the firm-level anti-takeover index of Bebchuk, Cohen, and Ferrell (2009) which could be constructed using anti-takeover provision data from the Thomson Reuters ASSET4 ESG database. Unfortunately, the data coverage of ASSET4 in our international sample is unsatisfactory and would reduce our sample size to below 28,000 observations. To maximize sample size and maintain consistency with samples used in our earlier analyses, we opt for estimating expected takeover probability directly.

[21] Firm-level anti-takeover provisions protecting managers from removal are detrimental to governance quality and firm value (e.g., Bebchuk and Cohen (2004) and Bebchuk et al. (2009)). Other studies exploit variation in the threat of hostile takeover provided by adoption of state-level hostile-takeover laws to examine the implications of governance for firm outcomes and policies (e.g., Cain, McKeon and Solomon (2017) and Karpoff and Wittry (2018)).

(2000) and Aggarwal, Erel, Ferreira, and Matos (2011)). Hence, managers of firms with higher institutional ownership are less likely to pursue a quiet life, due to more intense shareholder monitoring.

Insert Table 13 about here

To test the quiet-life hypothesis, we estimate the baseline model interacting *CLI* with the above governance proxies. We report the results in Table 13. The competition-ZL relation does not vary with any of the three proxies, as shown by the insignificant interaction terms. This evidence is not consistent with the view that managers' desire for a quiet life explains why firms move to ZL.

V. Conclusion

Our study exploits staggered changes in competition laws across countries and over time, to examine the effect of competition on firms' adoption of ZL. We find that competition increases firms' propensity to move to ZL. We perform extensive tests to distinguish between three hypotheses: the financial-flexibility, financial-constraint, and quiet-life hypotheses.

The results of several tests are most consistent with the flexibility hypothesis. The positive effect of competition on ZL increases with cash-flow volatility, consistent with the value of financial flexibility being magnified for firms with more volatile investment or profitability shocks. Second, we focus on ZL events and find that they are accompanied by increases in cash holdings and payout. Since ZL firms do not appear to be constrained, and do not cut payout as competition increases, our evidence is hard to reconcile with the constraint hypothesis. Third, we construct a 'deleveraging' subsample by retaining 10 years of observations after a given firm reaches its peak leverage. We argue that firms in this subsample are more likely than others to

delever for financial-flexibility reasons in the post-peak period (DeAngelo et al., 2018). Our duration analysis estimated on this subsample shows that increases in competition are associated with a higher annual likelihood of ZL.

Turning to the constraint hypothesis, we examine the cost of debt and whether it has a mediating role. Although the cost of debt indeed increases with competition, it does not explain firms' propensity to use ZL; it does not mediate the relation between competition and choice of ZL status. To glean more insights, we examine if firms adjust their payout policies in ways consistent with being more financially constrained. We find little evidence that firms reduce share buybacks as competition increases, and thus they show little sign of being increasingly constrained. Together, the above evidence is inconsistent with the constraint hypothesis.

Finally, we find little evidence that the relation between competition and ZL is concentrated in firms with weaker governance or more managerial entrenchment. This suggests that moving to ZL for flexibility reasons does not represent an agency problem. Overall, we consistently find that competition is conducive to debt conservatism in firms, the reason being that competition increases the value of financial flexibility. This is consistent with the view that the flexibility motive drives leverage dynamics (e.g., Graham and Harvey (2001), Brounen et al. (2004), Gamba and Triantis (2008), DeAngelo et al. (2011), Denis and McKeon (2012), Jang (2017), DeAngelo et al. (2018), Fahlenbrach et al. (2021), Barry et al. (2022), and DeAngelo et al. (2022)). Debt capacity is a scarce resource, and firms have incentives to maintain and restore unused capacity to meet future funding needs. As DeAngelo et al. (2017) put it, such deleveraging could be viewed as reducing the balance on the firm's 'credit card'. As competition increases cash flow risk and thus the value of flexibility, managers' motivation to keep the balance low increases.

There is surely more to learn about the role of the flexibility motive in financing decisions. One direction is to study the interplay between this motive and other factors affecting financing. For instance, in the setting we study, some firms respond to increased competition by repaying all their debt, but others do not, consistent with an impact of non-flexibility factors on firms' responses to competition. The question of how the flexibility motive and other forces interact seems a promising area for further research.

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TABLE 1
Descriptive Statistics by Country

Our main data sources are Compustat Global and Compustat North American Fundamental Annual Databases for the non-U.S. and U.S. firms, respectively. Our sample consists of 169,571 firm-year observations from 25,784 firms over the period 1988 to 2010. There are 58 countries in total. For each country we report the number of observations and unique firms, the proportion of firm-year observations with ZL, and the mean values of the CLI and its five components. Definitions of the variables can be found in Appendix A.2.

Countries	Obs.	%	# of firms	%	*ZL*	*CLI*	*Authority*	*Substance*	*Merger control*	*Abuse of dominance*	*Anti-comp agreements*
Australia	3,616	2.1%	666	2.6%	9.7%	0.68	0.80	0.53	0.50	0.53	0.62
Austria	199	0.1%	47	0.2%	3.5%	0.75	0.79	0.67	0.50	0.88	0.64
Bahrain	49	0.0%	10	0.0%	61.2%	0.00	0.00	0.00	0.00	0.00	0.00
Bangladesh	62	0.0%	32	0.1%	12.9%	0.00	0.00	0.00	0.00	0.00	0.00
Belgium	270	0.2%	72	0.3%	0.7%	0.60	0.57	0.66	0.63	0.78	0.60
Brazil	529	0.3%	182	0.7%	4.0%	0.84	0.86	0.77	0.38	0.94	0.90
Bulgaria	12	0.0%	10	0.0%	0.0%	0.73	0.84	0.56	0.63	0.77	0.40
Canada	2,532	1.5%	405	1.6%	14.1%	0.81	0.89	0.67	0.35	0.56	1.00
Chile	186	0.1%	71	0.3%	2.2%	0.49	0.61	0.39	0.13	0.42	0.70
China	11,340	6.7%	1,828	7.1%	7.9%	0.52	0.55	0.53	0.30	0.70	0.63
Colombia	23	0.0%	15	0.1%	0.0%	0.74	0.63	0.86	0.75	0.81	0.90
Croatia	24	0.0%	12	0.0%	8.3%	0.55	0.48	0.66	0.78	0.82	0.44
Cyprus	35	0.0%	21	0.1%	2.9%	0.75	0.71	0.77	0.88	0.81	0.60
Denmark	577	0.3%	116	0.4%	4.5%	0.19	0.13	0.28	0.32	0.30	0.22
Egypt, Arab Rep.	19	0.0%	10	0.0%	15.8%	0.36	0.39	0.41	0.38	0.56	0.43
Finland	333	0.2%	99	0.4%	6.9%	0.65	0.57	0.75	0.75	0.70	0.75
France	1,216	0.7%	401	1.6%	1.2%	0.78	0.86	0.65	0.63	0.75	0.60
Germany	1,974	1.2%	482	1.9%	9.5%	0.69	0.79	0.56	0.63	0.79	0.37
Greece	544	0.3%	162	0.6%	7.2%	0.54	0.53	0.58	0.38	0.81	0.60
Hungary	42	0.0%	15	0.1%	11.9%	0.83	0.81	0.80	0.88	0.88	0.63
India	3,518	2.1%	1,025	4.0%	7.0%	0.75	0.80	0.66	0.34	0.70	0.90
Indonesia	844	0.5%	196	0.8%	8.4%	0.50	0.42	0.59	0.45	0.50	0.73
Ireland	208	0.1%	46	0.2%	12.5%	0.85	0.86	0.79	0.88	0.85	0.61
Israel	344	0.2%	134	0.5%	11.3%	0.88	0.93	0.75	0.88	0.89	0.50
Italy	701	0.4%	208	0.8%	2.4%	0.66	0.57	0.77	1.00	0.81	0.50
Japan	23,640	13.9%	3,291	12.8%	8.9%	0.99	0.93	0.97	0.86	0.94	0.95
Kenya	102	0.1%	24	0.1%	12.7%	0.78	0.64	0.93	0.88	0.75	1.00
Korea, Rep.	3,551	2.1%	638	2.5%	2.7%	0.69	0.64	0.75	0.65	0.88	0.70
Kuwait	19	0.0%	12	0.0%	5.3%	0.00	0.00	0.00	0.00	0.00	0.00
Luxembourg	45	0.0%	14	0.1%	2.2%	0.25	0.21	0.42	0.13	0.75	0.50
Malaysia	5,372	3.2%	862	3.3%	11.4%	0.03	0.04	0.02	0.01	0.05	0.02

Mexico	117	0.1%	43	0.2%	17.9%	0.80	0.71	0.88	0.77	0.81	0.92
Morocco	88	0.1%	37	0.1%	8.0%	0.78	0.86	0.65	0.63	0.63	0.70
Netherlands	545	0.3%	123	0.5%	10.1%	0.24	0.22	0.38	0.75	0.53	0.10
New Zealand	418	0.2%	90	0.3%	3.8%	0.70	0.88	0.45	0.59	0.50	0.40
Nigeria	162	0.1%	51	0.2%	17.3%	0.00	0.00	0.00	0.00	0.00	0.00
Norway	778	0.5%	156	0.6%	10.2%	0.54	0.46	0.68	0.88	0.56	0.61
Oman	162	0.1%	39	0.2%	25.9%	0.00	0.00	0.00	0.00	0.00	0.00
Pakistan	654	0.4%	151	0.6%	12.4%	0.49	0.44	0.60	0.54	0.62	0.67
Peru	61	0.0%	28	0.1%	19.7%	0.57	0.61	0.56	0.13	0.72	0.83
Philippines	350	0.2%	101	0.4%	16.3%	0.66	0.87	0.39	0.17	0.62	0.51
Poland	122	0.1%	65	0.3%	12.3%	0.56	0.48	0.71	0.67	0.83	0.62
Portugal	128	0.1%	35	0.1%	0.0%	0.62	0.56	0.72	0.74	0.69	0.70
Qatar	32	0.0%	13	0.1%	21.9%	0.30	0.21	0.52	0.53	0.64	0.48
Saudi Arabia	207	0.1%	58	0.2%	48.8%	0.70	0.69	0.65	0.68	0.58	0.63
Singapore	2,587	1.5%	493	1.9%	7.1%	0.36	0.36	0.34	0.30	0.35	0.35
Slovenia	21	0.0%	12	0.0%	9.5%	0.87	0.93	0.74	0.50	1.00	0.70
South Africa	977	0.6%	201	0.8%	9.2%	0.66	0.83	0.44	0.32	0.69	0.44
Spain	391	0.2%	96	0.4%	0.3%	0.65	0.58	0.75	0.88	0.91	0.49
Sri Lanka	316	0.2%	101	0.4%	2.8%	0.28	0.45	0.18	0.24	0.34	0.22
Sweden	1,095	0.6%	235	0.9%	15.3%	0.54	0.60	0.50	0.44	0.69	0.47
Switzerland	1,347	0.8%	185	0.7%	3.9%	0.61	0.69	0.51	0.55	0.73	0.37
Thailand	742	0.4%	249	1.0%	10.6%	0.62	0.54	0.75	0.69	0.80	0.73
Turkey	130	0.1%	60	0.2%	5.4%	0.68	0.57	0.81	0.88	0.81	0.70
Utd Arab Emirs.	34	0.0%	22	0.1%	14.7%	0.00	0.00	0.00	0.00	0.00	0.00
United Kingdom	5,450	3.2%	1,177	4.6%	12.6%	0.82	0.86	0.72	0.78	0.68	0.68
United States	90,690	53.5%	10,820	42.0%	14.1%	0.70	0.79	0.58	0.88	0.56	0.40
Vietnam	41	0.0%	37	0.1%	4.9%	0.59	0.50	0.72	0.50	0.94	0.70
Total	169,571	100.0%	25,784	100.0%	11.7%	0.56	0.56	0.55	0.51	0.62	0.53

TABLE 2
Summary Statistics

Summary statistics of the main variables at both firm and country levels. The number of observations, means, standard deviations, and percentile statistics are reported. Definitions of the variables can be found in Appendix A.2.

	Obs.	Mean	Stdev.	25%	Median	75%
Panel A. Firm-Year Level						
ZL	169,571	0.117	0.321	0.000	0.000	0.000
ZL (book leverage < 2.5%)	169,571	0.207	0.405	0.000	0.000	0.000
Debt/TA	169,571	0.230	0.201	0.048	0.203	0.357
CLI	169,571	0.706	0.203	0.701	0.701	0.736
ΔCLI	169,571	0.006	0.066	0.000	0.000	0.000
Size (in million USD)	169,571	1,768.020	21,458.500	37.594	141.675	576.450
ln(Size)	169,571	5.052	1.996	3.627	4.954	6.357
Market-to-book ratio	169,571	1.284	1.533	0.402	0.770	1.514
ROA	169,571	0.078	0.165	0.048	0.101	0.156
Asset tangibility	169,571	0.311	0.226	0.125	0.265	0.452
Div/TA	169,571	0.012	0.022	0.000	0.003	0.015
R&D/Sales	169,571	0.100	0.490	0.000	0.000	0.021
Capx/TA	169,571	0.060	0.063	0.019	0.041	0.077
Cash/TA	169,571	0.166	0.187	0.033	0.098	0.225
Taxes/TA	169,571	0.020	0.029	0.001	0.014	0.032
Non-debt tax shield/TA	169,571	0.042	0.031	0.022	0.036	0.054
ROA σ	113,123	0.031	0.050	0.007	0.013	0.031
Interest expense/Debt	140,249	0.078	0.062	0.040	0.067	0.096
Panel B. Country-Year Level						
CLI	658	0.588	0.275	0.517	0.678	0.782
Authority	658	0.606	0.294	0.500	0.643	0.857
Substance	658	0.563	0.272	0.488	0.628	0.767
Merger control	658	0.528	0.325	0.125	0.625	0.875
Abuse of dominance	658	0.623	0.289	0.563	0.750	0.813
Anticompetitive Agreements	658	0.553	0.290	0.400	0.600	0.700
CPI growth	658	0.039	0.032	0.017	0.029	0.054
GDP growth	658	0.036	0.033	0.017	0.037	0.055
ln(GDP per capita)	658	9.597	1.255	8.736	10.058	10.612
Private credit/GDP	658	0.836	0.468	0.400	0.769	1.134
Stocks traded/GDP	658	0.453	0.522	0.089	0.261	0.599
Market capitalization/GDP	658	0.726	0.518	0.328	0.576	0.994

TABLE 3
Competition and ZL Policies

Results from our baseline regressions, which examine the effect of competition laws on the incidence of ZL. The dependent variable is *ZL*, a dummy variable equal to one if the firm has ZL in the current year and zero otherwise. The independent variable of interest is *CLI*, which is a country-level measure of the stringency of competition regulations compiled by Bradford and Chilton (2018). Lagged firm- and country-level control variables are included. Industry effects are constructed using the Fama-French 48 industry classification. *T*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ZL		
	1	2	3
CLI	0.026***	0.041***	0.036**
	(2.915)	(3.348)	(2.540)
ln(Size)		-0.015***	-0.015***
		(-10.400)	(-11.484)
Market-to-book ratio		0.010***	0.010***
		(13.615)	(12.519)
ROA		0.030***	0.030***
		(2.996)	(3.037)
Asset tangibility		-0.057**	-0.057**
		(-2.547)	(-2.570)
Div/TA		0.617***	0.629***
		(10.894)	(12.500)
R&D/Sales		-0.006***	-0.006***
		(-4.255)	(-4.231)
Capx/TA		-0.090***	-0.089***
		(-5.276)	(-5.470)
Cash/TA		0.313***	0.314***
		(34.173)	(35.852)
Tax/TA		0.299***	0.298***
		(8.677)	(8.405)
Non-debt tax shield/TA		0.026	0.030
		(0.763)	(0.926)
ΔCPI			0.115
			(1.014)
ΔGDP			0.063
			(0.898)
ln(GDP per capita)			0.016
			(0.621)
Private credit/GDP			0.007
			(0.787)
Stocks traded/GDP			0.006
			(1.442)
Market capitalization/GDP			-0.011*
			(-1.849)
Firm FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Observations	169,571	169,571	169,571
R-squared	0.603	0.615	0.615

TABLE 4
Competition and ZL Policies: Component Analysis

Results from regressions examining the effects of components of the CLI on the incidence of ZL. The dependent variable is *ZL*. *Authority* and *Substance* are the two main component indexes of *CLI*, which is defined as the average of the two. *Merger control*, *Abuse of dominance*, and *Anticompetitive agreements* are the three subcomponents of *Substance*, which is defined as the average of the three. The definitions of these component indexes can be found in Appendix A.1. Baseline (Table 3) firm and country control variables and fixed effects are included in all models. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ZL			
	1	2	3	4
Authority	0.021*		0.003	0.002
	(1.778)		(0.263)	(0.180)
Substance		0.043**	0.041**	
		(2.614)	(2.116)	
Merger control				0.037***
				(3.875)
Abuse of dominance				-0.008
				(-0.424)
Anticompetitive Agreements				0.003
				(0.120)
Firm controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	169,571	169,571	169,571	169,571
R-squared	0.615	0.615	0.615	0.615

TABLE 5
Competition and Future Cash-Flow Volatility

The effect of competition on firms' cash-flow volatility. In column 1, the dependent variable is future cash-flow volatility, *ROA σ*, defined as the standard deviation of firms' ROA estimated using all available quarterly observations over a 3-year period from year $t + 1$ to $t + 3$ (requiring a minimum of 4 available observations). In column 3, the dependent variable is *ROA* σ_{Rank}, which is a rank variable based on *ROA σ,* constructed by dividing the firms into 100 groups by *ROA σ*, assigning the rank value to the firms, and then dividing the rank variable by 100. In columns 2 and 4, we estimate the model in yearly changes, dropping firm fixed effects. Baseline firm and country control variables are included in all models. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ROA σ	Δ*(ROA σ)*	*ROA* σ_{Rank}	Δ*(ROA* σ_{Rank}*)*
	1	2	3	4
CLI	0.0053**		0.048***	
	(2.366)		(2.750)	
Δ*CLI*		0.0031**		0.021***
		(2.229)		(2.831)
Firm controls	Yes	Yes (in Δ)	Yes	Yes (in Δ)
Country controls	Yes	Yes (in Δ)	Yes	Yes (in Δ)
Firm FE	Yes	No	Yes	No
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	113,123	92,942	113,123	92,942
R-squared	0.6578	0.0241	0.697	0.023

TABLE 6
Competition and the Cash-Flow Sensitivity of Cash

Results from tests examining the relation between competition and the cash-flow sensitivity of cash. The dependent variable is yearly changes in cash holdings divided by total assets, Δ*Cash/TA*, which is the sum of income before extraordinary items, depreciation and amortization, divided by total assets. The independent variable of interest is *CLI*. Lagged firm controls include Tobin's q, the natural logarithm of total assets (in $USD), and capital expenditure, acquisition expenditure, and yearly changes in net working capital and short-term debt, all scaled by total assets. Lagged baseline country control variables are included in some models. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ*Cash/TA*			
	1	2	3	4
Cash flow/TA	0.127***	0.207***	0.210***	0.221***
	(7.108)	(8.483)	(8.551)	(7.766)
CLI	-0.007**	0.003	0.000	-0.015
	(-2.007)	(0.429)	(0.040)	(-1.462)
Cash flow/TA × *CLI*	0.129***	0.083***	0.081***	0.103***
	(5.558)	(3.514)	(3.461)	(3.136)
Firm controls		Yes	Yes	Yes
Country controls			Yes	Yes
Firm FE				Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	217,335	217,335	217,335	217,335
R-squared	0.162	0.212	0.212	0.360

TABLE 7
Competition, Cash-Flow Volatilities, and ZL Policies

Results from tests examining whether cash-flow volatility influences the relation between competition and firms' ZL policies. The dependent variable is *ZL*. *ROA σ* is the standard deviation of firms' ROA estimated using all available quarterly observations over a 3-year period from year $t-1$ to $t-3$ (requiring a minimum of 4 available observations). *ROA* σ_{Rank} is a rank variable based on *ROA σ*, constructed by dividing the firms into 100 groups based on *ROA σ*, assigning the rank value to the firms, and then dividing the rank variable by 100. The independent variable of interest is *CLI*. Lagged baseline firm- and country-level control variables are included. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ZL	
	1	2
CLI	0.010	-0.013
	(0.529)	(-0.808)
ROA σ	-0.683***	
	(-3.657)	
CLI × *ROA σ*	0.936***	
	(3.127)	
ROA σ_{Rank}		-0.067***
		(-3.266)
CLI × *ROA* σ_{Rank}		0.080**
		(2.410)
Firm controls	Yes	Yes
Country controls	Yes	Yes
Firm FE	Yes	Yes
Industry × Year FE	Yes	Yes
Observations	98,142	98,142
R-squared	0.623	0.623

TABLE 8
Heterogeneity Tests According to Financial Constraint

Results from tests examining the heterogeneous effects of competition according to two proxies of financial constraint. The dependent variable is *ZL*, and the independent variable of interest is *CLI*. *No-dividend dummy* is a dummy variable equal to one for non-dividend paying firms and zero otherwise. *WW* is the Whited and Wu (2006) index of financial constraints, computed as -0.091 times cash flow (scaled by total assets), minus 0.062 times a dividend dummy variable, plus 0.021 times long-term leverage, minus 0.044 times the natural logarithm of total assets, plus 0.102 times industry sales growth (2-digit SIC industries), minus 0.035 times sales growth. *High WW* is a dummy variable equal to one if a firm's *WW* is above the sample median within a country-year bin. Lagged baseline firm- and country-level control variables are included, as well as their interaction with the two constraint dummy variables. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ZL	
	1	2
CLI	0.030	-0.000
	(1.547)	(-0.022)
CLI × *No-dividend dummy*	0.065*	
	(1.862)	
CLI × *High WW index*		0.073***
		(2.699)
Firm controls	Yes	Yes
Country controls	Yes	Yes
Firm FE	Yes	Yes
Industry × Year FE	Yes	Yes
Observations	169,571	155,436
R-squared	0.636	0.665

TABLE 9
Competition and Corporate Policies Surrounding ZL Events

Results from analysis focusing only on ZL events. We define a firm as having a ZL event if its *Debt/TA* is positive in years $t-3$, $t-2$, and $t-1$, but zero in years t, $t+1$, and $t+2$. In each year in which there is at least one ZL event, we keep only firms with no missing observations over a 6-year event window (from 3 years before to 2 years after the event year), and we exclude potential control firms (without a ZL event in the event year) with at least one year of ZL within the 6-year window. To identify control firms, we estimate a full-sample logit regression modelling the likelihood that firms receive a change in *CLI* as a function of the lagged baseline firm and country controls, as well as industry and year fixed effects. Using the estimated propensity score, we match each firm with a ZL event with a 'clean' control firm from the same country and that has the closest propensity score during the event year (absolute differences in propensity score must not exceed 1%). We then stack firm-year observations across the cohorts and perform analysis on this sample. Panel A reports the means of *Debt/TA*, cash holdings (*Cash/TA*), dividends and repurchases (*Div/TA* and *Repur/TA*), and equity issuance (*EIS/TA*), in event time surrounding ZL events, for both treated and matched 'clean' control firms. We also compute the post-minus-pre differences in these variables as well as their difference-in-differences (DiD) estimates, along with *t*-statistics based on firm-clustered standard errors in parentheses. In Panel B, for each firm with a ZL event, we compute its abnormal corporate-policy variables in relation to cash holdings ($\Delta Cash/TA_{DiD}$), dividends ($\Delta Div/TA_{DiD}$), repurchases ($\Delta Repur/TA_{DiD}$), and equity issuance ($\Delta EIS/TA_{DiD}$) as their respective differences in the post-minus-pre differences between the treated and matched 'clean' control firms. We then regress these abnormal policy variables on changes in CLI from year $t-1$ to year t, lagged baseline firm and country control variables, and industry-year interacted fixed effects. In Panel B, *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Event Analysis Surrounding ZL Events

	Treated firms					Matched 'clean' control firms				
Event year	*Debt/TA*	*Cash/TA*	*Div/TA*	*Repur/TA*	*EIS/TA*	*Debt/TA*	*Cash/TA*	*Div/TA*	*Repur/TA*	*EIS/TA*
-3	0.114	0.279	0.007	0.009	0.059	0.212	0.217	0.007	0.008	0.045
-2	0.093	0.289	0.007	0.010	0.053	0.209	0.221	0.008	0.011	0.041
-1	0.058	0.309	0.008	0.010	0.058	0.200	0.245	0.008	0.014	0.050
0	0.000	0.340	0.009	0.014	0.064	0.200	0.226	0.008	0.015	0.039
1	0.000	0.360	0.010	0.019	0.045	0.203	0.220	0.009	0.014	0.040
2	0.000	0.358	0.011	0.019	0.048	0.209	0.210	0.008	0.014	0.030
Pre (-3 to -1)	0.088	0.293	0.007	0.010	0.056	0.207	0.228	0.007	0.011	0.045
Post (0 to 2)	0.000	0.353	0.010	0.017	0.052	0.204	0.219	0.008	0.014	0.036
Post – Pre	-0.088	0.060	0.002	0.008	-0.004	-0.003	-0.009	0.001	0.003	-0.009
DiD	-0.085***	0.069***	0.002***	0.004***	0.005					
	(-13.004)	(9.744)	(3.248)	(3.010)	(1.020)					

Panel B. Competition and Corporate Policies Among ZL Firms

	$\Delta Cash/TA_{DiD}$	$\Delta Div/TA_{DiD}$	$\Delta Repur/TA_{DiD}$	$\Delta EIS/TA_{DiD}$
	1	2	3	4
ΔCLI	0.221***	-0.012	-0.024	0.095
	(3.063)	(-0.559)	(-1.568)	(1.229)
Firm controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	691	691	691	691
R-squared	0.569	0.504	0.439	0.503

TABLE 10
Competition and the Timing of ZL: Evidence from a Deleveraging Subsample

Results from tests examining the effect of changes in competition on the timing of firms' adoption of ZL. The analysis is performed on a "deleverage" sample. To construct the deleverage sample, for each firm, we first identify the year during which its debt-to-asset ratio is the highest over the entire sample period, i.e., the peak year, and we then keep its observations during the post-peak period for up to ten years, or the year in which the firm's leverage becomes zero. Firms with debt of zero in the peak year are excluded. Panel A reports descriptive statistics for the deleverage subsample, including the total number of firms and the number of firms that adopt ZL within the 10-year window. Among the 1,614 firms that adopt ZL, we also report the average number of years it takes to delever to ZL, and the means of corporate policy variables relating to *Debt/TA*, cash holdings, dividend, repurchases, and equity issuance for the year in which leverage peaks and the year in which it reaches zero. In Panel B, we estimate Cox proportional hazards models, which model a firm's hazard rate, i.e., the probability that the firm reaches ZL, is a function of the lagged changes in CLI, baseline firm and country control variables and industry and country fixed effects. *Z*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Descriptive Statistics for the ZL Firms in the Deleveraging Sample

	# of countries	Obs. or Mean	Median	Peak	Zero	Diff.
# of firms	57	11,965				
# of firms going ZL	33	1,614				
# of years taken to go ZL		3.3	3.0			
Debt/TA				0.330	0.000	-0.330
Cash/TA				0.242	0.330	0.088
Div/TA				0.007	0.008	0.001
Repur/TA				0.005	0.009	0.004
EIS/TA				0.055	0.085	0.030

Panel B. Duration Analysis

	1	2
ΔCLI	1.469**	1.628***
	(2.174)	(3.010)
Δln(Size)	-0.114**	-0.123***
	(-2.567)	(-3.269)
ΔMarket-to-book ratio	0.127***	0.125***
	(4.479)	(4.942)
ΔROA	-0.936***	-0.827***
	(-4.911)	(-6.077)
ΔAsset tangibility	-0.848**	-0.756*
	(-1.968)	(-1.895)
Δdiv/TA	7.067**	10.091***
	(2.566)	(2.972)
ΔR&D/Sale	-1.489***	-1.151***
	(-2.820)	(-4.264)
ΔCapx/TA	-0.650*	-0.552*
	(-1.703)	(-1.739)

ΔCash/TA	1.152*	0.994*
	(1.762)	(1.756)
ΔTaxes/TA	1.995***	1.587***
	(3.095)	(3.765)
ΔNon-debt tax shield/TA	1.219	0.568
	(0.889)	(0.482)
ΔCPI growth	-0.591	3.423
	(-0.260)	(0.977)
ΔGDP growth	8.997***	6.965*
	(3.185)	(1.896)
Δln(GDP per capita)	-8.217***	-9.750**
	(-3.189)	(-2.077)
ΔPrivate credit/GDP	2.528**	1.181
	(2.473)	(1.583)
ΔStocks traded/GDP	0.241***	0.134
	(3.923)	(1.371)
ΔMarket capitalization/GDP	-0.362	-0.188
	(-1.169)	(-0.704)
Industry FE	Yes	Yes
Country FE		Yes
Observations	47,127	47,127

TABLE 11
Competition, Cost of Debt, and ZL Policies

Panel A examines the effect of competition on the cost of debt. The dependent variable is the ratio of interest expenses scaled by total debt (*Interest expense/Debt*). In column 2, we report a model in which all variables are in yearly changes, dropping firm fixed effects. To avoid the effect of outliers, we exclude observations of *Interest expense/Debt* which exceed 0.50. Panel B examines the relation between competition, industry-average cost of debt, and firms' ZL policies. *Interest expense/Debt*$_{SIC3}$ is the average *Interest expense/Debt* within each country-industry-year bin (3-digit SIC industry). We also report a Sobel test statistic and its corresponding *p*-value. Lagged baseline firm and country control variables and fixed effects are included in the models unless stated otherwise. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Competition and Cost of Debt

	Interest expense/Debt	Δ*(Interest expense/Debt)*
	1	2
CLI	0.015**	0.024*
	(2.010)	(1.880)
Firm controls	Yes	Yes (in Δ)
Country controls	Yes	Yes (in Δ)
Firm FE	Yes	
Industry × Year FE	Yes	Yes
Observations	140,249	113,034
R-squared	0.532	0.014

Panel B. Competition, Industry Cost of Debt, and ZL Policies

	Interest expense/Debt$_{SIC3}$	*ZL*	
	1	2	3
CLI	0.010*	0.030**	0.030**
	(1.690)	(2.445)	(2.445)
Interest expense/Debt$_{SIC3}$			0.008
			(0.204)
Firm controls	Yes	Yes	Yes
Country controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Observations	167,287	167,287	167,287
R-squared	0.779	0.611	0.611
Sobel test statistic			0.203
p-value			[0.839]

TABLE 12
Competition and Payout

Results from regressions examining the relation between competition and firms' share repurchases. The dependent variable is the ratio of shares repurchases to total assets (*Repur/TA*). The independent variable of interest is *CLI*. Lagged baseline firm- and country-level control variables are included in the model. In column 2, the regression is estimated in yearly changes, with firm fixed effects dropped. *t*-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Repur/TA	Δ*Repur/TA*
	1	2
CLI	0.001	
	(0.380)	
Δ*CLI*		-0.001
		(-0.786)
Firm controls	Yes	Yes (in Δ)
Country controls	Yes	Yes (in Δ)
Firm FE	Yes	
Industry × Year FE	Yes	Yes
Observations	163,899	135,382
R-squared	0.376	0.025

TABLE 13
Financial Flexibility and Managerial Quiet Life

This table examines whether the effect of competition on firms' ZL policies varies with several proxies of managerial entrenchment. The dependent variable is *ZL*. The independent variables of interest are measures of entrenchment interacted with *CLI*. *Shareholder rights* is the country-level anti-director-rights index in Djankov et al. (2008), which measures how well a country protects its minority shareholders based on six legal rights granted to them. *Expected target* is a dummy variable equal to one if a firm is an expected takeover target based on the model-estimated probability of being a target, and zero for unexpected targets. To estimate the probability of takeover, we first estimate a probit model for whether firm is acquired in year *t* as a function of the baseline firm controls, *Industry M&A liquidity*, industry sales concentration (*HHI*), and country, industry, and year fixed effects. We then obtain the expected probability from the model estimation. We construct intervals in increments of 0.01 from 0 to the maximum expected probability, and calculate the percentages of targets and non-targets for each interval, resulting in two empirical distributions of target and non-target percentages between zero and the maximum expected probability. The crossover point of the two distributions is defined as the cutoff point for expected targets, which is 0.06. A firm is defined as an expected target if its expected probability is larger than the cutoff point, and as an unexpected target otherwise. *Institutional ownership* is the percentage share ownership by institutional investors. Lagged baseline firm- and country-level control variables are included. t-statistics based on country-clustered robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ZL		
	1	2	3
CLI	0.060**	0.038***	0.034**
	(2.056)	(3.515)	(2.117)
CLI × *Shareholder rights*	-0.006		
	(-0.768)		
Expected target		-0.020	
		(-1.357)	
CLI × *Expected target*		-0.004	
		(-0.185)	
Institutional ownership			0.170
			(1.511)
CLI × *Institutional ownership*			-0.165
			(-1.079)
Firm controls	Yes	Yes	Yes
Country controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Observations	168,909	122,913	110,523
R-squared	0.613	0.639	0.677

APPENDIX A.1

Components of the CLI

This appendix summarizes the components of the CLI. *Authority* captures the authority granted, i.e. provisions on who can enforce the laws, and limits to their application. It is computed by adding or deducting scores based on the presence or absence of provisions on: a private right of action, fines, imprisonment, divestitures, damages, extraterritoriality, industry exemptions, and enterprise exemptions. The laws are more stringent if individuals can bring suits against firms pursuing anticompetitive activities, which can be punished by fines, imprisonment, divestiture, or compensation to a private party. Extraterritorial enforcement, meaning the authorities can attach jurisdiction regardless of the firm's nationality or the location of its anticompetitive activity, is conducive to competition. Exemptions for industries and certain types of firms reduce competition. *Authority* is an index ranging from -1 to 6.

Substance captures the substantive rules regulating competition and is computed as the equal-weighted average of three subcomponent indexes: *Merger control*, *Abuse of dominance*, and *Anticompetitive agreements*. It ranges from -3.5 to 12.

Merger control is constructed by adding or subtracting scores based on variables capturing the presence or absence of provisions in relation to pre-merger notification, the jurisdiction's discretion in restricting anticompetitive mergers, and exemptions to such restrictions. In jurisdictions where pre-merger notification is mandatory and the merger needs to be approved by the authorities, firms face more regulatory risk. Stringent competition laws allow the authorities to restrict mergers based on economic and public-interest grounds (to prevent acquirers strengthening their dominance), whereas defenses/exemptions to such restrictions, based on grounds of efficiency, firm failure or public interest, reduce stringency.

Abuse of dominance captures the extent to which market-abusive behaviors by dominant firms are prohibited. It is constructed by adding scores based on the type of 'blanket' prohibition imposed, and on whether certain types of anti-competitive behavior are considered as abusive. In some regimes, the authorities have vast discretion to prohibit abusive conduct by dominant companies, because there is no statutory requirement to offer guidance on what constitutes an abuse. Such a blanket prohibition raises firms' regulatory risk. The more common types of abusive activities that can be prohibited include discriminatory pricing, unfair pricing, predatory pricing, anticompetitive discounts, and refusal to deal with customers or suppliers. The presence of defenses, on grounds of efficiency or public interest, lowers the subcomponent index.

Anticompetitive agreements are constructed based on the presence of substantive prohibitions on horizontal and vertical agreements. Horizontal agreements (cartels) represent one of the most prohibited anticompetitive activities around the world, and provisions that prohibit each of the four most common cartel practices—price-fixing, market-sharing, output limitations, and bid-rigging—add to the subcomponent index. For vertical agreements, prohibitions on exclusive dealing, resale price maintenance, and tying or agreements that eliminate competitors, add to the subcomponent index. Defenses on grounds of efficiency or public interest lower competition and carry deductions from the subcomponent index.

To construct the overall CLI, Bradford and Chiltern (2018) adjust *Authority* by multiplying it by two (so that it counts as equivalent to 12 points) and then take the equal-weighted average of *Substance* and the adjusted *Authority*. The aggregated index is rescaled to lie between 0 and 1. A value of 0 (least competition) indicates a country without any competition laws in the given year, whereas a value of 1 (most competition) indicates a country with the most stringent laws.

APPENDIX A.2
Definitions of Other Variables

This table provides detailed definitions of the main variables used in our analysis, and their respective data sources.

Variable	Definition	Source
ZL	Dummy variable equal to one for firms with ZL and zero otherwise.	Compustat Global; Compustat North America
ZL (Book leverage < 2.5%)	Dummy variable equal to one for firms whose debt-to-asset ratio is below 2.5% and zero otherwise.	Compustat Global; Compustat North America
Debt/TA	Ratio of the sum of long- and short-term debt to total assets.	Compustat Global; Compustat North America
ln(Size)	Natural logarithm of market capitalization in million USD dollars.	Compustat Global; Compustat North America
Market-to-book ratio	Ratio of market capitalization to total assets.	Compustat Global; Compustat North America
ROA	Operating income before extraordinary items divided by total assets.	Compustat Global; Compustat North America
Asset tangibility	Asset tangibility, computed as net property, plant, and equipment divided by total assets.	Compustat Global; Compustat North America
Div/TA	Common dividends divided by total assets.	Compustat Global; Compustat North America
R&D/Sales	R&D expenses divided by total sales.	Compustat Global; Compustat North America
Capx/TA	Capital expenditure divided by total assets.	Compustat Global; Compustat North America
Cash/TA	Cash and short-term investments divided by total assets.	Compustat Global; Compustat North America
Tax/TA	Income taxes divided by total assets.	Compustat Global; Compustat North America
Non-debt tax shield/TA	Depreciation and amortization divided by total assets.	Compustat Global; Compustat North America
CLI	Country-level index of the stringency of competition laws compiled by Bradford and Chilton (2018). It is the equal-weighted average of two component indexes: *Authority* and *Substance*.	Bradford and Chilton (2018)
Authority	Component index of *CLI*, capturing the stringency of competition laws based on the provisions on who can enforce the laws and the limits of their application.	Bradford and Chilton (2018)
Substance	Component index of *CLI*, capturing the stringency of competition laws based on the substance of the laws, i.e., substantive rules regulating competition. It is the equal-weighted average of three subcomponent	Bradford and Chilton (2018)

	indexes: *Merger control*, *Abuse of dominance*, and *Anticompetitive agreements*.	
Merger control	Subcomponent of *CLI*, capturing the stringency of competition laws relating to exercise of merger control, e.g., notification, restrictions, and defences against takeovers.	Bradford and Chilton (2018)
Abuse of dominance	Subcomponent of *CLI*, capturing the stringency of competition laws relating to prohibition of abusive behaviors by dominant firms.	Bradford and Chilton (2018)
Anticompetitive agreements	Subcomponent of *CLI*, capturing the stringency of competition laws relating to substantive prohibition anticompetitive activities.	Bradford and Chilton (2018)
CPI growth	Annual percentage growth in consumer price index (CPI).	World Bank
GDP growth	Annual percentage growth in GDP.	World Bank
ln(GDP per capita)	Natural logarithm of GDP per capita.	World Bank
Private credit/GDP	Total credit to the private sector by banks divided by GDP.	World Bank
Stocks traded/GDP	Total values of stocks traded divided by GDP.	World Bank
Market capitalization/GDP	Total capitalization of the stock market divided by GDP.	World Bank
Δ*Cash/TA*	Change in cash holdings from year t - 1 to year t, divided by total assets in year t.	Compustat Global; Compustat North America
Cash flow/TA	Cash flow divided by lagged property, plant, and equipment. Cash flow is defined as the sum of income before extraordinary items and depreciation and amortization.	Compustat Global; Compustat North America
Q	Market value of assets minus the difference between book value of assets and net property, plant, and equipment, divided by lagged net property, plant, and equipment. Market value is the sum of the market value of common stock, total liability, and preferred stock, minus deferred taxes.	Compustat Global; Compustat North America
No-dividend dummy	Dummy variable equal to one for non-dividend payers and zero for the payers.	Compustat Global; Compustat North America
WW index	Whited and Wu (2006) firm-level index of financial constraints, computed as -0.091 times cash flow (scaled by total assets), minus 0.062 times a dividend dummy variable, plus 0.021 times long-term leverage (scaled by total assets), minus 0.044 times the natural logarithm of total assets, plus 0.102 times industry (2-digit SIC industries) sales growth, and minus 0.035 times sales growth.	Compustat Global; Compustat North America
Interest expense/Debt	Ratio of interest expenses to total debt, the sum of long-term and short-term debt.	Compustat Global; Compustat North America
Interest expense/Debt$_{SIC3}$	Average of *Interest expense/Debt* for each country-industry (3-digit SIC industry)-year bin. In the computation, we exclude all firms with *Interest expense/Debt* larger than 0.5.	Compustat Global; Compustat North America
ROA σ	Standard deviation of ROA estimated using all available quarterly observations over a 3-year period (requiring a minimum of 4 quarterly observations for the estimation).	Compustat Global Quarterly; Compustat North America Quarterly
ROA σ_{Rank}	Rank variable computed by dividing firms into 100 groups based on *ROA* σ within each country-year bin, then assigning the rank to each firm, and dividing the rank by 100	Compustat Global Quarterly; Compustat North America Quarterly
Repur/TA	Ratio of share repurchases in total assets.	Compustat Global; Compustat North America

EIS/TA	Ratio of equity issuance in total assets.	Compustat Global; Compustat North America
Shareholder rights	Country-level anti-director-rights index compiled by Djankov et al.'s (2008), which measures how well a country protects its minority shareholders based on six legal rights granted to them. It is constructed by adding one to the index for each legal right a country has, including (1) shareholders can mail proxy votes; (2) shareholders are not required to deposit their shares prior to the general shareholders' meeting; (3) cumulative voting or proportional representation of minorities on the board of directors is allowed; (4) there is an oppressed minorities mechanism; (5) shareholders have pre-emptive rights that can only be waived by a shareholders' meeting; and (6) minimum percentage of share capital entitling a shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10%.	Djankov et al. (2008)
Expected target	Dummy variable equal to one if a firm is an expected takeover target based on a model-estimated probability of being a target, and zero otherwise. To estimate the expected takeover probability, we first estimate a probit model of firms' incidence of being taken over in year *t* as a function of our baseline firm controls, *Industry M&A liquidity*, industry sales concentration (*HHI*), and country, industry, and year fixed effects, and we then obtain the expected probability. We construct intervals in increments of 0.01 from 0 to the maximum expected probability and calculate the percentages of targets and non-targets for each interval, resulting in two empirical distributions of target and non-target percentages between zero and the maximum expected probability. The crossover point of the two distributions is defined as the cutoff point for the expected targets, which is 0.06. A firm is defined as an expected target if its expected probability is larger than the cutoff point and as an unexpected target otherwise.	SDC Platinum (for observed takeovers)
Institutional ownership	Percentage ownership by institutions.	FactSet Lionshares
Industry M&A liquidity	Liquidity of the M&A market within a country, 3-digit SIC industry, and year, computed as the sum of total deal value of all M&As within a country-industry-year bin, divided by the sum of total assets within the same bin.	SDC Platinum; Compustat Global; Compustat North America
HHI	Industry sales Herfindahl–Hirschman index.	Compustat Global; Compustat North America

Online Appendix

for

Competition and Debt Conservatism

June 2025

Online Appendix A. Pairwise Correlations

Pairwise correlations between the main variables used in our analysis. Panel A reports correlations between firm-level variables estimated at the firm-country-year level. Panel B reports correlations between country-level variables estimated at the country-year level.

Panel A. Firm-Country-Year Level

		V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
ZL	V1	1.000														
	p-value															
ZL (leverage < 2.5%)	V2	0.711	1.000													
	p-value	0.000														
Debt/TA	V3	-0.416	-0.575	1.000												
	p-value	0.000	0.000													
CLI	V4	0.000	0.012	-0.032	1.000											
	p-value	0.956	0.000	0.000												
ΔCLI	V5	-0.006	-0.009	0.001	0.069	1.000										
	p-value	0.010	0.000	0.551	0.000											
ln(Size)	V6	-0.062	-0.048	-0.010	0.098	0.027	1.000									
	p-value	0.000	0.000	0.000	0.000	0.000										
Market-to-book ratio	V7	0.230	0.285	-0.259	-0.031	0.050	0.196	1.000								
	p-value	0.000	0.000	0.000	0.000	0.000	0.000									
ROA	V8	-0.062	-0.069	-0.008	-0.003	0.010	0.275	-0.168	1.000							
	p-value	0.000	0.000	0.001	0.172	0.000	0.000	0.000								
Asset tangibility	V9	-0.204	-0.268	0.301	-0.066	0.032	0.095	-0.200	0.174	1.000						
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000							
DivTA	V10	0.067	0.076	-0.112	-0.112	-0.004	0.179	0.077	0.299	0.076	1.000					
	p-value	0.000	0.000	0.000	0.000	0.108	0.000	0.000	0.000	0.000						
R&D/Sales	V11	0.116	0.137	-0.089	0.002	-0.018	-0.038	0.294	-0.524	-0.156	-0.098	1.000				
	p-value	0.000	0.000	0.000	0.491	0.000	0.000	0.000	0.000	0.000	0.000					
Capx/TA	V12	-0.082	-0.108	0.135	-0.073	0.013	0.060	0.059	0.117	0.508	0.023	-0.052	1.000			
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
Cash/TA	V13	0.399	0.468	-0.391	0.021	-0.002	-0.032	0.423	-0.317	-0.410	-0.029	0.440	-0.145	1.000		
	p-value	0.000	0.000	0.000	0.000	0.450	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Taxes/TA	V14	0.104	0.136	-0.210	0.039	-0.016	0.237	0.206	0.496	-0.059	0.308	-0.119	0.060	0.032	1.000	
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Non-debt tax shield/TA	V15	-0.050	-0.061	0.087	-0.006	-0.036	-0.058	-0.006	0.010	0.340	-0.020	-0.007	0.346	-0.146	-0.066	1.000
	p-value	0.000	0.000	0.000	0.016	0.000	0.000	0.010	0.000	0.000	0.000	0.007	0.000	0.000	0.000	

Panel B. Country-Year Level

		V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12
CLI	V1	1.000											
	p-value												
Authority	V2	0.949	1.000										
	p-value	0.000											
Substance	V3	0.890	0.707	1.000									
	p-value	0.000	0.000										
Merger control	V4	0.712	0.551	0.816	1.000								
	p-value	0.000	0.000	0.000									
Abuse of dominance	V5	0.819	0.689	0.887	0.645	1.000							
	p-value	0.000	0.000	0.000	0.000								
Anticompetitive agreements	V6	0.782	0.649	0.846	0.447	0.692	1.000						
	p-value	0.000	0.000	0.000	0.000	0.000							
CPI growth	V7	-0.046	-0.048	-0.027	-0.060	-0.056	0.044	1.000					
	p-value	0.236	0.221	0.492	0.127	0.155	0.257						
GDP growth	V8	-0.234	-0.212	-0.226	-0.255	-0.223	-0.120	0.173	1.000				
	p-value	0.000	0.000	0.000	0.000	0.000	0.002	0.000					
ln(GDP per capita)	V9	0.153	0.158	0.109	0.278	0.116	-0.094	-0.518	-0.272	1.000			
	p-value	0.000	0.000	0.005	0.000	0.003	0.016	0.000	0.000				
Private credit/GDP	V10	0.225	0.242	0.150	0.232	0.165	0.013	-0.435	-0.244	0.501	1.000		
	p-value	0.000	0.000	0.000	0.000	0.000	0.745	0.000	0.000	0.000			
Stocks traded/GDP	V11	0.153	0.160	0.117	0.238	0.109	-0.021	-0.278	0.001	0.339	0.435	1.000	
	p-value	0.000	0.000	0.003	0.000	0.005	0.584	0.000	0.982	0.000	0.000		
Market capitalization/GDP	V12	-0.038	0.034	-0.145	-0.109	-0.109	-0.136	-0.303	0.115	0.355	0.450	0.510	1.000
	p-value	0.331	0.379	0.000	0.005	0.005	0.001	0.000	0.003	0.000	0.000	0.000	

Online Appendix B. Robustness Tests

Results from our robustness tests. The model specification follows that of the baseline model of equation (1). For brevity, we only report estimates on *CLI*, the number of observations, and the estimated R-squared. In row (1), we use an alternative near-ZL measure, *ZL (book leverage<2.5%)*, a dummy variable equal to one if a firm has total debt to total assets below 2.5%, and zero otherwise. In rows (2), (3), and (4), we use alternative 3-digit SIC, 6-digit GICS (i.e., GICS industry), and 4-digit GICS (i.e., GICS group) industry classifications for constructing industry fixed effects. In row (5), we control for economic region-year interacted fixed effects; countries are divided into five economic regions, namely Africa, Americas, Asia, Europe, and Oceania. In row (6), we control for economic industry-region-year interacted fixed effects. In rows (7), (8), and (9), we alternatively double-cluster standard errors at the country and year levels, the firm and year levels, and the country-industry and year levels, respectively. In row (9), we further control for earnings volatility (*ROA* σ), estimated as the standard deviation of *ROA* using quarterly data over the past 3 years (a 12-quarter window; we require at least 3 quarterly observations for the estimation). In row (10), our sample consists of non-U.S. firms only. In row (11), we exclude firm-year observations for which there have been no changes in *CLI* over the entire sample period. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

		CLI		
Row	Description	Coef.	Observations	R-squared
1	*ZL (book leverage<2.5%)*	0.042***	169,571	0.655
		(4.021)		
2	3-digit SIC industry	0.038**	169,571	0.626
		(2.454)		
3	6-digit GICS, i.e., GICS industry	0.037***	169,571	0.617
		(2.739)		
4	4-digit GICS, i.e., GICS group	0.036**	169,571	0.613
		(2.506)		
5	Controlling for *Region* × *Year FE*	0.044***	169,571	0.615
		(2.864)		
6	Controlling for *Industry* × *Region* × *Year FE*	0.041**	169,571	0.620
		(2.623)		
7	Double-clustered by country and year	0.036**	169,571	0.615
		(2.207)		
8	Double-clustered by firm and year	0.036***	169,571	0.615
		(2.535)		
9	Double-clustered by country-industry and year	0.036***	169,571	0.615
		(2.511)		
10	Dropping USA	0.034**	78,881	0.681
		(2.386)		
11	Exclude obs. with no changes in *CLI*	0.036**	169,102	0.614
		(2.553)		

Online Appendix C. The Inclusion Criterion

In this online appendix, we test the inclusion criterion of the competition law index (CLI), i.e., we examine whether increases in the index (more stringent competition laws) raise the degree of market competition firms face. While Ding et al. (2022) have shown that the CLI significantly reduces industry concentration, we perform additional tests on our international sample for more credence.

Specifically, we aggregate our sample to the industry-country-year level and construct two measures of competition. The first is a 3-digit SIC industry sales Herfindahl–Hirschman index of industry concentration, and the second is the number of firms in each industry-country-year; we log-transform both measures due to high skewness. The rationale is that more competitive markets should have a lower industry sales concentration and a higher number of competing firms within an industry. We regress the two industry competition measures on the one-year-lagged *CLI*, firm and country characteristics, and country and year fixed effects. The results are reported in Table C.1 (see the next page).

As shown in columns 1 and 5, when only industry, country, and year fixed effects are included, we find that competition laws significantly reduce industry concentration and raise the number of firms in an industry-country pair. In columns 2, 3, 6, and 7, the results continue to hold after including the aggregated firm and country characteristics in the models. Finally, in columns 4 and 8, we further include industry-year interacted fixed effects to sweep out all industry-specific time trends, finding that our results are intact.

Overall, our findings suggest that competition laws intensify the degree of competition firms face, consistent with the inclusion criterion.

TABLE C.1
Competition Laws and Industry Competition

The analysis is performed at the industry-country-year level. The industry classification is the 3-digit SIC industry classification. The dependent variable is the log of industry sales Herfindahl–Hirschman index (*ln(HHI)*) and log number of firms in a given industry-country-year bin. The main independent variable of interest is one-year lagged *CLI*. Our lagged baseline firm control variables (aggregated to the industry-country-year level) and country control variables are included in the models. *t*-statistics based on country-clustered robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ln(HHI)				*ln(# of firms)*			
	1	2	3	4	5	6	7	8
CLI	-0.245***	-0.243***	-0.159**	-0.144**	0.467**	0.467***	0.268**	0.250***
	(-2.683)	(-2.780)	(-2.646)	(-2.543)	(2.659)	(2.755)	(2.580)	(2.759)
ln(Size)		0.031***	0.030***	0.029***		-0.027	-0.023	-0.018
		(3.854)	(4.085)	(3.994)		(-1.313)	(-1.297)	(-1.176)
Market-to-book ratio		0.007	0.005	0.003		-0.003	-0.001	-0.000
		(0.760)	(0.572)	(0.266)		(-0.258)	(-0.042)	(-0.034)
ROA		-0.177**	-0.155**	-0.165*		0.088	0.038	0.068
		(-2.664)	(-2.171)	(-1.784)		(0.684)	(0.262)	(0.470)
Asset tangibility		-0.227***	-0.224***	-0.248***		0.220**	0.217**	0.244**
		(-3.841)	(-3.802)	(-3.845)		(2.517)	(2.503)	(2.500)
Div/TA		-0.233	-0.239	-0.234		0.077	0.076	0.206
		(-0.672)	(-0.720)	(-0.629)		(0.155)	(0.161)	(0.394)
R&D/Sale		0.065	0.060	0.016		0.025	0.036	0.099*
		(1.329)	(1.270)	(0.316)		(0.375)	(0.563)	(1.738)
Capx/TA		-0.029	-0.046	0.021		0.275	0.298	0.218
		(-0.233)	(-0.375)	(0.203)		(1.334)	(1.499)	(1.450)
Cash/TA		-0.069	-0.060	-0.053		0.169*	0.151	0.157
		(-1.363)	(-1.227)	(-1.016)		(1.759)	(1.619)	(1.443)
Taxes/TA		0.275	0.262	0.315		-0.686	-0.678	-0.847
		(0.948)	(0.947)	(0.878)		(-1.488)	(-1.560)	(-1.569)
Non-debt tax shield/TA		0.424	0.471	0.451		-0.186	-0.278	-0.241
		(1.299)	(1.469)	(1.456)		(-0.481)	(-0.733)	(-0.521)
ΔCPI			0.665	0.506			-0.914	-0.785
			(1.442)	(1.304)			(-1.315)	(-1.275)
ΔGDP			0.552**	0.363**			-0.946**	-0.767**
			(2.469)	(2.018)			(-2.368)	(-2.507)
ln(GDP per capita)			-0.442**	-0.370**			0.860***	0.767***
			(-2.509)	(-2.186)			(3.229)	(3.134)
Private credit/GDP			0.058	0.027			-0.181**	-0.143*
			(1.084)	(0.538)			(-2.315)	(-1.852)
Stocks traded/GDP			0.082***	0.058**			-0.187***	-0.158**
			(2.957)	(2.075)			(-3.338)	(-2.510)
Market capitalization/GDP			-0.023	-0.020			0.070	0.058
			(-0.525)	(-0.521)			(0.939)	(0.940)
Industry FE	Yes	Yes	Yes		Yes	Yes	Yes	
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes		Yes	Yes	Yes	
Industry × Year FE				Yes				Yes
Observations	30,421	30,421	30,421	30,421	30,421	30,421	30,421	30,421
R-squared	0.451	0.457	0.459	0.534	0.583	0.585	0.590	0.641

Online Appendix D. Pre-Existing ZL and Competition Laws

In this online appendix, we test for the reverse causality concern by examining whether firms' pre-existing ZL policies predict the CLI. To this end, we aggregate our firm-level data to the country-year level and regress *CLI* on one- and two-year lagged average "realized" *ZL*, country-average firm controls, country controls, and country and year fixed effects. To better capture firms' *intention* to use *ZL*, we estimate a full-sample probit model of *ZL* on the firm controls, and country, industry, and year fixed effects, and we fit firms' expected probability to move to ZL (*E(ZL)*). Our results show that lagged realized or expected *ZL* cannot predict future changes in competition laws, suggesting that this concern is unlikely to be severe (see Table D.1 on the next page).

Note that this analysis has two caveats. First, although the lagged expected probability of ZL does not predict competition laws, the reverse-causality concern is not fully addressed because we cannot observe all variables affecting firms' intention to use ZL. Second, a few firm and country variables, i.e., cash holdings, CPI growth, log GDP per capita, and ratio of market capitalization to GDP, are significant in predicting competition laws, indicating that the CLI is not fully exogenous to firm or macroeconomic conditions. While this motivates us to control for these variables in our analysis throughout, our estimation is still subject to potential endogeneity arising due to unobserved or omitted variables.

TABLE D.1
Pre-Existing ZL and Competition Laws

The analysis is performed at the country-year level. The dependent variable is *CLI*. ZL_{t-1} and ZL_{t-2} are the one-year- and two-year-lagged average *ZL* for a given country-year bin. To better capture firms' *intention* to use *ZL*, we estimate a full-sample probit model of *ZL* on our baseline lagged firm controls and country, industry, and year fixed effects. We then fit firms' expected probability to move to ZL ($E(ZL)$). $E(ZL)_{t-1}$ and $E(ZL)_{t-2}$ are the one-year- and two-year-lagged average $E(ZL)$ for a given country-year bin. *t*-statistics based on country-clustered robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	CLI	
	1	2
ZL_{t-1}	0.129	
	(0.815)	
ZL_{t-2}	-0.194	
	(-1.261)	
$E(ZL)_{t-1}$		-0.167
		(-1.235)
$E(ZL)_{t-2}$		0.064
		(0.722)
ln(Size)	-0.020	-0.020
	(-0.900)	(-0.928)
Market-to-book ratio	-0.000	-0.000
	(-0.172)	(-0.135)
ROA	0.066	0.074
	(0.854)	(0.853)
Asset tangibility	0.301	0.309
	(0.754)	(0.760)
Div/TA	0.033	0.040
	(0.463)	(0.543)
R&D/Sale	-0.006	-0.007
	(-1.379)	(-1.410)
Capx/TA	-0.325	-0.313
	(-0.835)	(-0.809)
Cash/TA	-0.963**	-0.979**
	(-2.255)	(-2.426)
Taxes/TA	1.901	2.009
	(0.983)	(1.163)
Non-debt tax shield/TA	-0.604	-0.578
	(-0.769)	(-0.767)
CPI growth	0.497**	0.512**
	(2.060)	(2.014)
GDP growth	-0.523	-0.520
	(-1.196)	(-1.164)
ln(GDP per capita)	0.514*	0.512*
	(1.964)	(1.989)
Private credit/GDP	-0.032	-0.033
	(-0.378)	(-0.395)
Stocks traded/GDP	-0.017	-0.015
	(-0.649)	(-0.562)
Market capitalization/GDP	0.079**	0.078**
	(2.084)	(2.042)
Country FE	Yes	Yes

Year FE	Yes	Yes
Observations	499	499
R-squared	0.874	0.874

Online Appendix E. Additional Tests Based on Change-On-Change Regressions

In this online appendix, we estimate alternative regressions in changes. Specifically, we estimate the following change-in-change regression that replaces all variables in the baseline model with their yearly changes:

$$\Delta ZL_{ijt} = \beta_1 \Delta CLI_{jt} + \delta \cdot \Delta X_{ijt-1} + \gamma \cdot \Delta V_{jt-1} + Industry \times Year\ FE + \varepsilon_{ijt}, \quad \text{(E.1)}$$

where Δ is a first-difference operator. ΔCLI_{jt} is the yearly change in *CLI* from year $t-1$ to year t. ΔX_{it-1} and ΔV_{jt-1} are vectors containing the yearly changes in the lagged firm and country control variables, respectively. Industry-year interacted fixed effects are included; standard errors are clustered at the country level.

The estimation results of equation (E.1) are reported in Table E.1. As column 1 shows, the estimate on ΔCLI is 0.038 and significant at the 1% level, which is similar in both magnitude and significance to those of the baseline test results.

To account for the possibility that the effect of CLI on firms' ZL is non-linear, we replace the continuous ΔCLI with ΔCLI_{Dummy}, the latter being a categorical variable that takes on a value of 1 if there is an increase in *CLI*, a value of -1 if there is a decrease in *CLI*, and 0 for no change. As column 2 shows, the estimate on ΔCLI_{Dummy} is 0.013 and remains significant at the 1% level. In column 3, we further include firm fixed effects in the model to eliminate all between-firm heterogeneities, again finding that the positive estimate on ΔCLI_{Dummy} remains similar in size and significance.

A related question is whether firms' zero-leverage policies respond differently to increases and decreases in competition, i.e., there is an asymmetry. Behavioral economics theories suggest that people tend to care more about downside losses and risks than about upside gains (Kahneman and Tversky, 1979; Gul, 1991; Ang et al., 2006). Since competition is expected to make the

business environment riskier, firms may respond more to increases in competition (and be more inclined to use ZL) than to decreases in competition. To test this conjecture, we decompose ΔCLI_{Dummy} into a positive and negative component: $+ve\ \Delta CLI_{Dummy}$ ($-ve\ \Delta CLI_{Dummy}$) is a dummy variable that takes on the value of 1 (-1) if there is an increase (decrease) in *Competition law index*, and zero otherwise. As shown in column 4, the estimates on $+ve\ \Delta CLI_{Dummy}$ and $-ve\ \Delta CLI_{Dummy}$ are 0.009 and 0.017, both significant at the 1% level.[1] The Wald test of coefficient equality shows that the two estimates are not significantly different from each other (*p*-value = 0.177).

In column 5, we test the reverse causality concern by including two leading changes in the competition law index into equation (E.1): $\Delta CLI_{Dummy}^{at\ t\ =\ +2}$ ($\Delta CLI_{Dummy}^{at\ t\ =\ +1}$) takes on a value of 1 if there is an increase in *CLI* two years (one year) later, a value of -1 if there is a decrease in *CLI* two years (one year) later, and 0 if there is no change in *CLI* two years (one year) later. If our results are subject to reverse causality as firms may actively lobby for or against competition laws, firms' ZL policies may be affected even prior to the actual changes in competition laws. Reassuringly, in column 5, we find that the estimates on $\Delta CLI_{Dummy}^{at\ t\ =\ +2}$ and $\Delta CLI_{Dummy}^{at\ t\ =\ +1}$ are small and insignificant. Importantly, the positive estimate on ΔCLI_{Dummy} remains similar in size and significant at the 1% level, thus ruling out the reverse causality concern.

[1] The negative and significant estimate on $-ve\ \Delta CLI_{Dummy}$ is indicative of a positive relation between changes in *CLI* and changes in *ZL*.

TABLE E.1
Change-On-Change Regressions

The dependent variable is yearly changes in *ZL*. ΔCLI_{Dummy} is a categorical variable that takes a value of 1 if there is an increase in *CLI* from the previous year to the current year, a value of -1 if there is a decrease from the previous to the current year, and 0 for no change. $+ve\,\Delta CLI_{Dummy}$ ($-ve\,\Delta CLI_{Dummy}$) is a decomposed version of ΔCLI_{Dummy} that takes on the value of 1 (-1) if there is an increase (decrease) from the previous year to the current year, and zero otherwise. $\Delta CLI_{Dummy}^{at\ t=+2}$ ($\Delta CLI_{Dummy}^{at\ t=+1}$) is a categorical variable that takes on the value of 1 if there is an increase in *CLI* two years (one year) later, a value of -1 if there is a decrease two years (one year) later, and 0 if there is no change two years (one year) later. Yearly changes in our lagged baseline firm- and country-level control variables are included. *t*-statistics based on country-clustered robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ZL				
	1	2	3	4	5
ΔCLI	0.038***				
	(2.832)				
$\Delta CLI_{Dummy}^{at\ t=+2}$					0.002
					(1.310)
$\Delta CLI_{Dummy}^{at\ t=+1}$					-0.001
					(-0.650)
ΔCLI_{Dummy}		0.013***	0.014***		0.009***
		(3.897)	(4.271)		(3.817)
$+ve\,\Delta CLI_{Dummy}$ (a)				0.009***	
				(3.033)	
$-ve\,\Delta CLI_{Dummy}$ (b)				0.017***	
				(3.304)	
H_0: (a) = (b), *p*-value				[0.177]	
ΔFirm controls	Yes	Yes	Yes	Yes	Yes
ΔCountry controls	Yes	Yes	Yes	Yes	Yes
Firm FE			Yes		
Industry × Year FE	Yes	Yes	Yes	Yes	Yes
Observations	139,187	139,187	139,187	139,187	120,421
R-squared	0.008	0.008	0.105	0.008	0.009

Online Appendix F. Alternative Stacked and Matching Approaches

In this online appendix, we adopt alternative 'stacked' and matching estimation approaches to address potential bias in staggered DiD models and to improve covariate balance.

Since the CLI changes in a staggered fashion across countries and over time, one may view our baseline model of equation (1) as a staggered DiD model with a continuous treatment assignment variable (Atanasov and Black, 2016). Recent studies (e.g., Goodman-Bacon, 2021; Baker et al., 2022) show that if the treatment effect is heterogeneous across groups and time periods, a staggered DiD model may give misleading estimates. The reason is that the staggered DiD estimate is a weighted average of treatment effects across groups and time periods; negative effects may arise as control groups used in one period are treated in another period, thus biasing the estimate of the average treatment effect (De Chaisemartin and D'Haultfœuille, 2020).

To alleviate this concern, following Gormley and Matsa (2011), we adopt a 'stacked' estimation approach. For each firm-year with a change in the CLI, we retain all observations in the three years before and after the event year (at least one available observation in the event year and each of the pre- and post-event periods), remove potential control firms that have already experienced or will experience a law change within the 7-year window, and obtain a subsample ('cohort') for each event year consisting of the treated firms and *clean* 'control' firms. We stack the cohorts into a panel and estimate the baseline DiD on it. As Panel A of Table F.1 shows, our results hold under the stacked approach.

To improve the counterfactual outcomes of the control firms, in each cohort at the beginning of the event year, we match each treated firm with a 'clean' control firm in the same economic region, with the closest propensity score estimated from a full-sample logit model.[2] We

[2] There are five economic regions: Africa, Americas, Asia, Europe, and Oceania. The absolute difference in propensity score cannot exceed 1%.

then stack the matched cohorts into a panel (in total 2,120 matched pairs of firms) and estimate the baseline test.

In Panel B of Table F.1, we compare the means of *ZL* (in level and changes) and of the baseline firm and country characteristics for the treated and matched "clean" control firms in the pre-treatment year. Not only are the differences in mean insignificant, but their standardized differences are all small, indicating that the matching procedure performs well in removing differences in covariates between the two groups of firms.

In Panel C, we report the estimation results of baseline models estimated on the stacked matched sample. The firm and industry-year fixed effects are interacted with the cohort dummy variables. In all three columns, *CLI* enters the model positively and significantly (at the 10% level or higher), with estimates ranging between 0.029 and 0.045, consistent with our baseline results.

TABLE F.1
Alternative Stacked and Matching Approaches

In Panel A, in each year *t* in which the *CLI* changes in at least one country, we retain all firm-year observations for the 3 years before and 3 years after the event year (all firms must have an observation for the event year and at least one observation before and after the event year). We then remove all control firms (firms in countries without a law index change) that have already experienced or will experience a change in the index within the 7-year event window. This procedure yields a 7-year subsample for each year with some law index changes, i.e., a "cohort," consisting of all treated firms and clean "control" firms. We stack the firm-year observations across the cohort subsamples, estimate our baseline tests on the stacked sample, and report these results in Panel A. Panels B and C report results using the matching approach. We estimate a full-sample logit regression modelling the likelihood that firms receive a change in the law index as a function of the lagged baseline firm and country controls as well as industry and year fixed effects. Using the estimated propensity scores, we match each firm receiving a law index change with the "clean" control firm within the same economic region (Africa, Americas, Asia, Europe, or Oceania) that has the closest propensity score during the event year. The absolute difference in propensity score cannot exceed 1%. We retain observations for the 3 years before and after the event year for the matched pairs, stack the firm-year observations across the cohort subsamples, and perform baseline tests on the stacked matched sample. Panel B reports the differences in mean in lagged *ZL* (in level and changes), and in the baseline firm and country control variables, between the treated and matched "clean" control firms during the pretreatment year, along with their respective two-sample *t*-statistics and standardized differences. Panel C reports estimation results from the baseline DiD tests estimated on the stacked matched sample. All models include firm-cohort and industry-year-cohort interacted fixed effects. *t*-statistics based on robust standard errors clustered at the country level are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Stacked Approach

	ZL		
	1	2	3
CLI	0.027***	0.032***	0.041***
	(3.689)	(3.876)	(3.070)
Firm controls		Yes	Yes
Country controls			Yes
Firm × Cohort FE	Yes	Yes	Yes
Industry × Year × Cohort FE	Yes	Yes	Yes
Observations	508,625	508,625	508,625
R-squared	0.699	0.703	0.703

Panel B. Differences in Firm and Country Characteristics Prior to Treatment

	Treated	Control	T - C	*t*-statistics	Standardized differences
ΔZL_{t-1}	0.005	0.006	-0.001	-0.144	-0.005
ZL_{t-1}	0.083	0.100	-0.018	-1.082	-0.061
ln(Size)	4.999	4.643	0.356	1.113	0.189
Market-to-book ratio	1.016	0.991	0.024	0.162	0.019
ROA	0.099	0.098	0.001	0.068	0.007
Asset tangibility	0.371	0.351	0.020	0.795	0.087
Div/TA	0.021	0.021	0.000	-0.027	-0.004
R&D/Sale	0.028	0.027	0.001	0.047	0.003
Capx/TA	0.058	0.058	0.000	0.093	0.005
Cash/TA	0.135	0.136	-0.001	-0.136	-0.010
Tax/TA	0.019	0.018	0.001	0.424	0.044
Non-debt tax shield/TA	0.039	0.039	0.000	0.068	0.008
ΔCPI	0.030	0.029	0.001	0.156	0.040
ΔGDP	0.039	0.032	0.008	0.486	0.167
ln(GDP per capita)	9.386	9.469	-0.083	-0.199	-0.066
Private credit/GDP	1.056	1.029	0.027	0.308	0.077
Stocks traded/GDP	0.607	0.560	0.047	0.367	0.104
Market capitalization/GDP	0.794	0.857	-0.063	-0.349	-0.128

Panel C. Matched DiD Estimates

	ZL		
	1	2	3
CLI	0.043*	0.045***	0.029**
	(2.111)	(3.223)	(2.102)
Firm controls		Yes	Yes
Country controls			Yes
Firm × Cohort FE	Yes	Yes	Yes
Industry × Year × Cohort FE	Yes	Yes	Yes
Observations	19,958	19,958	19,958
R-squared	0.751	0.755	0.756

Online Appendix G. Alternative Explanation: Mergers & Acquisitions Incentives

An alternative explanation for our results is that the effect of competition laws on ZL is through the effect on firms' M&A incentives as opposed to through changes in competition. Prior studies show that managers consider deviations from target capital structure when making or planning acquisitions; over-levered (under-levered) firms are less (more) likely to make acquisitions and finance their M&As with debt (e.g., Harford et al. (2009) and Uysal (2011)). Increased merger control induced by competition laws might discourage firms from engaging in M&As, many of which would have been funded by debt. In this case, firms would borrow less than before and remain under-levered for longer, which could explain our results.

To rule this alternative explanation out, we perform two tests. First, since changes to acquisition incentives mostly affect firms that are planning to make future acquisitions, we exclude firms with acquisitive activities in year *t* or over a 3-year period from years *t* to *t* + 2, finding that our results are unaffected. Second, we examine whether the ZL status depends on firms' propensity to acquire. The alternative view predicts that our results are concentrated on firms with a higher propensity to acquire.

Following prior studies (Schlingemann et al. (2002) and Uysal (2011)), we measure firms' propensity to acquire by the liquidity of the market for corporate assets (*Industry M&A liquidity*), defined as the sum of deal values across all M&A deals, divided by the sum of total assets across all firms in each country-industry-year bin. Firms in industries with a larger volume of M&A transactions are more likely to be acquirers. A second proxy we consider is a dummy variable equal to one if a firm is an 'expected acquirer' based on a statistical model, and zero otherwise (Palepu (1986) and Harford (1999)).[3]

[3] To estimate the expected probability to acquire, we first estimate a probit model for whether a firm is an acquirer in year *t* as a function of the baseline firm controls, *Industry M&A liquidity*, industry sales concentration, and country,

The results are reported in Table G.1. They show that the relation between ZL and competition does not depend on firms' propensity to acquire, and that it remains robust among firms with a lower propensity to acquire. Overall, our results do not support the alternative explanation for why regulatory control of takeovers might result in preference for ZL.

industry, and year fixed effects, and we obtain the expected probability. We then construct intervals in increments of 0.01 from 0 to the maximum expected probability and calculate the percentages of acquirers and non-acquirers for each interval, resulting in two distributions of acquirer and non-acquirer percentages between zero and the maximum expected probability. The crossover point of the two distributions is defined as the cutoff point for expected acquirers, which is 0.11. Firms having a larger expected probability than the cutoff point are defined as 'expected acquirers.'

TABLE G.1
Alternative Explanation: Mergers & Acquisitions Incentives

M&A data are collected from the SDC platinum database. In Panel A, we estimate baseline models excluding observations for all acquiring firms in year *t* (column 1) and between year *t* and year *t* + 2 (column 2). In Panel B, we examine whether the propensity to acquire determines the relation between competition and firms' ZL policies. *Industry M&A liquidity* captures the liquidity of the M&A market within a country, 3-digit SIC industry, and year, computed as the sum of total deal value of all M&As within a country-industry-year bin, divided by the sum of total assets within the same bin. *Expected acquirer* is a dummy variable equal to one if a firm is an expected acquirer based on its expected probability to acquire, and zero otherwise. To estimate the expected probability to acquire, we first estimate a probit model for whether a firm is an acquirer in year *t* as a function of the baseline firm controls, *Industry M&A liquidity*, industry sales concentration, and country, industry, and year fixed effects, and we obtain the expected probability. We then construct intervals in increments of 0.01 from 0 to the maximum expected probability and calculate the percentages of acquirers and non-acquirers for each interval, resulting in two distributions of acquirer and non-acquirer percentages between zero and the maximum expected probability. The crossover point of the two distributions is defined as the cutoff point for expected acquirers, which is 0.11. Firms having a larger expected probability than the cutoff point are defined as expected acquirers. In both panels, all other variables and fixed effects are identical to those in the baseline model of Table 3 of the main paper. *t*-statistics based on country-clustered robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Excluding Acquiring Firms

	ZL	
	Excluding firms with acquisition(s) during year…	
	t	*t* to *t* + 2
	1	2
CLI	0.037**	0.032**
	(2.484)	(2.023)
Firm controls	Yes	Yes
Country controls	Yes	Yes
Firm FE	Yes	Yes
Industry × Year FE	Yes	Yes
Observations	152,283	116,638
R-squared	0.627	0.648

Panel B. Competition, Propensity to Acquire, and ZL

	ZL	
	1	2
CLI	0.035**	0.035***
	(2.465)	(3.026)
Industry M&A liquidity	-0.061	
	(-0.716)	
CLI × *Industry M&A liquidity*	0.043	
	(0.381)	
Expected acquirer		-0.012
		(-0.803)
CLI × *Expected acquirer*		0.036
		(1.606)
Firm controls	Yes	Yes
Country controls	Yes	Yes
Firm FE	Yes	Yes
Industry × Year FE	Yes	Yes
Observations	169,429	123,062
R-squared	0.614	0.639

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