To be or not to be debt-free, which is the optimal answer for a better firm performance?

Flávio Morais*, Assistant Professor in Management, Department of Management and Economics & Center for Advanced Studies in Management and Economics of the UBI (CEFAGE-UBI) & Research Center in Business Sciences (NECE-UBI), University of Beira Interior (UBI), Portugal, flavio.morais@ubi.pt
Estrada do Sineiro, Polo IV 6200-209 Covilhã, Portugal
ORCID: https://orcid.org/0000-0002-3808-5017

Zélia Serrasqueiro, Full Professor in Management, Department of Management and Economics & Center for Advanced Studies in Management and Economics of the UBI (CEFAGE-UBI), University of Beira Interior (UBI), Portugal, zelia@ubi.pt
Estrada do Sineiro, Polo IV 6200-209 Covilhã, Portugal
ORCID: https://orcid.org/0000-0003-1761-5426

Joaquim J.S. Ramalho, Full Professor in Economics, Department of Economics & Business Research Unit (BRU-IUL), Instituto Universitário de Lisboa (ISCTE-IUL), Portugal, jjsro@iscte-iul.pt
Avenida das Forças Armadas, 1649-026 Lisboa, Portugal.
ORCID: https://orcid.org/0000-0003-3533-2411

*corresponding author

To be or not to be debt-free, which is the optimal answer for a better firm performance?

Abstract

This paper examines the effect of zero-leverage policies on firm's financial performance. Using a sample of European listed firms for the 2002-2020 period and dynamic panel data regression models, we find that zero-leverage policies increase firm's performance of both financially unconstrained and constrained firms. During the 2008 global financial crisis the positive effect of zero-debt policies became even stronger for the former group, remaining similar for the latter. The positive effect of zero leverage on firm's long-term (short-term) performance was predicted to be 1.7 (4.7) percentage points (pp) when considering the whole period analysed and 11.2 (16.5) pp during the 2008 crisis.

Keywords: Zero leverage; Firm's performance; Financial crisis; Financial constraints; Dynamic panel data

JEL classification: G32

1. Introduction

Research about capital structure decisions and firm's performance remains on the daily agenda of the scientific community (Botta and Colombo, 2022; Huang, 2021). However, the answer to the question of how financing decisions impact firm's financial performance continue as one of the most puzzling questions faced by finance researchers and financial managers (Le and Phan, 2017; Sánchez-Vidal et al., 2020). Theoretical foundations about the effect of capital structure on firm's performance start with the irrelevance paradigm of Modigliani and Miller (1958), which under the assumption of a perfect capital market show that the debt-equity mix does not influence firm's value. However, in a real-world context debt brings tax shields (Modigliani and Miller, 1963) and, if held at a (too) high level, financial distress and bankruptcy costs (Kraus and Litzenberger, 1973), implying, as argued by the trade-off theory, the existence of an optimal debt level that maximizes the firm's value. Moreover, as claimed by the agency theory (Jensen and Meckling, 1976; Jensen, 1986), managers are self-interested and do not always act to maximize shareholders

wealth, which means that another benefit of debt is its contribution to reduce the so-called principal-agent problems. Finally, because debt issuance generates lower information costs than issuing equity, debt financing is expected to have a lower cost than equity, and hence the pecking order theory (Myers, 1984; Myers and Majluf, 1984) postulates firm's preference for financing through debt over equity. Therefore, all classical capital structure theories argue that, until a sustainable level, debt rises firm performance.

Despite the theoretical benefits of debt to firm's performance, during the last decade researchers have noted that a growing number of firms does not hold any amount of debt. Strebulaev and Yang (2013) and D'Mello and Gruskin (2014) found that almost 20% of US listed firms were debt-free in the beginning of the 2010s. Devos et al. (2012), Bessler et al. (2013), Ghoul et al. (2018) and Saona et al. (2020) showed that this so-called mystery of zero-leverage firms is a persistent and global phenomenon, with firms from of all over the world remaining debt free for several years. Since this zero-leverage phenomenon cannot be accommodated by classical capital structure theories, new explanations for that behavior emerged. According to the most popular zero-leverage theories, for some firms zero leverage is mainly the consequence of financial constraints, i.e. creditors do not wish to grant credit to the firm (Bessler et al., 2013). For others, zero leverage is the result of their own financial decisions, i.e. firms deliberately opt for zero-debt policies to build up financial flexibility and preserve borrowing capacity (Morais et al., 2020). Notwithstanding the considerable advances done in the last decade to understand zero-leverage firms' motivations (Dang, 2013; Haddad and Lotfaliei, 2019; Huang et al., 2017; Ramalho et al., 2009; Ramalho et al., 2018), little is known about the effect of such a conservative policy on firm's financial performance. There are some studies focusing on the long-run stock performance of zero-leverage firms (Lee and Moon, 2011; Moon et al., 2015), but they do not examine the role of zero-debt policies as a determinant of firm's financial performance, namely its profitability. More recently, for a sample of financial conservative African firms, Chipeta et al. (2021) show that firms facing financial constraints have lower stock market valuation and profitability relative to their unconstrained counterparts.

Firms that are debt-free due to creditors imposition may be forced to bypass good investment opportunities, which may negatively affect their financial performance. On the contrary, firms that opt for zero leverage due to its own decision hold the real option to lever up in the future when good investment opportunities arise, which suggests that they do not lose value by remaining debt-free for some time. Actually, it may even contribute for a superior financial performance during crises and negative macroeconomic shocks, since these firms may use their financial slack to invest or their borrowing capacity to access debt (to invest or simply to survive) at favourable conditions. In contrast, during crisis periods the costs of external financing tends to raise substantially for firms already highly dependent on bank debt, increasing their financial distress and bankruptcy risk. See Arslan-Ayaidin et al. (2014) for some empirical evidence on the better performance of financially flexible firms during macroeconomic shocks.

The literature about the role played by zero-leverage policies as a determinant of firm's financial performance, if any, is largely silent. In order to fill this gap, this study focuses on the following research question: 1) *Does zero-leverage firms perfom better than their leveraged counterparts?* We conjecture that the impact of zero leverage on firm's financial performance may be particularly relevant during macroeconomic shocks, which justifies our second research question: *2) Does the effect of zero leverage on firm's performance become more important during crisis periods?* Finally, as some zero-leverage firms adopt this financing policy by their own decision and others by creditor's imposition, it is important to examine whether the potential superior performance of zero-leverage firms is restricted to the former group. Thus, the third research question is the following: *3) Is the effect of zero-leverage policies on firm's performance similar across financially constrained and unconstrained zero-leverage firms?*

To answer these questions and provide empirical evidence about the effects of zero leverage policies on firm's performance, we use an unbalanced panel of 5,144 listed firms from 14 European countries for the 2002-2020 period. The impact of zero-leverage policies on firm's performance is estimated using dynamic panel data methods, namely the system GMM estimator (Blundell and Bond, 1998), which accounts for firm's performance dynamics, unobservable

individual heterogeneity, endogeneity and reverse causality concerns. We use Tobin's Q as a measure of firm's market valuation and Return on Assets as a measure of firm's profitability, with each one serving as a proxy for, respectively, long- and short-term firm's financial performance. As macroeconomic shock, we consider the 2008 financial crisis, which is covered in full by our sample, and to decide if a firm should be classified as being financially constrained or unconstrained, we consider the *WW-index* (Whited and Wu, 2006). For robustness, we also consider the *SA-index* (Hadlock and Pierce, 2010) for defining financially constrained firms, use alternative definitions of financial conservatism and employ propensity score (PS) methods, which account for sample selection effects and allow a direct comparison of the performance of zero-leverage and leveraged firms.

Our paper makes several contributions to the financial literature. First of all, we show that zero-debt financing policies increase firm's performance, which implies that current theories of capital structure are not enough to explain the relationship between debt and performance. Second, we show that the positive effects of those policies are valid for both financially unconstrained and constrained firms and for both crisis and non-crisis periods. Third, we find that the positive impact of zero-leverage policies on firm's performance was boosted during the 2008 global crisis period for financially unconstrained zero-leverage firms. Actually, while the performance of leveraged firms deteriorated significantly during the crisis, most of our estimated models suggest that the same did not happen with debt-free firms, which managed to keep a similar market performance and a significant better short-term performance. Overall, our results suggest that the better financial performance of zero-leverage firms may be a possible reason for firms adopting such an extremely conservative financial policy.

The remainder of the paper is organised as follows. Section 2 briefly reviews the empirical literature relating capital structure and firm's financial performance and formulate some empirical hypotheses. Section 3 describes the data, variables and the applied methodology. Section 4 presents and discusses the main results of the paper. Finally, section 5 concludes.

2. Capital structure and financial performance: evidence and hypotheses

2.1 Empirical evidence on the effect of capital structure on financial performance

Corporate finance researchers have intensively studied how financing decisions impact firm's performance, discussing their results at the light of existing theories. As discussed in the introductory section, classical capital structure theories defend a positive effect of debt on firm performance due to tax shields, reduction of principal-agent problems and/or lower issuance costs. This conjecture is also supported by several empirical studies. Particularly, Berger and di Patti (2006), using data on US banking industry, find that a higher debt ratio is associated with a higher performance, even for high levels of debt. In another influential study, Margaritis and Psillaki (2007) found the same impact of leverage on firm's performance for their sample of New Zealand firms. Using a sample of German non-financial listed firms, Abdullah and Tursoy (2019) found that a 1 percentage point (pp) increase in total debt ratio leads to an increase in return on assets (ROA) of approximately 3.6pp. A number of other studies using samples of firms from a series of other developed or developing economies empirically show that debt has a positive impact on firm's performance (e.g. Davydov, 2016; Fosu, 2013; Jouida, 2018; Kyereboah-Coleman, 2007).

Beyond benefits, debt can also bring costs. Financial distress and bankruptcy costs increase with leverage (Kraus and Litzenberger, 1973), being more relevant for higher debt levels, where the mentioned costs increase more rapidly than the tax benefit of debt. Furthermore, while at a low level of leverage an increase in debt reduces agency conflicts between shareholders and managers, at higher levels it can cause agency conflicts between shareholders and creditors, which may prevent the firm to invest in projects with positive net present value (NPV), originating the so-called underinvestment problem (Jensen and Meckling, 1976; Myers, 1977). Thus, a negative effect of debt on firm profitability can be also explained by theory and in fact was observed in several empirical studies (e.g. Dawar, 2014; Le and Phan, 2017; Vithessonthi and Tongurai, 2015; Vo and Ellis, 2017), making difficult to reach consensus on the effect of debt on firm performance.

In order to accommodate both the negative and positive effects of debt on firm performance predicted by theory, Margaritis and Psillaki (2010) specify a regression model including both the debt ratio and its square as explanatory variables. However, using a sample of French firms, they found that leverage has a positive impact on firm's performance over the entire relevant range of leverage values. From these results, and the underlying theories, we should infer that adopting a zero-leverage policy should decrease firm's performance. Next, we argue that that may not be the case and formulate some research hypotheses to be tested in the empirical part of the paper.

2.2 Research hypotheses

2.2.1 Zero leverage and firm's performance

Since classical theories of capital structure are not able to explain the zero-leverage phenomenon, new theories have been formulated to describe it. One of those theories is the financial flexibility approach, according to which firms may deliberately adopt zero-leverage policies to build up a financial slack and keep their borrowing capacity to invest when good investment opportunities arrive or to answer opportunely to unexpected changes on the firm's activity (Bessler et al., 2013; Dang, 2013). Survey evidence confirms the prominent role that financial managers attribute to financial flexibility in their decisions related to firm's capital structure (Bancel and Mittoo, 2004; Brounen et al., 2006), revealing for example that credit lines are reduced to maintain firm's debt capacity to turn to credit only when entirely necessary.

Since zero-leverage firms keep the real option to lever up in the future, Lotfaliei (2018) argues that firms do not lose value by remaining debt-free, quite the contrary. Another sign of the possible positive effect of zero leverage on firm's performance is given by studies analysing the stock returns of zero-leverage firms. For example, Zaher (2010) shows that investing in portfolios of debt-free firms tends to generate higher returns for investors and Lee and Moon (2011) and Moon et al. (2015) find that zero-leverage firms generate positive abnormal returns in the long run regardless of the level of debt capacity.

Based on these arguments, we hypothesise that, as implicitly suggested by the financial flexibility theory, firm's financial performance may be positively influenced by zero-debt policies. Hence, we formulate the following hypothesis:

H1: Zero leverage increases firm's financial performance.

2.2.2 Zero leverage and firm's performance during the 2008 global financial crisis

Economic cycles are an important determinant of both firm's financial performance and default risk (Cook and Tang, 2010), which also affects the firm's capital structure. Recessionary periods such as the 2008 global financial and economic crisis reduce consumer confidence and the levels of consumption, eventually resulting in firm's losses (Ivashina and Scharfstein, 2010) and higher financial distress levels and bankruptcy risks (Kahle and Stulz, 2013). Due to the greatest default risk and information asymmetries observed during adverse macroeconomic shocks, raising (or paying) external finance becomes more expensive (Hackbarth et al., 2006). Thus, firms that were already dependent on debt are expected to experience higher risk (Deloof and Vanacker, 2018) and to be particularly affected by the increased interest rates demanded by creditors and may be forced to forego investment opportunities, which contributes to decrease their financial performance during crisis periods.

Conversely, the performance of zero-leverage firms is expected to be less affected by macroeconomic shocks. On the one hand, even if they needed to resort to external financing during the crisis period, zero-leverage firms would start in a much better position to raise debt. On the other hand, as implied by the financial flexibility theory, the financial slack of debt-free firms may allow them to invest during recessions using only internal sources of financing. Supporting this conjecture that zero-leverage firms perform better than their leveraged counterparts during periods of macroeconomic uncertainty, Arslan-Ayaydin et al. (2014) shows that firms that created a financial slack in pre-crisis periods were less affected by crises; and Sanchéz-Vidal et al. (2020) found that financial conservatism fosters job creation during economic crises.

Overall, we think that the positive effect described in hypothesis H1 will be stronger during crisis periods. Thus, we formulate the following hypothesis:

H2: The positive effect of zero leverage on firm's financial performance was stronger during the 2008 financial crisis.

2.2.3 Zero leverage and firm's performance under financial constraints

The previous research hypotheses implicitly assume that firms are debt-free by their own choice. However, sometimes, more than a financial decision of the firm, zero leverage may be the result of an imposition of the lenders, which refuse or impose severe conditions to grant debt to the firm (Diamond, 1991; Stiglitz and Weiss, 1981). This is the main idea of the financial constraints approach, another theory that has emerged as one of the most popular explanations of zero leverage. According to this theory, in the presence of adverse selection and moral hazard problems, obtaining external finance becomes difficult for firms with little reputation or without a favourable past in the credit market, since lenders are not able to properly assess the quality of their assets (Stiglitz and Weiss, 1981). Hence, debt becomes too expensive for those firms, which may have no other choice than remaining debt-free. See *inter alia* Bessler et al. (2013), Dang (2013) and Morais et al. (2020) for some empirical evidence on the existence of financially constrained zero-leverage firms.

Unlike financially flexible firms, financially constrained firms are not expected to have a substantial financial slack. Therefore, they may be prevented to invest in projects with positive NPV and forced to bypass good investment opportunities, which will negatively impact their performance (Almeida and Campello, 2007; Chipeta et al., 2021). Thus, we conjecture that the previously hypothesized positive effect of zero leverage on firm's financial performance is not valid when the firm is debt-free due to financial constraints. Hence, we formulate the following hypothesis:

H3: Zero leverage increases the financial performance of financially unconstrained firms, but not of financially constrained firms.

3. Data and methodology

3.1 Sample

To test our hypotheses, we use as main source of information the *DataStream* database, which provides firm's annual reports and other financial and market information relevant to perform the study. Data were collected for listed firms from 14 Western European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and the UK) over the period ranging from 2002 to 2020. The European context is particularly interesting to study how extremely conservative financing policies may affect or not affect the firm's financial performance. Indeed, on the one hand, Europe has the largest banking system of the world, which results in a great dependence of non-financial firms on bank debt as primary source of external finance (European Investment Bank, 2015). On the other hand, Europe also includes some countries with highly developed and strong capital markets. In addition, some of the countries that compose our sample were highly impacted by the 2008 financial crisis, with some of them being later also affected by sovereign debt crises (European Investment Bank, 2015), with severe implications for their economic growth and availability of financing sources. Our sample covers the period of the financial crisis and includes a few years pre- and post-crisis, extending until the most recent year with available data.

Using the FTSE/Dow Jones Industry Classification Benchmark (ICB), we excluded firms with an industry code ranging from 7000 to 7999 (Utilities) or 8000 to 8999 (Financials), because those firms face different regulations that affect their capital structure decisions. Firms without an industry code have been also excluded from the sample. We also removed from the sample firm/year observations with missing information for total assets or sales, as well as observations with obvious errors (e.g. non-positive sales or assets) or missing data for any variable used in the econometric models. To be able to test for the absence of second-order serial correlation, an assumption of the method used for estimating the dynamic regression model considered in our analysis, we kept in the sample only firms with at least four consecutive years of complete data (Pindado et al., 2011). Finally, we allowed firms' entry and exit from the sample to avoid the

possible survivorship bias that could arise from considering only successful firms (Munjal et al., 2019).

Our final sample is represented by an unbalanced panel data with 55,881 firm-year observations, corresponding to 5,144 firms.[1] Table 1 presents the distribution of observations and firms and the percentage of debt-free observations by country. Approximately 60% of the observations are relative to France, Germany or UK. Between 2002 and 2020 around 10.7% of firm-year observations are classified as having zero leverage, with debt-free firms being present in all countries, although in an unbalanced way. Indeed, the percentage of zero-leverage firms ranges from 0.51% in Spain to 19.09% in Sweden. Overall, 1,433 firms had zero leverage in at least one year during the period of analysis.

Please insert table 1 about here

3.2 Variables

Table 2 provides a definition of the variables considered in our empirical analysis, namely the dependent, explanatory and control variables used in the main regression models, the categorical variable used to divide the sample in groups of financially constrained and unconstrained firms and the variables considered in the robustness tests. Following most previous studies investigating the determinants of firm's financial performance, and in order to study the effects of zero leverage on both short- and long-term performance, we consider two distinct dependent variables in our models, namely Return on Assets (*ROA*) and Tobin's *Q* (e.g. Bachmann et al., 2020; Chipeta et al., 2021; Davydov, 2016; Le and Phan, 2017; Lindemanis et al., 2020; Munjal et al., 2019). *ROA* is an accounting-based performance measure that, contrary to the also common Return on Equity (ROE), is not directly influenced by firm's leverage and hence is a better measure for firm's operational profitability when the aim is to examine the effect of debt on firm's short-term profitability. On the other hand, to investigate the effect of debt on long-term performance,

[1] Note that because some of the variables used in the right-hand side of the main models use lags, not all observations could be used in model estimation.

market-based measures appear as a more proper way to proxy for firm's performance. Tobin's *Q* is one of the mostly used proxies for firm market value, being also used in the literature as a proxy for firms' future growth opportunities and investments (Dang, 2013).

Please insert Table 2 about here

Regarding the explanatory variables, to test the effect of firm's debt policy on its performance we consider the dummy variable (*ZL*), which is equal to 1 when the firm's book leverage ratio is zero, i.e. a firm is considered to adopt a zero-leverage policy if both short- and long-term debt are equal to zero in a given year (Strebulaev and Yang, 2013). To examine the moderating role of the 2008 financial crisis on the effect of *ZL* on *Tobin's Q* and *ROA*, we use the *Crisis* dummy variable. Recognizing that this crisis in some European countries gave rise to sovereign debt crises, with their effects on economic growth, finance and investment being felt until recently (European Investment Bank, 2015), our definition of *Crisis* considers that the crisis period was extended beyond 2009 in several European countries. Therefore, following the recent classification of Laeven and Valencia (2018) about crises, we assign distinct final years for the crisis in each country (2009, 2011 or 2012 – see Table 2's note).

To examine whether the effects of zero leverage on firm's financial performance are different for financially constrained and unconstrained firms, we divide the sample into two groups of firms using as indicator of financial constraints the widely used *WW-index* (Whited and Wu, 2006).[2] This index is a composite measure of financial constraints that aggregates a comprehensive set of firm- and industry-specific characteristics, with a higher (lower) value indicating greater (smaller) financial constraints. To identify the groups of constrained and unconstrained firms, we first calculate quintiles of the cross-sectional distributions of each variable in each year, being the firm assigned to the corresponding quintile. Then, we compute the (rounded) average quintile of a firm over time and assign all its observations to this average quintile. This procedure leads to five

[2] There are several alternative measures used to separate firms that are suffering from financial constraints from those that are not, but the best measure it is still a matter of debate. In addition to the *WW-index*, in the robustness section we consider the size and age index *SA-index* (Hadlock and Pierce, 2010). These are two of the most commonly used aggregate indexes in the corporate finance literature (Baños-Caballero et al., 2014).

groups of firms, but to avoid misclassification firms in quintile 3 are excluded. Firms placed in quintiles 4 and 5 are classified as constrained and those in quintiles 1 and 2 as unconstrained.

The econometric models used in this paper also include a set of standard firm-specific control variables commonly found in the literature to be important for explaining firm's financial performance, such as *Size*, *Tangibility*, *Dividend payout*, *Cash holdings*, *Sales growth*, *Capital expenditures* and *Firm risk* (Davydov, 2016; Le and Phan, 2017; Munjal et al., 2019). A consequence of the study's international sample is the presence of a mixture of different elements of the non-leverage regulatory environment that may influence our estimates. To control for such influence, our models also include the dummy variable *Credit rating*, computed as in Strebulaev and Yang (2013), which is commonly evaluated regardless of country.[3]

Table 3 presents some descriptive statistics for the dependent and firm-specific explanatory and control variables. During 2002-2020, on average, firms exhibited a ROA of approximately 2.5%, a figure slightly higher than that recently reported (1.06%) by Sardo and Serrasqueiro (2017) also for European countries. On average, firms' market value tend to be higher than their book value, with the Tobin's Q measure being about 1.67, a value similar to the 1.71 reported by Sardo and Serrasqueiro (2017).

Please insert Table 3 about here

3.3 Dynamic panel data model specification

The baseline empirical specification of the dynamic panel data models used to test the overall effect of zero leverage on firm's financial performance (hypothesis H1) are the following:

$$Tobin's\ Q_{i,t} = \beta_1 Tobin's\ Q_{i,t-1} + \beta_2 ZL_{i,t} + \phi X_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$ROA_{i,t} = \beta_1 ROA_{i,t-1} + \beta_2 ZL_{i,t} + \phi X_{i,t} + \varepsilon_{i,t}, \quad (2)$$

[3] Alternatively, we also considered the *Investment grade* dummy variable, which equals one for a firm with an investment-grade rating (BBB- or higher) and is zero otherwise. Results, which are available upon request, are quite similar to those reported for the *Credit rating* variable.

where i and t index, respectively, the firm and the year, $Tobin's\ Q_{i,t}$, $ROA_{i,t}$ and $ZL_{i,t}$ were defined in Table 1, $X_{i,t}$ is the set of control variables, β and ϕ are the variable coefficients and $\varepsilon_{i,t}$ is the error term. This last term may be split in three components: a time-invariant effect (η_i), a time-specific effect (d_t) and a random disturbance ($\upsilon_{i,t}$).

This baseline specification is then extended by adding the dummy variable *Crisis* and the interaction term between *ZL* and *Crisis* to examine whether the effect of zero leverage on firm's financial performance changed during the 2008 crisis (hypothesis H2):

$$Tobin's\ Q_{i,t} = \beta_1 Tobin's\ Q_{i,t-1} + \beta_2 ZL_{i,t} + \beta_3 Crisis_t + \beta_4 ZL_{i,t} * Crisis_t + \phi X_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$ROA_{i,t} = \beta_1 ROA_{i,t-1} + \beta_2 ZL_{i,t} + \beta_3 Crisis_t + \beta_4 ZL_{i,t} * Crisis_t + \phi X_{i,t} + \varepsilon_{i,t} \quad (4)$$

By estimating model (3) and (4) separately for financially constrained and unconstrained firms, we use this specification to also assess whether the effects of zero leverage on firm's performance, both during crisis and non-crisis years, depend on the level of financial constraints faced by firms (hypothesis H3).

Following Cicero et al. (2013) and Wintoki et al. (2012), all models are estimated using the two-step system GMM (SYS-GMM) estimator (Blundell and Bond, 1998; Roodman, 2009). Similar to the most common fixed-effects estimators, to avoid biased estimation due to unobserved heterogeneity, the SYS-GMM estimator accounts for time-invariant, individual-specific factors (η_i) that may also explain firm's performance and financing policy but are unobservable to the researcher, including firm (*e.g.* strategy, culture), industry and country-specific characteristics (Pindado et al., 2011). It also accounts for time-variant heterogeneity by adding a set of year dummies to the model, which allows the time-specific effects d_t to be estimated. In addition, and this is its major advantage over standard fixed-effects estimators, SYS-GMM also allows to control for endogeneity and reverse causality concerns, i.e. correlation between the explanatory/control variables and the remaining component of the error term ($\upsilon_{i,t}$).

Reverse causality is one of the main sources of endogeneity when firm's performance is examined, since the firm's specific indicators used as regressors (*ZL*, *Size*, *Tangibility*, *Dividend payout*, *Cash holdings*, *Sales growth*, *Capital expenditures Firm risk* and *Credit rating*) can determine firm's performance but all can also be influenced by firm's performance (Wintoki et al., 2012). The use of instrumental variables may help to deal with the problem but finding external instrumental variables related with regressors but not with the dependent variable is not easy and sometimes it is even impossible (Ullah et al., 2018). Furthermore, instrumental variables are often selected by the personal assessment and experience of the researchers, which can also always lead to questionable choices.

Recognizing the difficulties to find satisfactory external instruments to investigate firm-level phenomena and considering the dynamic nature of the firm's activity, where past decisions and outputs are expected to influence present values, the SYS-GMM estimator uses lags of the model endogenous variables as instruments for their value in the current time period to control for endogeneity and reverse causality concerns.[4] The reasoning is that lagged values of the firm's regressors may be related with their present values, but they are uncorrelated with current firm's performance. Here, we use all firm-specific right hand-side variables in the models lagged from t−1 to t−4 as instruments for their contemporaneous values (Drobetz et al., 2015; Wintoki et al., 2012). To check for the validity of the models, we first apply Hansen's *J* statistic of overidentifying restrictions to assess whether instruments are valid or not. Then, we use the m_2 statistic (Arellano and Bond, 1991) to test for lack of second order serial correlation, another crucial assumption of the SYS-GMM estimator. Only if the null hypothesis of correct specification is not rejected in both cases can we conclude that SYS-GMM produces valid estimates.

[4] There are other estimators that work in a similar way, but using different combinations of instruments, such as the dynamic IV estimators of Anderson and Hsiao (1981) and the difference GMM estimator of Arellano and Bond (1991), but they often suffer from a weak instruments problem.

4. Empirical findings

4.1 The overall effect of zero leverage on firm's performance

Table 4 presents SYS-GMM estimates for the models (1), (2), (3) and (4) described in Section 3.3. Models (1) and (3) use *Tobin's Q* as proxy for firms' performance, while models (2) and (4) use *ROA*. The models also differ on the set of explanatory variables considered, with models (3) and (4) using, in addition to *ZL*, the binary variable *Crisis* and the interaction between *ZL* and *Crisis* (*ZL*Crisis*). For each independent variable, we report the estimated coefficient and the result of a Wald test for its individual significance in brackets. The Wald test uses robust standard errors that are adjusted for heteroscedasticity. Hansen's *J* and the m_2 statistics are presented at the bottom of the table. In both cases, and for all models, the null hypothesis cannot be rejected, suggesting that SYS-GMM produces suitable estimates for both specifications. In addition, all Wald tests of the individual and joint significance of the reported coefficients confirm the ability of the models to explain firm's financial performance. Another sign of the good specification of the models is that the coefficients of all control variables have the expected signs.

Please insert Table 4 about here

Columns (1) and (2) of Table 4 show that zero-leverage policies have a significant, positive effect on firm's financial performance, providing empirical support to hypothesis H1. In particular, by adopting a zero-debt policy, *ceteris paribus*, a firm will increase its long-term financial performance by around 1.7pp and its short-term profitability by around 4.7pp. This finding confirms that classical theories of capital structure are not appropriate to explain the zero-leverage phenomenon, since *e.g.* zero-debt firms are not losing value by not levering up as postulated by the trade-off theory. This result also does not corroborate empirical studies on firm's performance that show an overall positive effect of debt on firm's performance (Abdullah and Tursoy, 2019; Berger and di Patti, 2006; Margaritis and Psillaki, 2007). In contrast, it validates the arguments of Lotfaliei (2018) that zero-leverage firms do not lose value by remaining debt-free, since they increase their debt capacity and keep the real option to lever up in the future. Our findings also

show that the positive abnormal returns in the long run obtained by zero-leverage firms (Lee and Moon 2011; Moon et al., 2015) are supported by a direct, positive effect of zero leverage on firm's financial performance.

To examine whether the effect of zero leverage on firm's financial performance changed during the 2008 financial crisis and test hypothesis H2, the third and the fourth column of Table 4 reports the results obtained for models (3) and (4), which add the variable *Crisis* and the interaction term *ZL*Crisis*. The results show that the positive effect of zero leverage on firm's performance was stronger during the crisis period, increasing in 8pp when *Tobin's Q* is used as proxy for firm's financial performance and 14.8pp when we use *ROA*. Focusing on the effect of zero leverage on *Tobin's Q*, while outside the crisis period adopting a zero-leverage policy increases performance in 3.2pp, *ceteris paribus*, during the crisis years the performance of zero-leverage firms was superior in 11.2pp relative to their leveraged counterparts[5]. This is a direct consequence of the fact that during the 2008 crisis the market value of leveraged firms deteriorated in 5.4pp, while that of zero-leverage firms did not change significantly[6]. Regarding the models based on *ROA*, adopting a zero-leverage policy outside the crisis, *ceteris paribus*, raises firm's short-term performance in 1.7pp, while during the crisis this effect increases to 16.5pp. This huge increment is due to a significant lower profitability (2.8pp) of leveraged firms in crisis periods and a significant better performance (12pp) of zero-leverage firms.

Overall, as conjectured in Section 2.2.2, the 2008 financial crisis seems to have been more severe for firms dependent on debt, most likely due to the increased interest rates demanded by creditors during this period, which may also have forced them to forego good investment opportunities (Santos, 2011). In contrast, also as hypothesized in Section 2.2.2, the zero-leverage strategy pursued by debt-free firms allowed them to face the unexpected 2008 crisis in a better financial position, since it seems that they were able to use their financial slack and/or borrowing capacity

[5] The last figure is the sum of the coefficients of the variables ZL and ZL*Crisis, which is statistically significant at the 1% level.

[6] In the crisis period the performance of zero-leverage firms increased in 2.6pp (sum of the coefficients of the variables Crisis and ZL*Crisis), but this result is not statistically significant.

to continue their investment plans. Moreover, probably due to the absence of debt obligations and consequent lower financial risk and superior financial flexibility, zero-debt firms managed to keep their market evaluation during the 2008 crisis, unlike what happened with leveraged firms. Therefore, our findings support Arslan-Ayaydin et al. (2014) claims that firms exhibiting financial flexibility in pre-crisis periods are less affected by crises. It also validates hypothesis H2.

4.2 The role played by financial constraints on the effect of zero leverage on firm's performance

The results for the models that consider only financially constrained zero-leverage and leveraged firms, on the one hand, and unconstrained zero-leverage and leveraged firms, on the other hand, are reported in Table 5. These models are based on partitions of the original sample according to the *WW-index*, as explained in Section 3.2. Again, both Hansen's *J* and the m_2 statistics do not detect any sign of misspecification in any of the four estimated models.

Please insert Table 5 about here

For all models in Table 5, the coefficient of the *ZL* dummy variable is again positive and significant, reinforcing the findings of the previous models and additionally showing that zero leverage positively impacts firm's performance irrespective of whether it faces financial constraints or not, unlike what we conjectured in hypothesis H3. Therefore, it does not matter if zero leverage is the consequence of a financial decision taken by unconstrained firms to build up financial flexibility (Dang, 2013) or it is an imposition of creditors that refuse to grant credit to the firm (Bessler et al., 2013): in both cases the financial performance of the firm is increased by the adopted zero-debt financing policy. Thus, when facing financing constraints, it seems to be more profitable for a firm to pursue a zero-leverage policy than resorting to debt, avoiding the greater compensation and higher interest rates imposed by lenders to offset the risk of granting credit to riskier firms. On the basis of these results, hypothesis H3 is rejected.

Table 5 also shows that, nevertheless, the existence or not of financial constraints is an important factor to take into account when evaluating the effect of zero leverage policies on firm's performance, namely during crisis periods. Indeed, the coefficient of the interaction term *ZL*Crisis* is only significant for the group of unconstrained firms. This means that the previously found stronger positive effect of zero leverage policies during the 2008 global financial is only valid for financially flexible firms. When firms are financially constrained, then the difference in terms of performance between zero-leverage and leveraged firms is similar across the years and does not change with macroeconomic shocks.

4.3 Robustness analysis

4.3.1 Alternative measures of financial conservatism

This section examines whether the previous results are robust to the use of alternative measures of financial conservatism. To this end, we re-estimate models (3) and (4) of Table 4 and all models of Table 5 using alternative proxies to classify a firm as being financial conservative. First, by replacing *ZL* by the *ZL3* variable, we narrow down the definition of zero-leverage firms to those that have zero debt in at least three consecutive years and investigate the effect of persistent zero-leverage policies (Devos et al., 2012). Then, we do the opposite and use a less stringent definition of financial conservatism than the one implied by *ZL*. In particular, we consider the *AZL* variable and examine whether low-debt levels, not necessarily zero (Strebulaev and Yang, 2013), influence firm's financial performance in the same way as found before. See Table 2 for a full description of the new variables.

Table 6 shows that the overall effect of *ZL3* on firm's financial performance is quite similar to that of the *ZL* variable. As before, we find that (persistent) zero-leverage policies positively impact firm's performance and that this effect was stronger during the crisis period. Moreover, we find again that while the former effect is valid irrespective of the level of financial constraints felt by firms, the latter is observed only for unconstrained firms.

Please insert Table 6 about here

The results on Table 7 show that our previous findings are also robust to the inclusion of firms with low, but not zero, leverage in the definition of financial conservatism.

Please insert Table 7 about here

4.3.2 Alternative definition of financially constrained firms

Given that financially constrained firms can be defined in a number of different ways, we now re-estimate the models of Table 5 using as basis for the partition of the sample the *SA-index*; see Table 2 for a full description of this index. The identification of the groups of constrained and unconstrained firms was made following exactly the same procedures described in Section 3.2 for the *WW-index*.

Please insert Table 8 about here

Table 8 shows that, as before, the coefficient of the *ZL* dummy variable is positive and significant in all models and that the coefficient of the interaction term *ZL*Crisis* is only significant for the group of unconstrained firms. Therefore, all previous conclusions taken based on the use of the *WW-index* as measure of financial constrains remain valid when we consider the *SA-index* to partition the sample in groups of financially constrained and unconstrained firms.

4.3.3 Propensity score analysis

As a final robustness test for the effects of zero leverage on firm's financial performance, we use PS methods (Rosenbaum and Rubin, 1983), which have the advantage of accounting for sample selection effects. In our study, zero-leverage firms are the 'treatment' group and leveraged firms the control group and, hence, the PS is the estimated probability of a firm being debt-free. We use a logit model, with *ZL* as dependent variable, to estimate the PS conditional on a set of other firm-specific characteristics, namely all control variables defined in Table 2. Next, using nearest-

neighbour matching, we match each zero-leverage firm with the leverage firms that display the closest predicted propensity scores, and vice-versa.[7] Finally, we estimate the differences between the predicted performances for each match and compute the effect of zero leverage on firm's financial performance by averaging those differences for the whole sample.

Table 10 presents, both for the original and matched sample, descriptive statistics and Rubin (2001) diagnostic criteria for the balance of the distribution of the covariate values for the zero-leverage and leveraged group of firms, for all cases analysed in the paper. A perfect matching would imply a standardized mean difference of zero across groups and a variance ratio of one. As can be seen, the level of balance between the groups improves substantially in the matched sample in all cases and Rubin (2001) measures suggest that the matched samples are sufficiently balanced.

Please insert Table 9 about here

Because the applied PS method does not involve the estimation of any regression coefficient, giving direct predictions for the effect of zero leverage, in Table 11 we report only these predictions. We compute effects separately for all firms, financially constrained firms and financially unconstrained firms; and for the whole period in analysis, the crisis years and the non-crisis years. For each effect we provide not only its point estimate, but also a Wald statistic for assessing its statistical significance and the bounds of a 95% confidence interval for the predicted effect. When the point estimate in one case (e.g. all firms / non-crisis years) is not included in the confidence interval of other case (e.g., all firms / crisis years), we conclude that the predicted effects are significantly different.

Please insert Table 10 about here

Table 11 shows that the general effects of zero leverage on firm's performance (all years / all firms) are positive and statistically significant, confirming again the validity of hypothesis H1.

[7] Each firm in one group is matched with at least one firm in the other group and all observations are potential matches regardless of how dissimilar they are.

Concerning hypothesis H3, this hypothesis is again refuted, confirming that zero leverage in general positively impacts firm's performance irrespective of whether it faces financial constraints or not. Regarding hypothesis H2, our previous conclusions are also confirmed. In all cases, the point estimates for the crisis years are higher than the corresponding estimates for the non-crisis years, suggesting that the positive effect of zero leverage on firm's performance was stronger during the crisis period. Moreover, the only cases where those effects are not significantly different from zero are the same as before: only for financially constrained firms is the point estimate of the effect for one period covered by the confidence interval estimated for the other period.

5. Conclusion

This paper examines the financial performance of zero-leverage firms, discussing how extremely conservative financing policies affect firm's performance. To perform this research, we used a sample of 5,144 European listed firms over the period between 2002 and 2020, where more than 10% of the observations correspond to debt-free firms. Using dynamic panel data models, we found that zero-leverage policies significantly increase the firm's financial performance and that this effect was stronger during the 2008 global financial crisis. Overall, the long-term performance of zero-leverage firms is predicted to be 1.7pp superior to that of leveraged firms, while their short-term performance is predicted to be superior in 4.7pp. During the crisis period, using zero-debt policies increased the firm's market performance in 11.2pp, while its short-term profitability increased in 16.5pp.

Zero leverage may be a financial decision taken by the firm or an imposition of creditors that refuse to grant credit to the firm. We found that the positive impact of zero debt on firm's performance is valid for both financially unconstrained and constrained firms. However, the estimated stronger positive effect of zero leverage on firm's performance during crisis periods

only holds for the former group of firms, with the performance gap between zero-leverage and leveraged financially constrained firms being similar over the whole sample period.

Our findings contradict the most established capital structure theories, which claim that, given its benefits, debt rises firm performance. Thus, such theories do not seem suitable to explain the performance of zero-leverage firms. However, there are many possible explanations for the superior performance of zero-leverage firms. By remaining debt-free due to their own decisions, financially flexible firms are able to keep their borrowing capacity to invest when good investment opportunities arise. They will be also better prepared to answer opportunely to unexpected changes on their activity and to face negative economic cycles. Moreover, when firms are financially constrained, remaining debt free, and because of that possibly being forced to bypass some investment opportunities, seems to be a better option than paying the greater compensations demanded by lenders to accept granting credit to them. Therefore, in a sense, a financially constrained firm is often a zero-leverage firm also by choice. Overall, our results implicitly suggest that one of the main reasons for firms adopting a zero-leverage policy may be the consequent expected better financial performance, a hypothesis that has not been considered previously in the capital structure literature, to the best of our knowledge.

Beyond the theoretical contributions, our paper also has some interesting implications for practitioners, managers and government entities. The high dependence on external financing of European firms led to the harmful consequences of the financial crisis that emerged in 2008, which triggered a wave of bankruptcies that originated high unemployment rates, especially in peripheral countries where firms are most dependent on debt such as Greece, Italy, Portugal and Spain. By showing that debt-free firms can overcome macroeconomic shocks in a better financial position than firms relying on debt, our results suggest that governmental entities should actively delineate policies and incentives to reduce the dependence of firms on external financing. They also clearly show to managers that they will be more likely to keep investments and the competitiveness of their firms if they opt for low-leverage policies.

References

Abadie, A., and G. W. Imbens, 2016, Matching on the estimated propensity score, *Econometrica* 84(2), 781-807.

Abdullah, H., and T. Tursoy, 2019, Capital structure and firm performance: evidence of Germany under IFRS adoption, *Review of Managerial Science*, 1–20.

Aktas, N., K. Andries, E. Croci, and A. Ozdakak, 2019, Stock market development and the financing role of IPOs in acquisitions, *Journal of Banking and Finance* 98, 25–38.

Almeida, H., and M. Campello, 2007, Financial constraints, asset tangibility, and corporate investment, *The Review of Financial Studies* 20, 1429–1460.

Anderson, T. W., and C. Hsiao, 1981, Estimation of dynamic models with error components, *Journal of the American Statistical Association* 76, 598–606.

Arellano, M., and S. Bond, 1991, Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economic Studies* 58, 277–297.

Arslan-Ayaydin, Ö., C. Florackis, and A. Ozkan, 2014, Financial flexibility, corporate investment and performance: Evidence from financial crises, *Review of Quantitative Finance and Accounting* 42, 211–250.

Bachmann, R., A. Loyeung, Z. Matolcsy, and H. Spiropoulos, 2020, Powerful CEOs, cash bonus contracts and firm performance, *Journal of Business Finance and Accounting* 47, 100-131.

Bancel, F., and U. R. Mittoo, 2004, The determinants of capital structure choice : A survey of European firms, *Financial Management* 33, 103–132.

Baños-Caballero, S., P. J. García-Teruel, and P. Martínez-Solano, 2014, Working capital management, corporate performance, and financial constraints, *Journal of Business Research* 67, 332–338.

Beck, T., A. Demirgüç-Kunt, and R. E. Levine, 2000, A new database on financial development and structure, *World Bank Economic Review* 14, 597–605.

Berger, A. N., and E. B. di Patti, 2006, Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry, *Journal of Banking and Finance* 30, 1065–1102.

Bessler, W., W. Drobetz, R. Haller, and I. Meier, 2013, The international zero-leverage phenomenon, *Journal of Corporate Finance* 23, 196–221.

Blundell, R., and S. Bond, 1998, Initial conditions and moment restrictions in dynamic panel data models,

Journal of Econometrics 87, 115–143.

Botta, M., L. Colombo, 2022, Non-linear capital structure dynamics, *Journal of Business Finance and Accounting* 49, 1897–1928.

Brounen, D., A. de Jong, and K. Koedijk, 2006, Capital structure policies in Europe: Survey evidence, *Journal of Banking and Finance* 30, 1409–1442.

Chipeta, C., N. Aftab, and M. Machokoto, 2021, The implications of financial conservatism for African firms, *Finance Research Letters* 42, 1-9.

Cicero D., M. Wintoki, and T. Yang, 2013, How do public companies adjust their board structures?, *Journal of Corporate Finance* 23, 108–127.

Cook, D. O., and T. Tang, 2010, Macroeconomic conditions and capital structure adjustment speed, *Journal of Corporate Finance* 16, 73–87.

Cragg, J. G., and G. Donald, 1993, Testing identifiability and specification in instrumental variable models, *Econometric Theory* 9(2), 222–240.

D'Mello, R., and M. Gruskin, 2014, Are the benefits of debt declining? The decreasing propensity of firms to be adequately levered, *Journal of Corporate Finance* 29, 327–350.

Dang, V. A., 2013, An empirical analysis of zero-leverage firms : New evidence from the UK, *International Review of Financial Analysis* 30, 189–202.

Davydov, D., 2016, Debt structure and corporate performance in emerging markets, *Research in International Business and Finance* 38, 299–311.

Dawar, V., 2014, Agency theory , capital structure and firm performance, *Managerial Finance* 40, 1190–1206.

Deloof, M., and T. Vanacker, 2018, The recent financial crisis, start-up financing and survival, *Journal of Business Finance and Accounting* 45, 928–951.

Devos, E., U. Dhillon, M. Jagannathan, and S. Krishnamurthy, 2012, Why are firms unlevered ?, *Journal of Corporate Finance* 18, 664–682.

Diamond, D. W., 1991, Monitoring and reputation: The choice between bank loans and directly placed debt, *Journal of Political Economy* 99, 689–721.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer, 2008, The law and economics of self-dealing, *Journal of Financial Economics* 88(3), 430-465.

Drobetz, W., D. Schilling, and H. Schröder, 2015, Heterogeneity in the speed of capital structure adjustment

across countries and over the business cycle, *European Financial Management* 21(5), 936–973.

European Investment Bank, 2015, *Investment and Investment Finance in Europe – Investing in Competitiveness*.

Fosu, S., 2013, Capital structure, product market competition and firm performance: Evidence from South Africa, *Quarterly Review of Economics and Finance* 53, 140–151.

Ghoul, S. E., O. Guedhami, C. Kwok, and X. Zheng, 2018, Zero-leverage puzzle : An international comparison, *Review of Finance* 22, 1063–1120.

Hackbarth, D., J. Miao, and E. Morellec, 2006, Capital structure, credit risk, and macroeconomic conditions, *Journal of Financial Economics* 82, 519–550.

Haddad, K., and B. Lotfaliei, 2019, Trade-off theory and zero leverage, *Finance Research Letters* 31, 165–170.

Hadlock, C. J., and J. R. Pierce, 2010, New evidence on measuring financial constraints : Moving beyond the KZ index, *The Review of Financial Studies* 23, 1909–1940.

Huang, D. Z. X., 2021, Environmental, social and governance (ESG) activity and firm performance: a review and consolidation, *Accounting and Finance* 61(1), 335–360.

Huang, Z., W. Li, and W. Gao, 2017, Why do firms choose zero-leverage policy ? Evidence from China, *Applied Economics* 49, 2736–2748.

Ivashina, V., and D. Scharfstein, 2010, Bank lending during the financial crisis of 2008, *Journal of Financial Economics* 97, 319–338.

Jensen, M. C., 1986, Agency costs of free cash flow, corporate finance, and takeovers, *American Economic Review* 76, 323–329.

Jensen, M. C., and W. H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305–360.

Jouida, S., 2018, Diversification, capital structure and profitability: A panel VAR approach, *Research in International Business and Finance* 45, 243–256.

Kahle, K. M., and R. M. Stulz, 2013, Access to capital, investment, and the financial crisis, *Journal of Financial Economics* 110, 280–299.

Kraus, A., and R. H. Litzenberger, 1973, A state-preference model of optimal financial leverage, *The Journal of Finance* 28, 911–922.

Kyereboah-Coleman, A., 2007, The impact of capital structure on the performance of microfinance

institutions, *Journal of Risk Finance* 8, 56–71.

Laeven, L., and F. Valencia, 2018, Systemic banking crises revisited, *IMF Working Paper*, 1–47.

Le, T. P. V., and T. B. N. Phan, 2017, Capital structure and firm performance: Empirical evidence from a small transition country, *Research in International Business and Finance* 42, 710–726.

Lee, H., and G. Moon, 2011, The long-run equity performance of zero-leverage firms, *Managerial Finance* 37, 872–889.

Lindemanis, M., A. Loze, and A. Pajuste, 2019, The effect of domestic to foreign ownership change on firm performance in Europe, *International Review of Financial Analysis*, 1–15.

Lotfaliei, B., 2018, Zero leverage and the value in waiting to have debt, *Journal of Banking and Finance* 97, 335–349.

Margaritis, D., and M. Psillaki, 2007, Capital structure and firm efficiency, *Journal of Business Finance and Accounting* 34, 1447–1469.

Margaritis, D., and M. Psillaki, 2010, Capital structure, equity ownership and firm performance, *Journal of Banking and Finance* 34, 621–632.

Modigliani, F., and M. H. Miller, 1958, The cost of capital, corporation finance and the theory of investment, *American Economic Review* 48, 261–297.

Modigliani, F., and M. H. Miller, 1963, Corporate income taxes and the cost of capital : A correction, *American Economic Review* 53, 433–443.

Moon, G., H. Lee, and D. Waggle, 2015, The effect of debt capacity on the long-term stock returns of debt-free firms, *Applied Economics* 47, 333–345.

Morais, F., Z. Serrasqueiro, and J. J. S. Ramalho, 2020, The zero-leverage phenomenon: A bivariate probit with partial observability approach, *Research in International Business and Finance* 53, 1–16.

Morais, F., Z. Serrasqueiro, and J. J. S. Ramalho, 2021, The zero-leverage phenomenon in European listed firms: A financing decision or an imposition of the financial market? *BRQ Business Research Quarterly*, 1–23. https://doi.org/10.1177/23409444211024653

Munjal, S., I. Requejo, and S. K. Kundu, 2019, Offshore outsourcing and firm performance: Moderating effects of size, growth and slack resources, *Journal of Business Research* 103, 484–494.

Myers, S. C., 1977, Determinants of corporate borrowing, *Journal of Financial Economics* 5, 147–175.

Myers, S. C., 1984, The capital structure puzzle, *The Journal of Finance* 39, 575–592.

Myers, S. C., and N. S. Majluf, 1984, Corporate financing and investment decisions when firms have

information that investors do not have, *Journal of Financial Economics* 13, 187–221.

Özer, G., and İ. Çam, 2020, Financing decisions of firms: the roles of legal systems, shareholder rights and creditor rights, *Accounting and Finance* 61(2), 2717-2757.

Pindado, J., I. Requejo, and C. de la Torre, 2011, Family control and investment-cash flow sensitivity: Empirical evidence from the Euro zone, *Journal of Corporate Finance* 17, 1389–1409.

Ramalho, J. J. S., Silva, J. V. (2009). A two-part fractional regression model for the financial leverage decisions of micro, small, medium and large firms. Quantitative Finance, 9(5), 621–636.

Ramalho, J. J. S., R. M. Rita, and J. V. Silva, 2018, The impact of family ownership on capital structure of firms : Exploring the role of zero-leverage, size, location and the global financial crisis, *International Small Business Journal* 36, 574–604.

Roodman, D., 2009, How to do xtabond2: An Introduction to difference and system GMM in Stata, *The Stata Journal* 9, 86–136.

Rosenbaum, P. R., and D. B. Rubin, 1983, The central role of the propensity score in observational studies for causal effects, *Biometrika* 70, 41–55.

Rubin, D. B., 2001, Using propensity scores to help design observational studies: Application to the tobacco litigation, *Health Services and Outcomes Research Methodology* 2, 169–188.

Sánchez-Vidal, F. J., M. Hernández-Robles, and A. Mínguez-Vera, 2020, Financial conservatism fosters job creation during economic crises, *Applied Economics*, 1–14.

Santos, J., 2011, Bank corporate loan pricing following the subprime crisis, *The Review of Financial Studies* 24, 1916–1943.

Saona, P., E. Vallelado, and P. Martín, 2020, Debt, or not debt, that is the question: A Shakespearean question to a corporate decision, *Journal of Business Research* 115, 378-392.

Sardo, F., and Z. Serrasqueiro, 2017, A European empirical study of the relationship between firms' intellectual capital, financial performance and market value, *Journal of Intellectual Capital* 18, 771–788.

Stiglitz, J. E., and A. Weiss, 1981, Credit rationing in markets with imperfect information, *The American Economic Review* 71, 393–410.

Strebulaev, I. A., and B. Yang, 2013, The mystery of zero-leverage firms, *Journal of Financial Economics* 109, 1–23.

Ullah, S., P. Akhtar, and G., Zaefarian, 2018, Dealing with endogeneity bias: The generalized method of

moments (GMM) for panel data, *Industrial Marketing Management* 71, 69–78.

Vithessonthi, C., and J. Tongurai, 2015, The effect of leverage on performance: Domestically-oriented versus internationally-oriented firms, *Research in International Business and Finance* 34, 265–280.

Vo, X. V., and C. Ellis, 2017, An empirical investigation of capital structure and firm value in Vietnam, *Finance Research Letters* 22, 90–94.

Whited, T., and G. Wu, 2006, Financial constraints risk, *The Review of Financial Studies* 19, 531–559.

Wintoki, M., J. Linck, and J. Netter, 2012, Endogeneity and the dynamics of internal corporate governance, *Journal of Financial Economics* 105, 581–606.

Zaher, T. S., 2010, Performance of debt free firms, *Managerial Finance* 36, 491–501.

Table 1: Sample characterisation by country

Country	Firms		Firm/year observations		
	#	# zero-leverage	#	%	% zero-leverage
Austria	74	14	929	1.66	7.86
Belgium	116	13	1,406	2.52	3.91
Denmark	136	30	1,680	3.01	7.74
Finland	149	18	1,942	3.48	3.50
France	778	70	8,723	15.61	2.14
Germany	696	224	8,184	14.65	12.61
Greece	275	41	3,280	5.87	4.12
Ireland	69	21	716	1.28	11.59
Italy	266	19	3,034	5.43	1.51
Netherlands	167	40	1,832	3.28	7.15
Portugal	49	3	644	1.15	1.55
Spain	148	5	1,710	3.06	0.53
Sweden	551	252	5,583	9.99	19.09
UK	1,670	683	16,218	29.02	18.18
Total	5,144	1,433	55,881	100	10.69

Note: This table summarizes the distribution of firms by country highlighting the percentage of observations corresponding to zero-leverage firms. A firm is classified as zero-leverage if it has no long-term and short-term debt in a given year.

Table 2: Variables definition

Variable	Definition
Dependent variable	
Tobin's Q	Ratio of the firm's market value to total book assets. Market value is calculated as market capitalization plus total assets minus book equity.
ROA	Ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total book assets.
Explanatory variables	
ZL	Equals 1 if a firm has both zero short-term debt and zero long-term debt in a given year and is 0 otherwise
Crisis	Equals 1 if the observation corresponds to the years of financial and sovereign debt crises in Europe (the period of crisis goes from 2008 to 2009, 2011 or 2012, depending on the country being considered) and is 0 otherwise (source: Laeven and Valencia, 2018)*
Control variables	
Size	Logarithm of total book assets
Tangibility	Ratio of fixed assets to total book assets
Dividend payout	Ratio of common dividend to total book assets
Cash holdings	Ratio of cash and short-term investments to book assets
Sales growth	Sales in t minus sales in t–1 divided by sales in t–1
Capital expenditures	Ratio of capital expenditures to total book assets
Firm risk	The absolute value of the difference between the annual % change in EBITDA and the (time-series) average of this change
Credit rating	Equals 1 if the firm has a credit rating and 0 otherwise
Categorical variables	
WW-index	The WW-index is constructed as -0.091*CFlow - 0.062*DIVPOS + 0.021*TLTD - 0.044*LNTA + 0.102*ISG – 0.035*SG, where CFlow=(Net income+Depreciation)/Total assets, DIVPOS is an indicator set to 1 if the firm pays dividends, TLTD=Long term debt/Total assets, LNTA=Size, ISG is the average industry sales growth and SG is the firm's sales growth (source: Whited and Wu, 2006). Firms in quintiles 4 and 5 are classified as financially constrained, while those in quintiles 1 and 2 are classified as being unconstrained. To avoid misclassification all firms sorted in quintile 3 are excluded.
Variables for the robustness tests	
ZL3	Equals 1 if a firm has a zero debt during three consecutive years and is 0 otherwise
AZL	Equals 1 if the book leverage ratio is below 5% and is 0 otherwise
SA-index	The Size-Age index is constructed as (– 0.737 * Size) + (0.043 * Size^2) – (0.040 * Age), where Age is the difference between the year of the observation and the first date that the firm appears in the DataStream database with trading available data and Size is as defined previously (Hadlock and Pierce, 2010). Firms in quintiles 4 and 5 are classified as financially constrained, while those in quintiles 1 and 2 are classified as being unconstrained. To avoid misclassification all firms sorted in quintile 3 are excluded.

Note: * The longest crisis period is considered only for the following countries: Austria, Belgium, Greece, Ireland, Portugal and Spain. For UK the crisis period is 2008-2011 and for the remaining countries only the 2008-2009 period is considered as a crisis period. See Laeven and Valencia (2018).

Table 3: Descriptive statistics

Variable	N.obs.	Mean	s.d.	Min.	Median	Max.
Dependent variables						
Tobin's Q	55,881	1.669	1.326	0.015	1.265	14.978
ROA	55,881	0.025	0.218	-3.254	0.055	2.466
Explanatory variable						
ZL	55,881	0.107	0.309	0.000	0.000	1.000
Control variables						
Size	55,881	11.991	2.254	4.727	11.795	20.024
Tangibility	55,881	0.233	0.219	0.000	0.167	0.970
Dividend payout	55,881	0.018	0.038	0.000	0.005	0.796
Cash holdings	55,881	0.153	0.167	0.000	0.096	0.959
Sales growth	50,292	0.119	0.560	-1.000	0.046	9.952
Capital expenditures	55,881	0.044	0.055	0.000	0.027	0.757
Firm risk	50,226	1.793	4.951	0.000	0.436	43.850
Credit rating	55,881	0.558	0.497	0.000	1.000	1.000
Alternative explanatory variables						
ZL3	55,881	0.052	0.222	0.000	0.000	1.000
AZL	55,881	0.246	0.431	0.000	0.000	1.000

Table 4: Effect of zero leverage on firm's performance

Independent variables	(1) Tobin's Q	(2) ROA	(3) Tobin's Q	(4) ROA
Tobin's $Q_{i,t-1}$	0.524***		0.523***	
	(64.48)		(71.51)	
$ROA_{i,t-1}$		0.276***		0.277***
		(35.62)		(36.43)
ZL	0.017**	0.047***	0.032***	0.017***
	(2.01)	(15.40)	(3.06)	(7.17)
Crisis			-0.054**	-0.028**
			(-2.01)	(-1.98)
ZL*Crisis			0.080***	0.148***
			(3.83)	(5.42)
Size	-0.013	0.059***	-0.017	0.060***
	(-1.22)	(13.85)	(-1.52)	(13.76)
Tangibility	0.325***	0.025	0.283***	0.018
	(4.52)	(1.31)	(3.89)	(0.93)
Dividend payout	0.842***	0.817***	0.651***	0.855***
	(27.52)	(18.52)	(27.46)	(18.78)
Cash holdings	-0.123*	0.050***	-0.097	0.067***
	(-1.79)	(3.04)	(-1.47)	(4.07)
Sales growth	-0.223***	0.023***	-0.236***	0.023***
	(-14.40)	(21.42)	(-14.59)	(18.99)
Capital expenditures	0.597***	0.284***	0.531***	0.303***
	(5.98)	(13.98)	(5.45)	(13.91)
Firm risk	-0.011***	-0.011***	-0.010***	-0.011***
	(-3.44)	(-13.80)	(-3.04)	(-14.41)
Credit rating	0,143***	0.005	0.138***	0.019
	(5.10)	(0.02)	(4.83)	(0.10)
Observations	50,226	50,226	50,226	50,226
m_2 statistic	0.40	1.33	0.39	1.14
Hansen's J statistic	382.69 (360)	351.19 (330)	382.24 (358)	344.01 (328)
Wald test for joint significance	151131.65***	11546.61***	143496.01***	207357.86***

Note: The dynamic panel data models are estimated using the system GMM estimator. The dependent variable in column (1) and (3) is *Tobin's Q*, while *ROA* is the dependent variable used for columns (2) and (4). The list of independent variables is detailed in Table 2. For each independent variable we report the regression coefficients and, in brackets, a heteroskedasticity-robust Wald test for its individual significance. m_2 is a test for second order serial correlation, asymptotically distributed as N(0,1) under the null of no serial correlation; and Hansen's J is a test of over-identifying restrictions, asymptotically distributed as $\chi 2$ under the null of no correlation between the instruments and the error term (degrees of freedom in parentheses).

***,**,* indicates statistical significance at 1%, 5% and 10% respectively.

Table 5: Effect of zero leverage on firm's performance across different levels of financial constraints

	Panel A: Tobin's Q		Panel B: ROA	
Independent variables	Constrained firms	Unconstrained firms	Constrained firms	Unconstrained firms
Tobin's $Q_{i,t-1}$	0.427***	0.790***		
	(145.19)	(117.84)		
$ROA_{i,t-1}$			0.256***	0.348***
			(104.26)	(40.04)
ZL	0.056***	0.022***	0.008**	0.051***
	(8.74)	(4.56)	(2.16)	(16.14)
Crisis	-0.061***	-0.040**	-0.006	-0.027***
	(-4.72)	(-2.26)	(-0.51)	(-5.97)
ZL*Crisis	-0.002	0.136***	0.007	0.134***
	(-0.91)	(7.15)	(0.68)	(6.59)
Size	-0.131***	0.028	0.143***	-0.047***
	(-13.93)	(1.35)	(110.60)	(-11.27)
Tangibility	0.395***	-0.041	-0.015	-0.064***
	(12.58)	(-0.44)	(-1.56)	(-3.94)
Dividend payout	1.017***	0.423***	0.928***	0.628***
	(10.12)	(6.65)	(17.65)	(22.13)
Cash holdings	0.320***	0.095	0.059***	0.057***
	(10.49)	(1.32)	(32.54)	(5.75)
Sales growth	0.051***	-0.146***	0.026***	0.051***
	(14.40)	(-14.41)	(55.83)	(18.40)
Capital expenditures	0.547***	-0.277	0.218***	0.271***
	(30.92)	(-1.24)	(25.12)	(9.53)
Firm risk	-0.022***	0.008***	0.002***	-0.004***
	(-21.90)	(2.84)	(21.25)	(-9.26)
Credit rating	0.158***	0.039	-0.091	-0.003
	(3.00)	(1.54)	(-1.22)	(0.15)
Observations	12,348	17,635	12,348	17,635
m_2 statistic	0.14	0.42	0.56	0.33
Hansen's J statistic	427.32 (510)	333.13 (317)	312.70 (332)	250.09 (304)
Wald test for joint significance	647312.94***	2580000.00***	1270000.00***	3430000.00***

Note: The dynamic panel data models are estimated using the system GMM estimator. Panel A uses *Tobin's Q* as dependent variable, while Panel B uses *ROA*. Groups of financially constrained and unconstrained firms are created according with the categorical variable *WW-index* defined in Table 2. See Table 4 for the rest of the information needed to read this table.
***,**,* indicates statistical significance at 1%, 5% and 10% respectively.

Table 6: Effect of persistent zero-leverage policies on firm's performance

	Panel A: Tobin's Q			Panel B: ROA		
Independent variables	All firms	Constrained firms	Unconstrained firms	All firms	Constrained firms	Unconstrained firms
Tobin's $Q_{i,t-1}$	0.211***	0.184***	0.522***			
	(41.68)	(101.27)	(86.34)			
$ROA_{i,t-1}$				0.261***	0.243***	0.341***
				(43.29)	(260.23)	(33.74)
ZL3	0.198***	0.025***	0.027***	0.010***	0.006***	0.040***
	(4.98)	(2.92)	(3.11)	(8.54)	(5.29)	(17.34)
Crisis	-0.143***	-0.087***	-0.148***	-0.021**	-0.009*	-0.052***
	(-2.71)	(2.63)	(3.02)	(2.11)	(-1.69)	(-7.46)
ZL3*Crisis	0.166***	0.003	0.289***	0.132***	0.005	0.133***
	(6.85)	(1.28)	(2.82)	(3.66)	(1.48)	(13.06)
Size	-0.132***	-0.214***	-0.110***	0.029***	0.121***	-0.027***
	(-5.68)	(-55.47)	(-7.52)	(5.80)	(88.84)	(-7.36)
Tangibility	0.841***	0.132***	0.341***	0.001	-0.025***	-0.137***
	(12.94)	(5.68)	(4.26)	(0.08)	(-3.15)	(-16.12)
Dividend payout	0.544***	0.689***	0.723***	0.822***	0.693***	0.853***
	(22.92)	(8.66)	(9.64)	(21.51)	(12,58)	(20.09)
Cash holdings	0.172***	0.941***	0.930***	0.094***	0.099***	-0.003
	(22.64)	(55.60)	(28.10)	(6.33)	(47.05)	(-0.32)
Sales growth	-0.134***	0.206***	0.027***	0.036***	-0.005***	0.034***
	(-23.71)	(53.81)	(8.24)	(15.75)	(-9.45)	(13.29)
Capital expenditures	0.281***	0.356***	-0.131	0.295***	0.200**	0.272***
	(3.68)	(52.89)	(-1.36)	(12.58)	(2.44)	(13.66)
Firm risk	-0.000	-0.019***	0.005***	-0.009***	0.002***	-0.005***
	(-0.16)	(-35.33)	(3.34)	(-11.56)	(34.22)	(-13.75)
Credit rating	-0.093	0.585**	0.074	0.107**	-0.053	0.020
	(-0.38)	(2.58)	(0.54)	(2.05)	(-0.98)	(1.28)
Observations	50,226	12.348	17,635	50,226	12,348	17,635
m_2 statistic	1.09	0.71	0.61	1.40	0.55	0.26
Hansen's J statistic	349.18 (345)	384.94 (436)	418.55 (393)	378.22 (345)	462.27 (436)	306.55 (393)
Wald test for joint significance	7772.01***	2390000.00***	4330000.00***	15959.86***	1410000.00***	65488.68***

Note: The dynamic panel data models are estimated using the system GMM estimator. Panel A used *Tobin´s Q* as a proxy for firm's financial performance while Panel B uses *ROA*. The alternative explanatory variable *ZL3* is defined in Table 2. See Table 4 and Table 5 for the rest of the information needed to read this table. ***,**,* indicates statistical significance at 1%, 5% and 10% respectively.

Table 7: Effect of low leverage on firm's performance

	Panel A: Tobin's Q			**Panel B**: ROA		
Independent variables	All firms	Constrained firms	Unconstrained firms	All firms	Constrained firms	Unconstrained firms
Tobin's $Q_{i,t-1}$	0.251***	0.104***	0.453***			
	(43.51)	(180.28)	(56.76)			
$ROA_{i,t-1}$				0.280***	0.255***	0.367***
				(62.52)	(377.76)	(47.96)
AZL	0.028***	0.018***	0.034***	0.020***	0.023***	0.022***
	(2.99)	(7.67)	(10.34)	(12.05)	(6.34)	(40.51)
Crisis	-0.051***	-0.049***	-0.025*	-0.022**	-0.020***	-0.047***
	(3.02)	(3.00)	(-1.78)	(-2.12)	(-11.42)	(-6.26)
AZL*Crisis	0.056***	0.007	0.071***	0.092***	0.001	0.155***
	(6.92)	(0.82)	(11.49)	(4.92)	(0.75)	(13.45)
Size	-0.129***	-0.411***	0.020	0.054***	0.094***	-0.028***
	(-4.71)	(-113.97)	(1.02)	(14.95)	(218.22)	(-12.28)
Tangibility	0.886***	0.238***	0.178*	-0.020*	0.091***	-0.154***
	(14.66)	(14.23)	(1.74)	(-1.92)	(-30.95)	(-16.26)
Dividend payout	0.995***	0.779***	0.970***	0.811***	1.075***	0.680***
	(42.80)	(14.56)	(9.81)	(23.56)	(98.06)	(20.99)
Cash holdings	0.216***	0.263***	0.469***	0.024**	0.030***	0.103***
	(24.72)	(34,98)	(21.93)	(2.58)	(14.09)	(19.10)
Sales growth	-0.155***	0.046***	0.007**	0.045***	0.030***	0.073***
	(23.51)	(43.39)	(2.42)	(42.43)	(167.45)	(50.48)
Capital expenditures	0.281***	0.357***	0.207***	0.378***	0.094***	0.244***
	(4.16)	(28.46)	(3.08)	(16.64)	(20.37)	(10.64)
Firm risk	0.005**	-0.018***	-0.013***	-0.007***	0.001***	-0.001***
	(2.41)	(-23.11)	(-6.05)	(-14.80)	(25.13)	(-5.00)
Credit rating	0.094	0.475*	0.107	0.084***	-0.021	0.064***
	(0.46)	(1.68)	(0.71)	(-14.80)	(-0.34)	(3.97)
Observations	50,226	12,348	17,635	50,226	12,348	17,635
m_2 statistic	-1.56	1.12	0.18	1.40	0.29	0.41
Hansen's J statistic	313.83 (347)	331.94 (336)	245.13 (242)	336.93 (331)	342.40 (351)	332.20 (326)
Wald test for joint significance	146471.43***	1790000.00***	2520000.00***	89056.39***	8170000.00***	44712.57***

Note: The dynamic panel data models are estimated using the system GMM estimator. The dependent variable *Tobin's Q* proxies for firm's performance in Panel A, while *ROA* proxies for firm's performance in Panel B. The alternative explanatory variable *AZL* is defined in Table 2. Refer to Table 4 and Table 5 for the rest of the information needed to read this table.

***,**,* indicates statistical significance at 1%, 5% and 10% respectively.

Table 8: Effect of zero leverage on firm's performance across different levels of financial constraints: SA-index

	Panel A: Tobin's Q		**Panel B**: ROA	
Independent variables	Constrained firms	Unconstrained firms	Constrained firms	Unconstrained firms
Tobin's $Q_{i,t-1}$	0.520***	0.628***		
	(217.79)	(69.73)		
$ROA_{i,t-1}$			0.267***	0.264***
			(28.17)	(285.89)
ZL	0.023***	0.099***	0.027***	0.018**
	(5.95)	(14.16)	(5.29)	(2.18)
Crisis	-0.067***	-0.115***	-0.14***	-0.045***
	(-3.22)	(-5.26)	(-8.84)	(-2.73)
ZL*Crisis	-0.020	0.235***	-0.060	0.136***
	(-0.79)	(3.45)	(-1.23)	(8.38)
Size	-0.100***	0.064***	-0.044***	0.088***
	(-18.13)	(4.22)	(-9.63)	(62.76)
Tangibility	0.504**	0.275***	0.034**	-0.107***
	(12.58)	(3.62)	(2.46)	(-29.42)
Dividend payout	1.523***	0.577***	0.761***	0.508***
	(19.43)	(8.08)	(12.93)	(171.08)
Cash holdings	0.200***	0.135	0.152***	0.144***
	(8.19)	(1.03)	(7.50)	(53.41)
Sales growth	-0.195***	-0.157***	0.041***	0.041***
	(-42.42)	(-12.21)	(23.96)	(167.27)
Capital expenditures	0.842***	0.305*	0.165***	0.080***
	(23.22)	(1.74)	(4.23)	(42.25)
Firm risk	-0.015***	0.006*	-0.008***	-0.003***
	(-16.13)	(1.75)	(-11.71)	(-45.37)
Credit rating	0.078**	0.034	0.016	0.008
	(2.37)	(0.96)	(0.40)	(0.37)
Observations	19,726	19,908	19,726	19,908
m_2 statistic	1.55	0.56	1.40	0.14
Hansen's J statistic	281.73 (307)	393.88 (353)	218.35 (298)	347.04 (344)
Wald test for joint significance	466784.06***	1210000.00***	51508.53***	3240000.00***

Note: The dynamic panel data models are estimated using the system GMM estimator. Panel A uses *Tobin's Q* as dependent variable, while Panel B uses *ROA*. Groups of financially constrained and unconstrained firms are created according with the categorical variable *SA-index* defined in Table 2. See Table 5 for the rest of the information needed to read this table.
***,**,* indicates statistical significance at 1%, 5% and 10% respectively.

Table 9: Diagnostic criteria for the propensity score matching

	All years			Crisis years			Non-crisis years		
	All firms	Constrained firms	Unconstrained firms	All firms	Constrained firms	Unconstrained firms	All firms	Constrained firms	Unconstrained firms
Standardized mean differences									
- Raw sample	0.408	0.335	0.368	0.366	0.351	0.692	0.432	0.394	0.318
- Matched sample	0.084	0.040	0.159	0.122	0.076	0.108	0.115	0.072	0.144
Rubin (2001) B statistic									
- Raw sample	150.3[#]	120.04[#]	149.1[#]	115.4[#]	141.6[#]	113.2[#]	146.2[#]	117.3[#]	144.5[#]
- Matched sample	10.0	6.7	7.4	6.2	10.9	14.4	5.4	5.1	13.5
Variance ratios									
- Raw sample	1.554	1.236	1.834	1.217	1.275	1.453	1.405	1.237	1.470
- Matched sample	1.135	1.060	1.122	1.144	1.025	0.970	1.051	1.084	1.081
Rubin (2001) R statistic									
- Raw sample	1.27	1.22	0.89	0.59	1.51	0.63	1.19	1.15	0.92
- Matched sample	0.58	1.11	0.75	0.84	1.11	0.68	1.01	1.19	0.99
N. observations	50,226	12,348	17,635	10,053	2,587	3,306	40,173	9,761	14,329

Note: Standardized mean differences are the means of the absolute values of the standardized differences of the sample means in the control and treatment sub-samples. Rubin (2001) B statistic is an indicator of whether those differences are relevant ($B > 25$) or not ($B < 25$), being calculated as the absolute standardized difference of the means of the linear index of the propensity score in the control and treatment groups. Variance ratios are the means of the variance ratios of treated over control firms. Rubin (2001) R statistic is an indicator of whether the variance ratios are relatively similar ($0.5 \leq R \leq 2$) or not ($R < 0.5$ or $R > 2$), being calculated as the ratio of treated to non-treated variances of the propensity score index.

[#] $B > 25$ or R outside [0.5, 2].

Table 10: Effects of zero leverage on firm's performance: propensity score estimates

	Tobin's Q			ROA		
	All firms	Constrained firms	Unconstrained firms	All firms	Constrained firms	Unconstrained firms
All years	0.287***	0.261***	0.326***	0.030***	0.032***	0.053***
	(6.64)	(3.79)	(4.14)	(4.70)	(2.92)	(6.71)
	[0.202;0.372]	[0.126;0.397]	[0.171;0.480]	[0.017;0.042]	[0.011;0.054]	[0.038;0.069]
Non-crisis years	0.152**	0.128*	0.176***	0.040***	0.032***	0.053***
	(2.26)	(1.75)	(2.67)	(6.34)	(2.84)	(5.58)
	[0.030;0.274]	[-0.015;0.271]	[0.047;0.306]	[0.027;0.052]	[0.009;0.053]	[0.035;0.073]
Crisis years	0.276***	0.169***	0.322***	0.078***	0.036*	0.098***
	(6.83)	(4.26)	(10.56)	(5.32)	(1.69)	(4.39)
	[0.197;0.356]	[0.091;0.247]	[0.262;0.382]	[0.049;0.107]	[-0.006;0.077]	[0.054;0.142]

Note: PS matching uses robust standard errors based on the correction by Abadie and Imbens (2016). Wald tests for the individual significance of the parameters are reported in parenthesis. 95% confidence intervals for the predicted effects are reported in brackets. The dependent variable *Tobin's Q* and *ROA* are the proxies for firm's performance.

***,**,* indicates statistical significance at 1%, 5% and 10% respectively.