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The regulatory environment and financial constraints of private firms in the European Union

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ABSTRACT

This study analyzes the influence of the institutional environment on firms' capital structure in the European Union (EU). Unlike other research, we focus on private firms and include data from all EU countries from 2010 to 2018. We split the sample into groups of small and large firms, which we consider financially constrained and unconstrained, respectively. Throughout the study, we posit that institutional effects on financing policies vary with size, with the effects being greater for constrained firms as they face more financing frictions. We also run regression models controlling for firm-level characteristics and relevant macroeconomic factors. Our findings reveal that a high-quality regulatory environment negatively affects firms' leverage, whereas social corruption has the opposite effect. Moreover, the efficiency of enforcing commercial contracts and developing the financial system positively influences firms' leverage.

1. Introduction

In the 90s, some notable research papers in the capital structure literature examined the influence of the institutional environment on firms' corporate financing choices. For example, La Porta, Lopez de Silanes, Shleifer, and Vishny (1997, 1998) highlighted a country's legal origin and institutional development as relevant factors for firms' financing decisions. Other prominent researchers found that institutional factors and firm-level characteristics are decisive in corporate financing (Demirgüç-Kunt & Maksimovic, 1998, 1999; Rajan & Zingales, 1995).[1] In addition, Gungoraydinoglu and Öztekin (2011) reported that firm-level covariates account for two-thirds of the variation in capital structure across countries, while country-level factors explain the rest; however, most of this research focused on large, listed firms in developed or developing countries. Only a few papers addressed the subject of the institutional environment concerning European small or private firms' capital structure, which is the objective of our research.

Drawing on this literature, we focus on extending the knowledge about new (institutional) determinants of the financial policies of private firms in the European Union (EU). Doing so allows us to analyze differences across financially constrained and unconstrained private firms, which usually correspond to small and large firms. Thus, we intend to gain new insights by answering the following significant questions. (i) Does social corruption play a different role in financially constrained and unconstrained private firms? (ii) Does a financial system's level of development contribute differently to financially constrained and unconstrained private firms? (iii)

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[1] Also noteworthy are Alves and Francisco (2015), Antoniou, Guney, and Paudyal (2008), Azofra, Rodríguez-Sanz, and Velasco (2020), Bancel and Mittoo (2004), Booth et al. (2001), Casino-Martínez, López-Gracia, Mestre-Barberá, and Peiró-Giménez (2019), De Jong, Kabir, and Nguyen (2008), Fan et al. (2012), Giannetti (2003), Kayo and Kimura (2011), Lucey and Zhang (2011), Öztekin (2015), Shah, Shah, Smith, and Labianca (2017).

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Does the pecking order theory apply when institutional factors are considered in a capital structure model?

Notable work on small firms includes that of Beck, Demirgüç-Kunt, and Maksimovic (2008), who analyzed financing patterns worldwide using a firm survey database. They concluded that small firms and firms in countries with poor institutions face more difficulties than large firms in obtaining external finance, especially bank finance. In a study of the capital structure of small and medium-sized enterprises (SMEs) from a group of EU countries, Psillaki and Daskalakis (2009) stated that firm-specific rather than country factors explain differences in corporate financing choices; however, their methodology did not directly incorporate institutional factors. Jõeveer (2013a) used data from various Western European countries to analyze the explanatory power of country- and firm-specific factors in determining firms' capital structures, noting that country factors are more relevant for small firms than large firms. Furthermore, Mc Namara, Murro, and O'Donohoe (2017) tested in a European framework the impact of countries' lending conditions on SMEs' capital structure, finding that leverage is higher in countries with more efficient bankruptcy settings or lower capital requirements for banks. Kenourgios, Savvakis, and Papageorgiou (2020) analyzed the capital structure of listed SMEs in the EU, including firm and country factors. They concluded that no significant differences exist across firm-size categories or country groups, which is consistent with the rationale of institutional factors not having discriminatory power (see also Vasiliou & Daskalakis, 2009). As observed, there is a lack of consistency in the conclusions in the extant literature regarding the impact of institutional factors on private firms' capital structure.

Our research uses a large sample of private firms from all the countries in the EU in the period 2010–2018.[2] Private firms are usually restricted in issuing equity as they face more information costs; thus, retained income becomes their primary funding source. We posit that the institutional environment plays a substantial role in firms' leverage, with the effect being more significant for small firms than for large firms. Small private firms can be considered more financially constrained than their large counterparts as they are more limited in their ability to generate internal resources; they also face more financing frictions, such as information asymmetries, transactions costs, and default risk problems (Fazzari, Hubbard, & Petersen, 1988; Hennessy & Whited, 2007; Mol-Gómez-Vázquez, Hernández-Cánovas, & Koëter-Kant, 2020). Several notable studies have used size as an appropriate criterion to discriminate between financially constrained and unconstrained firms (Almeida, Campello, & Weisbach, 2004; Hadlock & Pierce, 2010; Whited & Wu, 2006).[3] Considering this research, we suggest that institutional factors can strongly influence small firms' capital structure as they depend heavily on external funding. These effects should be negligible or non-existent for large firms, which are considered financially unconstrained; that is, they have unrestricted access to external funds and are less affected by the institutional environment. As an additional focus, we consider the perspective of the institutional differences among EU countries in terms of the market versus bank orientation and how this orientation can influence the capital structure of firms (Bancel and Mittoo, 2004). For instance, firms operating in market-based economies are more likely to launch an initial public offering or seek venture capital financing than firms operating in bank-oriented economies.

Fig. 1 displays the evolution of leverage for the groups of small and large firms in our analysis sample, 2010 to 2018. In most years, large firms' leverage surpasses that of small firms by more than three percentage points, with both groups following a similar trend. We explore whether the institutional environment explains this difference and other factors, such as the firms' characteristics or the macroeconomic conditions.

Our first objective is to explore the role of the legal or regulatory environment in private firms' financing choices. After partitioning the sample into small and large firms, we analyze the effects of some relevant legal factors on firms' leverage and compare these effects between the two groups. We expect that a high-quality regulatory environment—defined as reduced corruption and freedom to do business—can encourage firms to choose equity rather than debt. This should have a more pronounced (negative) effect on small firms' leverage than on that of large firms, as the former group is financially constrained and, therefore, more reliant on external finance, mainly bank finance. This rationale seems consistent with the pecking order theory, which postulates that firms choose capital resources according to the corresponding information costs. Thus, companies first deplete internally-generated cash flow; second, they look for external debt; and finally, they use equity funds, the most expensive source (Myers & Majluf, 1984). Therefore, we expect that better institutional regulation can lead financially constrained firms to secure alternative funding to debt finance once their internal resources have been depleted.

Our second objective consists of analyzing the effect of the enforcement of debt contracts on capital structure choice (Claessens & Klapper, 2005; Davydenko & Franks, 2008; Fan, Titman, & Twite, 2012; Moro, Maresch, & Ferrando, 2018). In countries with well-defined insolvency procedures and high recovery rates, we expect leverage to be used more than equity, as creditors can easily access collateral in the event of default, while firms can resort to a reorganization process to prevent liquidation. Small firms are supposedly more financially constrained than large firms; therefore, this effect will be greater.

Lastly, our third objective is to assess the impact of a developed financial system on private firms' financing. Although prior research reports inconsistent results concerning the role of bank market power in private firms' access to credit, there is a clear consensus that it influences the value of lending relationships (Carbó-Valverde, Rodríguez-Fernández, & Udell, 2009; Huyghebaert & Wang, 2016). Following Petersen and Rajan (1995), we suggest that strong market power in bank concentration can positively contribute to debt financing, as financial entities have access to more information from companies, thus reducing information asymmetries. As this problem is more severe for constrained firms, small firms will experience a greater impact. Furthermore, Popov

[2] The UK is included as it officially left the EU on January 31, 2020.

[3] Age can also be a good criterion, although it has been applied less often. In this regard, while Almeida et al. (2004), Denis and Sibilkov (2010), and Erickson and Whited (2000), do not use it, they do acknowledge that small firms are often young. Nevertheless, we also apply this criterion for comparative purposes.

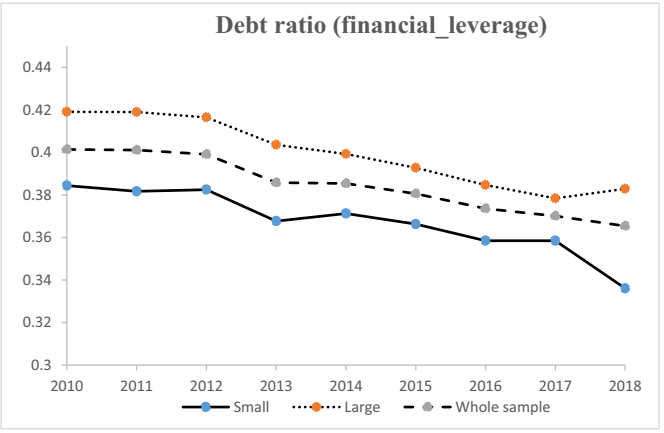

Fig. 1. Average debt ratio (*financial_leverage*) over the 2010–2018 sample period. The figure shows the evolution for the whole sample and separately for the smallest and largest observations.

and Udell (2012) state that the positive and negative shocks to a bank are more significant for riskier firms and firms with less collateral, typically small firms.

We contribute to the research on EU private firms' capital structure choice in several ways. First, we provide new evidence on the impact of European institutional factors by differentiating between financially constrained (small) and unconstrained (large) firms; this field remains underexplored as most of the research has focused on large, listed firms. We extend the conventional determinants of capital structure by exploring the role of new variables, such as corruption in society or the enforcement of debt contracts. Furthermore, we suggest a challenging new hypothesis to explain why small (constrained) firms may be more affected than their large counterparts due to the statutory environment. Second, unlike other research papers on this topic, such as Jõeveer (2013a, 2013b) or Mc Namara et al. (2017), we include all EU countries at the time of the study; thus, we base our analysis on a broader and more representative sample. This approach also allows us to discard some significant countries to control for their particular weight in the regression results. Third, we provide evidence of small firms' greater difficulties accessing external finance. Unlike other research papers—such as Beck et al. (2008), which is based on a firm survey—our findings are built on an extensive panel data set combining firm- and country-level variables. To show clear and homogeneous results, we separate the institutional factors into three categories: namely, legal or regulatory, enforcement, and financial system development. This separation also allows us to tackle the endogeneity problem affecting some financial system variables.

The rest of the paper is organized as follows. The next section discusses essential issues in the literature and defines some hypotheses to be tested. Section 3 explains the methodology applied and the variables used, while Section 4 analyses the data and presents some relevant variable statistics. Section 5 examines the estimation results, Section 6 adds some appropriate robustness tests, and Section 7 concludes.

2. Literature review and hypotheses

As described above, we focus on the legal or regulatory environment in the financing choice of private firms by dividing the sample into small and large firms, supposedly financially constrained and unconstrained firms. We also use a firm's age as an alternative criterion to split the sample for comparative purposes. In countries where business legislation is inefficient and corruption is a real threat, firms use more debt than equity as it is more challenging to expropriate creditor rights (Fan et al., 2012). Consequently, companies tend to finance with debt in countries with low levels of protection for equity investors. In contrast, individuals' integrity or trust in the law facilitates business development; thus, they will use less debt and more equity (Demirgüç-Kunt & Maksimovic, 1999).

Although we expect to see such behavior for all private firms, the impact should be greater for small firms because they are considered more financially constrained than large firms; thus, they are more sensitive to external finance (Hadlock & Pierce, 2010). This constraint is because (i) small firms face more financial frictions (mainly adverse selection costs stemming from information asymmetries, high transaction costs, and default risk costs) and (ii) they are less able to generate cash flow (Hoberg & Maksimovic, 2015). Hence, once small firms have used up their internal resources, they heavily depend on external debt to finance their investment needs. Small firms can only access equity financing if the business legislation is efficient and trustworthy, thus allaying their financial frictions. Conversely, large companies have more flexibility to choose external finance, regardless of the business legislation.

Based on this rationale, our first hypothesis is expressed as follows:

H1. *Assuming that small firms are more financially constrained than large firms, we expect a positive (negative) effect of inefficient (efficient) business regulation on leverage, which is greater for small firms.*

The enforcement of debt contracts can also affect leverage (Djankov, Hart, McLiesh, & Shleifer, 2008). In countries with quality insolvency procedures and strict protection of creditors' rights, with repossession of collateral and control of the firm in default, firms

are expected to borrow less to take less risk (Acharya, Amihud, & Litov, 2011; Cho, El Ghoul, Guedhami, & Suh, 2014); however, creditor rights protection through the enforcement of contracts encourages lenders to increase credit to firms since they are guaranteed that the loans can be recovered in case of default (Fan et al., 2012; Giannetti, 2003). Furthermore, poor enforcement of debt contracts reduces loan recovery and increases the time needed to recover collateral after default (Bae & Goyal, 2009; Mol-Gómez-Vázquez, Hernández-Cánovas, & Koëter-Kant, 2018). Thus, borrowers are expected to find better credit conditions when there is well-defined insolvency legislation, as creditors rely on assuming less risk when repossessing the loan.

Considering that small firms are more financially constrained than large firms, this effect will be greater for them.

Keeping in mind this reasoning, we propose our second hypothesis:

H2. *Assuming that small firms are more financially constrained than large firms, we expect a positive effect of enforcement of debt contracts on leverage, which is greater for small firms.*

The literature indicates that the development of the financial system has a relevant influence on capital structure choice (Beck et al., 2008; Hernández-Cánovas & Martínez-Solano, 2010; Mc Namara et al., 2017). In particular, bank market power affects financing decision-making as financial entities can more easily monitor borrowers. This monitoring effect is based on the availability of information arising from bank market concentration; thus, by accessing more information, banks can achieve economies of scale and reduce agency costs (Diamond, 1984). Mol-Gómez-Vázquez, Hernández-Cánovas, and Koëter-Kant (2019) and Petersen and Rajan (1995) suggested that creditors would be more likely to finance credit-constrained firms (typically, small firms) in a concentrated credit market, thus allowing creditors to share the surplus generated by the firm in the future. Likewise, other indicators of financial development, such as the weight of financial assets of financial corporations and the development of financial institutions, can play a similar role; that is, they can encourage banks to finance constrained firms. This effect may extend less intensely to unconstrained firms as they do not depend heavily on bank financing.

Based on this rationale, our third hypothesis is defined as follows:

H3. *Assuming that small firms are more financially constrained than large firms, we expect a positive effect of institutional financial development on leverage, which is greater for small firms.*

3. Method and variables

3.1. Applied methodology

To test the formulated hypotheses, we split the sample into two sets according to the size of the observations. The first group corresponds to the 40% smallest observations, while the second group represents the largest 40%; we discard the 20% of observations in the middle. This strategy allows us to compare the behavior of small and large firms more clearly. The former group, small firms, is assumed to be more financially constrained. We propose a panel data regression model, estimated separately for the two groups. Then, we compare the estimates of the variables of interest in the two groups by testing the coefficients' differences. For comparative purposes, we apply stricter size cut-offs as a robustness test. Moreover, we also split the sample between young and mature firms and then replicate the regressions. As an additional robustness test to corroborate the results, we also use the SA_index of Hadlock and Pierce (2010) to split the sample between constrained and unconstrained firms.

Following the results of a Hausman test, either a fixed or random effects procedure is used for the estimations; we expect unobservable individual effects to be highly correlated with most of the included covariates, which is the key for using fixed effects. Furthermore, some country-level determinants have time-invariant values in their respective countries throughout the sample period. Accordingly, we conduct the estimations using random effects for comparative purposes and the Hausman–Taylor procedure, allowing time-invariant variables to be incorporated in the regression. Given all the above, we regress the following model:

$$\mathrm{lev}_{it} = \mathrm{X}'_{f}\,\beta_{f} + \mathrm{X}'_{c}\,\beta_{c} + \mu_{i} + \varepsilon_{it} \tag{1}$$

where the dependent variable, lev_{it}, is the leverage for the ith company in any country and year t. X_f is a vector of firm-level variables, X_c is a vector of country-level variables (macroeconomic and institutional variables), and β is a vector of coefficients associated with the covariates. μ_i absorbs unobservable individual effects, and ε_{it} is the model's disturbance term, which is assumed to be independent and identically distributed (iid).

Some problems associated with our estimation model, Eq. (1), must be addressed. Standard errors of coefficients are corrected with the Huber–White robust estimator to deal with heteroskedasticity. As an alternative, we also present estimates using a clustered estimator. Unlike the former, the clustering procedure allows for within-group correlation (e.g., among firms of the same country); that is, it relaxes the common condition that the observations be independent of one another for the regressions not to yield biased estimates. Furthermore, some institutional variables appear highly correlated, so they are introduced into the models separately—according to the hypothesis in question—to solve multicollinearity problems and facilitate the interpretation of results. Moreover, as indicated by early empirical evidence, firms' leverage may also influence the behavior of some institutional financial variables, raising endogeneity problems (Demirgüç-Kunt & Maksimovic, 1999; Fan et al., 2012). Thus, we conduct some robustness tests to check for possible bias of this type. We also consider that the aftermath of the 2007–2008 financial crisis may influence our results and

perform some robustness tests to check. In addition, to help corroborate our results, we use market versus bank orientation as an alternative benchmark to analyze the influence of institutions on financing policies.[4] Lastly, all firm-specific variables have been winsorized to allay concerns about outlier bias.

3.2. Dependent variable

Our primary definition of a firm's leverage is based on total financial debt—short- and long-term financial debt—and we term the measure *financial_leverage* expressed as the ratio between financial debt and financial debt plus net worth (Fan et al., 2012; Giannetti, 2003; Hovakimian & Li, 2012). Alternatively, for comparative purposes, we use a broader definition, denoted *total_leverage*, based on the firm's total liabilities; that is, it includes accounts payable and the like, defined as the ratio of total liabilities to total assets (Alter & Elekdag, 2020; Booth, Aivazian, Demirgüç-Kunt, & Maksimovic, 2001; Flannery & Rangan, 2006). This second definition seems particularly suitable for private firms, where accounts receivable and accounts payable can be meaningful.

3.3. Firm-level explanatory variables

Considering previous empirical evidence, we include some standard firm-specific variables in the model to control for their relevant effects (Fama & French, 2002; Flannery & Rangan, 2006; Frank & Goyal, 2009; Leary & Roberts, 2005; Öztekin, 2015). All firm-level data are collected from the Orbis database. We capture the risk of default, denoted *distress*, as the ratio of the standard deviation of the operating cash flow to total assets. We use the term *growth* to refer to growth opportunities calculated as the percentage change in total sales. This ratio is particularly appropriate when market data are unavailable.[5] The firm's profitability, *profit*, is expressed as the ratio of operating net income to total assets from the previous year; it is a proxy of the firm's general performance. Industrial sector leverage, termed *sector-financial_lev* (*sector-total_lev*), indicates the *financial_leverage* (*total_leverage)* of the industrial sector to which the firm belongs, defined as the average sector indebtedness for each country and year. We also incorporate the variable *size*, which refers to the firm's size in terms of assets, measured as the natural logarithm of total assets. Lastly, we consider the *tangibility* of the firm, which reflects the tangible fixed assets as a proportion of total assets.

3.4. Macroeconomic control variables

Three macroeconomic variables are considered in the analysis to control for general economic effects. They vary over time and across countries, although they are invariant for all the firms in each year and country. The first such variable captures the capital formation: it is denoted *capital_formation*, defined as the annual gross capital formation as a percentage of gross domestic product (GDP). Our second variable, *gdp_growth*, is measured as the percentage growth rate of real GDP per capita. Lastly, our third variable is the fluctuation in the Consumer Price Index, indicative of *inflation*. This variable is computed as the annual percentage rate of change in the Consumer Price Index. All these variables have been sourced from The World Bank Group (2020a).

3.5. Institutional variables

We collected data on seven relevant institutional variables to test the hypotheses, two of which capture the quality of regulation. First, we use a corruption index, *corruption*, which Transparency International defines as the abuse of entrusted power for private gain. It is a composite indicator that measures the perception of corruption in the public sector by aggregating different sources of corruption-related data. The index ranges from 0 to 100, with larger values indicating less corruption; however, we reversed the index for simplicity, so higher values indicate increased corruption. Second, the strength or efficiency of the legal system is proxied by the variable *freedom*. According to The Heritage Foundation, this index includes 10 items grouped into 4 broad categories: (i) the rule of law, (ii) limited government, (iii) regulatory efficiency, and (iv) open markets. The index ranges between 0 and 100, where 100 indicates the highest level of economic freedom. These two variables' data sources are The Heritage Foundation (2020) and Transparency International (2020).

The following two variables aim to capture the efficiency of contract enforcement. The first such variable, *enforce_procedures,* is the degree of enforcement of debt contracts. This variable is based on the number of procedures to enforce a contract, which is the number of independent actions mandated by law or courts that require interaction between the parties of a contract or between these parties and the judge or court officer. The second variable is the recovery rate of debt insolvency, *recovery_rate,* which captures the amount recovered through different processes, such as reorganization and liquidation. This variable considers the time, cost, and outcome of insolvency proceedings in each economy. Data for both variables were sourced from The World Bank Group (2020b).

Lastly, three additional variables are included to test the effects of a country's financial development on firm leverage. First, the relevance of the credit market, *bank_assets*, is measured by the ratio of the total financial assets of financial corporations to GDP. Total financial assets comprise all financial claims, equity, and the gold bullion component of monetary gold, while financial corporations refer to banks and other financial intermediaries. Second, the concentration of the banking system, *bank_concentration*, measures the

[4] We appreciate a referee's suggestion to include these tests.

[5] These two measures, growth and market-to-book, are significantly and positively correlated in previous research (López-Gracia & Sogorb-Mira, 2014).

bank market power and is calculated by the combined assets of the five largest credit institutions as a proportion of the total banking sector assets. Third, we use a financial development index, *financial_institutions*, built by Svirydzenka (2016), who prepared an International Monetary Fund Working Paper about a new broad index of financial development. Although it comprises two sets of indices, financial institutions and financial markets, we opted for the former as it is more appropriate for private firms. Financial institutions include banks, insurance companies, mutual funds, and pension funds; the associated index measures how developed financial institutions are overall. This index ranges from 0 to 1, with higher values indicating more financial development. Data for these three variables, *bank_assets*, *bank_concentration*, and *financial_institutions*, was sourced from Eurostat (2020), the European Central Bank (2020), and International Monetary Fund (2020), respectively.

Table A1 (Appendix) presents the notations, definitions, and sources for all the variables.

4. Data and variable statistics

4.1. Sample

Firm-level data were sourced from the Orbis database, managed by Bureau van Dijk Electronic Publishing. We accessed this database in October 2019 (update 188,004), when it comprised around 360 million entities worldwide. Orbis reports on more than 100 million companies in Europe, from which we collected financial data for a sample of private firms from the whole EU (28 countries) from 2010 to 2018. Selected firms have the information needed for all the variables included in our models, and they fulfill two additional requirements. (1) They audit and prepare consolidated accounts, and (2) they have total assets of more than €43 million in at least one of the sample years, in line with the definition established by the European Commission for an SME (Recommendation 2003/361/EC). All the firms in the sample are relatively large, ensuring better quality data and comparability, although we recognize that many firms are excluded from the sample. Financial and insurance sectors and the like have been discarded as they adhere to substantially different financial policies.

Our sample forms an unbalanced panel data set; some firms do not report information in some years throughout the sample period, thus allaying survivorship bias. In addition, observations containing inconsistencies were dropped. In the end, our panel data include 21,928 firms corresponding to 129,639 observations from the EU 28 countries. Details of distribution by country and size, including information on the mean leverage ratios, are displayed in Table A2 (Appendix). As shown, four countries—Bulgaria, Estonia, Romania, and Slovenia—contribute 10 or fewer observations to either of the groups, which is one of this study's weaknesses. In all countries, *total_leverage* is notably higher than *financial_leverage*, as expected. Table A3 (Appendix) displays the distribution of the two subsamples by year and size, while Table A4 (Appendix) breaks up the total sample by the industrial sector. Notable sectors are real estate and other services (46%), manufacturing (17%), and wholesale and retail trade (12%).

4.2. Variable statistics

Table 1 reports the main statistics of the dependent and explanatory variables. As explained (Subsection 3.1), observations are split into two groups according to their size, namely, small and large subsamples. All firm-specific variables are winsorized at 0.5% in each distribution tail to alleviate the impact of outliers.

Panel A shows that the dependent variable is higher in the large group, with a difference between the two groups of 2.9% points and 2.3% points for financial and total leverage, respectively. This discrepancy is consistent with our reasoning that small firms are more financially constrained than large firms; thus, they secure less external debt. Small firms appear to be notably smaller than their large counterparts (€46 and €413 million, respectively). The small subsample registers notably lower *tangibility* than the large group (29.5% and 34.4%, respectively), as a result of which the former group faces more difficulties in obtaining credit. In addition, *distress*, *growth*, and *profit* are similar in the two subsamples. Lastly, Panels B and C display relevant statistics for this study's macroeconomic and institutional variables.

To improve the understanding of the relationships between our variables, we estimate a Pearson correlation matrix, as shown in Table A5. Panel A displays correlations between firm-level variables, while Panel B reports correlations between country-level variables, including our two debt ratio measures in both cases. Both panels' correlations are significant, although their coefficients are not very high. A variance inflation factor (VIF) analysis using our two definitions of leverage confirms that multicollinearity is unlikely to be a serious problem in our data; all VIF estimates are below the generally accepted cut-off of 10 for all regressors (not reported).

Table 2 reports a mean difference test to analyze statistical differences in firm-level variables between the two groups of small and large firms, in line with this study's objectives. Significant statistical differences between the two groups exist for all dependent and independent variables. Consistent with our expectations, the debt ratios of small firms are significantly lower than those of large firms.

5. Empirical results

5.1. Baseline model

For comparative purposes, we start the empirical analysis by estimating a fixed-effect baseline model, Eq. (1), using the whole sample and only including firm-specific and macroeconomic variables. Table A6 (Appendix) shows the results for the two specifications of the debt ratio, *financial_leverage,* and *total_leverage*. Furthermore, Eq. (1) is regressed through the fixed-effect estimator using procedures robust to heteroskedasticity and clustering. As reported, all firm-specific variables are significant and consistent in all

Table 1
Descriptive statistics of variables.

Panel A. Financial variables

	Total (100%)					Small (40%)					Large (40%)				
Variables	Mean	SD	Min.	Max.	Obs.	Mean	SD	Min.	Max.	Obs.	Mean	SD	Min.	Max.	Obs.
financial_leverage	0.3845	0.2780	0.0000	0.9914	118,717	0.3689	0.2780	0.0000	0.9914	46,133	0.3983	0.2782	0.0000	0.9914	48,598
total_leverage	0.5929	0.2275	0.0225	0.9954	129,639	0.5814	0.2331	0.0225	0.9954	51,856	0.6052	0.2218	0.0225	0.9954	51,856
distress	0.0337	0.0420	0.0005	0.3520	98,043	0.0412	0.0516	0.0005	0.3520	38,683	0.0272	0.0315	0.0005	0.3520	39,236
growth	0.1382	0.7793	−0.8897	9.1665	102,202	0.1285	0.7550	−0.8897	9.1665	39,506	0.1451	0.7924	−0.8897	9.1665	41,824
profit	0.0659	0.0921	−0.2342	0.5982	103,686	0.0722	0.1032	−0.2342	0.5982	40,534	0.0594	0.0801	−0.2342	0.5982	42,081
sector-financial_lev	0.3824	0.0778	0.1819	0.5728	129,613	0.3789	0.0787	0.1819	0.5728	51,848	0.3864	0.0771	0.1819	0.5728	51,849
sector-total_lev	0.5929	0.0675	0.3883	0.7577	129,639	0.5890	0.0692	0.3883	0.7577	51,856	0.5974	0.0650	0.3883	0.7577	51,856
size	11.7689	1.2018	9.3447	16.3409	129,639	10.7379	0.3676	9.3447	11.238	51,856	12.9322	1.0059	11.7886	16.3409	51,856
tangibility	0.3205	0.2677	0.0000	0.9762	128,792	0.2951	0.2512	0.0000	0.9762	51,462	0.3449	0.2852	0.0000	0.9762	51,541

Panel B. Macroeconomic variables

			Total		
Variables	Mean	SD	Min.	Max.	Obs.
capital_formation	21.0563	3.6213	10.20	37.40	252
gdp_growth	1.8956	2.8640	−9.00	24.00	252
inflation	1.4563	1.4702	−2.10	6.10	252

Panel C. Institutional variables

			Total		
Variables	Mean	SD	Min.	Max.	Obs.
corruption	35.7092	14.7294	8.00	64.00	196
freedom	69.0821	5.6187	53.20	81.30	252
enforce_procedures	32.6786	5.3159	21.00	43.00	252
recovery_rate	60.8905	21.111	20.90	90.30	252
bank_assets	11.29	31.49	0.86	202.88	252
bank_concentration	0.6116	0.177	0.262	0.973	250
financial_institutions	0.6808	0.1362	0.400	0.910	252

The sample (total sample) is split into small (40% smallest observations) and large (40% largest) groups by size. The variable *size* is reported as the natural logarithm of total assets. Table A1 in the Appendix provides definitions of all the variables.

Table 2
Mean difference tests for small and large observations.

Variables	Small	Large	Difference (*p*-value)
financial_leverage	0.3689	0.3983	−0.0294 (0.000)
total_leverage	0.5814	0.6052	−0.0238 (0.000)
distress	0.0412	0.0272	0.0140 (0.000)
growth	0.1285	0.1451	−0.0166 (0.002)
profit	0.0722	0.0594	0.0128 (0.000)
sector-financial_lev	0.3789	0.3864	−0.0075 (0.000)
sector-total_lev	0.5890	0.5974	−0.0084 (0.000)
size	10.7379	12.9322	−2.1943 (0.000)
tangibility	0.2951	0.3449	−0.0498 (0.000)

The sample is split into small (40% smallest observations) and large (40% largest) groups by size. Table A1 in the Appendix provides definitions of all the variables.

regressions, and the *F*-statistic confirms their joint significance. Variables *distress* and *profit* are found to be negatively related to debt ratios, whereas *growth*, *sector-financial_lev* (*sector-total_lev), size,* and *tangibility* have a positive impact. Estimates align with previous empirical literature (Demirgüç-Kunt, Martinez Peria, & Tressel, 2020; He, Hu, Mi, & Yu, 2021; Thapa, Rao, Farag, & Koirala, 2020); however, Alter and Elekdag (2020) report different results. In particular, their variable *tangibility* is the only one that shows a similar effect to ours. Moreover, results hold after controlling for time, industrial sector, and country dummies (for brevity, the results are not reported).[6] Lastly, the *capital_formation* macroeconomic variable seems to negatively influence a firm's debt ratio, whereas *gdp_growth* and *inflation* have a positive impact.

5.2. Business regulation and leverage

In testing our first hypothesis, H1, we examine the impact of business regulation on firms' leverage. To this end, we include in Eq. (1) two institutional variables capturing (i) inefficiencies in the legal system (*corruption*) and (ii) the strength of the legal system for doing business (*freedom*). Furthermore, we control for firm-specific and macroeconomic variables. Table 3 reports the regression results for our two definitions of the debt ratio, *financial_leverage,* and *total_leverage*.

Columns 1 and 4 show estimates for the small subsample, while Columns 2 and 5 report those of the large group. Furthermore, Columns 3 and 6 report the test results for coefficient differences. Consistent with H1, the variable *corruption* has a statistically significant positive effect on leverage in small firms; however, it is insignificant in large firms. As explained above, small firms appear particularly sensitive to external finance and increase debt levels if corruption is high; this effect is negligible or non-existent for large firms. The test for the difference between coefficients in Column 3 (financial leverage analysis) is also significant, confirming the rationale. The variable *freedom* (a proxy for the efficiency of the legal system) shows a significant negative impact on leverage in all columns, as expected, with the difference between coefficients only significant for the total leverage estimates. Overall, the rationale for the effects of business regulation on firms' leverage resembles the pecking order theory, with these effects being greater for small firms, as explained above (Introduction). When considering sector and country dummies, estimates remain qualitatively the same, except for the variable corruption, which is insignificant.

5.3. Contract enforcement and leverage

We focus now on testing our second hypothesis (H2), which analyses the impact of contract enforcement regulation on a firm's leverage. We incorporate two institutional variables in Eq. (1): (i) the number of procedures to enforce a contract (*enforce_procedures*) and (ii) the recovery rate of debt insolvency (*recovery_rate*). We also control for firm-specific and macroeconomic variables. Table 4 displays the regression results for our two definitions of the debt ratio, *financial_leverage,* and *total_leverage*.

As the variable *enforce_procedures* is time-invariant, we estimate Eq. (1) using random effects, as explained above (Subsection 3.1). Columns 1 and 4 report the estimates for the small subsample, while Columns 2 and 5 give the results of the large group. Moreover, Columns 3 and 6 show the test results for coefficient differences. Both *enforce_procedures* and *recovery_rate* variables exhibit significant and positive coefficients, as predicted. Notwithstanding, differences between estimates for small and large subsamples are statistically insignificant. As an alternative, to reinforce the estimation results, we use the Hausman–Taylor estimator to estimate Eq. (1). The results qualitatively hold, except for the variable *enforce_procedures,* which are insignificant (results not reported). In line with previous research, contract enforcement regulation positively influences a firm's financial policy; however, the effects on small and large firms do not appear to differ significantly. Our results contradict He et al. (2021), who suggest that strong creditor protection may constrain firms' efforts to raise debt. Lastly, when introducing sector and country dummies in the regressions, the results remain qualitatively unchanged (not reported).

[6] Any results that are not reported are available from the authors upon request.

Table 3
Business regulation and leverage estimates.

	Dependent variable					
	financial_leverage			total_leverage		
	1 Small	2 Large	3 Difference (p-value)	4 Small	5 Large	6 Difference (p-value)
distress	−0.3214 (0.0680)***	−0.5205 (0.0871)***		−0.3137 (0.0578)***	−0.4136 (0.0682)***	
growth	0.0085 (0.0011) ***	0.0059 (0.0012) ***		0.0096 (0.0010) ***	0.0065 (0.0009) ***	
profit	−0.3252 (0.0192)***	−0.3178 (0.0237)***		−0.2109 (0.0140)***	−0.2238 (0.0170)***	
sector-financial_lev	0.4730 (0.0467)***	0.5619 (0.0450)***				
sector-total_lev				0.5302 (0.0438)***	0.4540 (0.0414)***	
size	0.0923 (0.0068)***	0.0783 (0.0075)***		0.0601 (0.0054)***	0.0495 (0.0058)***	
tangibility	0.2391 (0.0235) ***	0.1366 (0.0206) ***		0.0828 (0.0186) ***	0.0951 (0.0156) ***	
capital_formation	−0.0048 (0.0009)***	−0.0071 (0.0009)***		−0.0023 (0.0007)***	−0.0027 (0.0006)***	
gdp_growth	−0.0017 (0.0005) ***	−0.0022 (0.0005) ***		−0.0006 (0.0004)	−0.0021 (0.0004) ***	
inflation	−0.0003 (0.0009)	−0.0017 (0.0009) **		0.0005 (0.0006)	−0.0009 (0.0006) *	
corruption	0.0016 (0.0004)***	−0.0003 (0.0004)	0.0019 (0.0446)	0.0010 (0.0003)***	−0.0002 (0.0003)	0.0012 (0.2275)
freedom	−0.0035 (0.0008)***	−0.0031 (0.0008)***	−0.0004 (0.9307)	−0.0022 (0.0006)***	−0.0029 (0.0005)***	0.0007 (0.0614)
constant	−0.5576 (0.0969)***	−0.4925 (0.1156)***		−0.2097 (0.0771)***	−0.0605 (0.0852)	
Observations	30,122	32,817		32,406	33,901	
F-statistic	79.04	58.84		66.05	56.65	
P-value	0.0000	0.0000		0.0000	0.0000	
R-Squared	0.1273	0.0766		0.1095	0.0898	

The variable *financial_leverage* is total financial debt divided by the sum of net worth and total financial debt, while *total_leverage* is total liabilities divided by total assets. Robust fixed-effect regression coefficients estimated with standard errors are in parentheses. Significance levels at 1%, 5%, and 10% are indicated by ***, **, and *, respectively. F-statistic tests the null hypothesis that all coefficients of the explanatory variables are equal to zero. The Difference (p-value) column reports the test's *p*-values for the difference in coefficients between small and large firm subsamples. Table A1 in the Appendix provides definitions of all the variables.

5.4. Institutional financial development and leverage

We now test our third hypothesis (H3) regarding the effect of institutional financial development on firms' leverage. We estimate Eq. (1) incorporating three additional variables capturing (i) the importance of the banking institutions (*bank_assets*), (ii) the credit market competition (*bank_concentration*), and (iii) the development of the financial institutions (*financial_institutions*). In addition, we also control for firm-specific and macroeconomic variables. Table 5 reports the regression results for our two debt ratio definitions, *financial_leverage* and *total_leverage*.

Columns 1 and 4 show estimates for the small subsample, while Columns 2 and 5 refer to the large group results. Furthermore, Columns 3 and 6 show the test for differences between coefficients. As expected, institutional financial variables register significant positive effects in small and large subsamples. Overall, our results indicate that the financial system development helps all types of private firms access external funding, particularly bank financing; however, the tests for the differences between coefficients show a significant discrepancy between small and large firms only for the variable *bank_assets*. Given the considerable variation in this variable, we recalculated it as a logarithm, and the estimates remain the same (not reported). After incorporating sector and country dummies in the regressions, the overall results also hold.

Regarding the firm-specific variables, the regression results in Tables 3–5 show statistically significant coefficients in all scenarios, consistent with our baseline results in Table A6 and the extant literature, as stated above. Concerning the macroeconomic variables, the annual gross capital formation, *capital_form*, is negatively related to the debt ratio in almost all regressions. Moreover, the real GDP growth rate, *gdp_growth*, has a partial negative effect on leverage, whereas the relationship with *inflation* is primarily positive.

Lastly, we analyzed the institutional variables' economic impact on small and large firms. With all else constant, it can be estimated by a one standard deviation increase in the estimated coefficient of a particular variable divided by the mean value of the dependent variable (Kim, Mauer, & Sherman, 1998). Based on the regressions reported in Tables 3–5 and using the estimates relative to the *financial_leverage* dependent variables, two variables have a significant economic impact (in absolute terms) for the small group: *bank_assets*, 51.2%; and *financial_institutions*, 9.1%. The equivalent figures for the large group are 11.1% and 8.8%, respectively.

Table 4
Contract enforcement and leverage estimates.

	Dependent variable					
	financial_leverage			total_leverage		
	1 Small	2 Large	3 Difference (*p*-value)	4 Small	5 Large	6 Difference (p-value)
distress	−0.3891 (0.0478)***	−0.5106 (0.0663)***		−0.3162 (0.0428)***	−0.3769 (0.0550)***	
growth	0.0106 (0.0011) ***	0.0076 (0.0012) ***		0.0107 (0.0009) ***	0.0069 (0.0008) ***	
profit	−0.3395 (0.0165)***	−0.3393 (0.0202)***		−0.2149 (0.0125)***	−0.2245 (0.0151)***	
sector-financial_lev	0.7408 (0.0311)***	0.7684 (0.0310)***				
sector-total_lev				0.8298 (0.0288)***	0.6680 (0.0285)***	
size	0.0687 (0.0057)***	0.0368 (0.0033)***		0.0467 (0.0046)***	0.0286 (0.0031)***	
tangibility	0.2154 (0.0136) ***	0.1531 (0.0112) ***		0.0482 (0.0118) ***	0.0540 (0.0099) ***	
capital_formation	−0.0019 (0.0007)***	−0.0043 (0.0007)***		−0.0011 (0.0006)*	−0.0015 (0.0005)***	
gdp_growth	0.0006 (0.0004)	0.0003 (0.0004)		0.0009 (0.0003) ***	−0.0004 (0.0003)	
inflation	−0.0048 (0.0008) ***	0.0015 (0.0008) **		0.0035 (0.0006) ***	0.0018 (0.0005) ***	
enforce_procedures	0.0017 (0.0007) **	0.0005 (0.0007)	0.0012 (0.8318)	0.0003 (0.0006)	0.0002 (0.0005)	0.0001 (0.5916)
recovery_rate	0.0003 (0.0001)*	0.0003 (0.0001)**	0.0000 (0.6405)	0.0003 (0.0001)***	0.0002 (0.0001)**	0.0001 (0.3190)
constant	−0.7278 (0.0726)***	−0.3409 (0.0556)***		−0.4114 (0.0604) ***	−0.1386 (0.0530) ***	
Observations	34,039	36,623		36,586	37,782	
Wald-statistic	1648.44	1548.61		1544.89	1091.57	
P-value	0.0000	0.0000		0.0000	0.0000	
R-Squared	0.1214	0.0671		0.1049	0.0778	

The variable *financial_leverage* is total financial debt divided by the sum of net worth and total financial debt, while *total_leverage* is total liabilities divided by total assets. Robust random-effect regression coefficients estimated with standard errors are in parentheses. Significance levels at 1%, 5%, and 10% are indicated by ***, **, and *, respectively. Wald-statistic tests the null hypothesis that all coefficients of the explanatory variables are equal to zero. The Difference (p-value) column reports the test's p-values for the difference in coefficients between small and large firm subsamples. Table A1 in the Appendix provides definitions of all the variables.

6. Robustness

Below we present some tests of the sensitivity of our previous estimates. First, as this research mainly focuses on testing the effects of the institutional environment on the debt ratio of two groups of small and large firms, we split our sample again. Applying stricter parameters, the new small and large groups now include the smallest 30% and the largest 30% of the observations in the sample; we discard 40% of the observations in the middle. We then rerun all the regressions in Tables 3–5 to test our three hypotheses, and the estimates consistently hold (results are not reported).

Second, we have also split the sample using the age of companies to strengthen the results obtained using their size. Young and mature firms (financially constrained and unconstrained, respectively) are identified in three ways: (i) the first quartile versus the fourth quartile; (ii) the first quartile versus the remaining 75% of the sample; and (iii) those below the median versus those above the median. Then, we run all the regressions in Tables 3–5 using these three classification categories. The overall results resemble those previously obtained (not reported).

Third, given that our dependent variable (both *financial_leverage* and *total_leverage*) is bounded between 0 and 1, we regressed all the models in Tables 3–5 using the Tobit censored regression model. This method is appropriate in our model setting as some observations could result in censoring, particularly right-censoring; that is, above the threshold of 1 in highly indebted firms. Estimates resemble those previously obtained, although the variables *corruption* and *bank_assets* are not statistically significant (results not reported).

Fourth, some previous studies claim that institutional financial variables could be endogenous as they are likely to be influenced by the capital structure preferences of firms (Demirgüç-Kunt & Maksimovic, 1999; Fan et al., 2012); however, other research contends that these financial variables capturing a country's financial development do not generate endogeneity problems and can be considered exogenous regarding the individual firm (Giannetti, 2003). Notwithstanding, we test for this problem in all the models in Table 5 (Hypothesis 3), considering the three financial development variables as endogenous. In doing so, we use one lag of these variables as instruments. Estimation results reject the existence of endogeneity problems in all scenarios, except one (not reported).

Fifth, since the UK, Germany, and Italy have greater representation in the sample than the other EU countries, we explore whether the results in Tables 3–5 change if each of those countries is separately discarded. We find similar estimates in general, although some changes appear after removing the UK (for brevity, these estimates are not reported). In particular, the variables *corruption* and *recovery_rate* included in Tables 3 and 4 become non-significant for small and large firm regression models, respectively. Furthermore,

Table 5
Financial development and leverage estimates.

	Dependent variable					
	financial_leverage			total_leverage		
	1 Small	2 Large	3 Difference (p-value)	4 Small	5 Large	6 Difference (p-value)
distress	−0.2993 (0.0590)***	−0.4689 (0.0764)***		−0.2795 (0.0501)***	−0.3605 (0.0597)***	
growth	0.0094 (0.0011) ***	0.0061 (0.0012) ***		0.0101 (0.0009) ***	0.0064 (0.0008) ***	
profit	−0.3247 (0.0183)***	−0.3146 (0.0224)***		−0.2030 (0.0136)***	−0.2189 (0.0161)***	
sector-financial_lev	0.5689 (0.0459)***	0.6025 (0.0451)***				
sector-total_lev				0.6427 (0.0422)***	0.5166 (0.0381)***	
size	0.0843 (0.0063)***	0.0675 (0.0067)***		0.0547 (0.0051)***	0.0394 (0.0054)***	
tangibility	0.2382 (0.0227) ***	0.1456 (0.0195) ***		0.0781 (0.0178) ***	0.0997 (0.0150) ***	
capital_formation	−0.0014 (0.0008) *	−0.0042 (0.0008)***		−0.0005 (0.0006)	−0.0010 (0.0005)*	
gdp_growth	−0.0003 (0.0005)	−0.0006 (0.0004)		0.0004 (0.0003)	−0.0010 (0.0003) ***	
inflation	0.0059 (0.0008) ***	0.0026 (0.0008) ***		0.0043 (0.0006)***	0.0023 (0.0005) ***	
bank_assets	0.0060 (0.0015)***	0.0014 (0.0008) *	0.0046 (0.0230)	0.0041 (0.0011) ***	0.0004 (0.0006)	0.0037 (0.2990)
bank_concentration	0.1083 (0.0323)***	0.0908 (0.0333) ***	0.0175 (0.1739)	0.0447 (0.0262) *	0.0700 (0.0247)***	−0.0253 (0.7287)
financial_institutions	0.2461 (0.0547) ***	0.2586 (0.0538) ***	−0.0125 (0.2558)	0.1502 (0.0429) ***	0.2012 (0.0372) ***	−0.0510 (0.7011)
constant	−1.0684 (0.0910)***	−0.9107 (0.1031)***		−0.5543 (0.0774) ***	−0.4055 (0.0857)***	
Observations	34,038	36,621		36,585	37,780	
F-statistic	80.87	57.73		74.11	55.73	
P-value	0.0000	0.0000		0.0000	0.0000	
R-Squared	0.1256	0.0727		0.1081	0.0831	

The variable *financial_leverage* is total financial debt divided by the sum of net worth and total financial debt, while *total_leverage* is total liabilities divided by total assets. Robust fixed-effect regression coefficients estimated with standard errors are in parentheses. Significance levels at 1%, 5%, and 10% are indicated by ***, **, and *, respectively. F-statistic tests the null hypothesis that all coefficients of the explanatory variables are equal to zero. The Difference (p-value) column reports the test's p-values for the difference in coefficients between small and large firm subsamples. Table A1 in the Appendix provides definitions of all the variables.

the variables *bank_assets* and *bank_concentration* included in Table 5 are non-significant, again only for small firm regression models. All the remaining results hold.

Sixth, we consider market versus bank orientation as an alternative benchmark to analyze the influence of institutions on financing policies. We replicated all our estimates incorporating market-oriented countries versus bank-oriented countries. Some previous research analyzed which countries belong to one group or another, drawing on information about the quality of their capital markets (see Bancel & Mittoo, 2004; Demirgüç-Kunt & Levine, 1999; Demirgüç-Kunt & Maksimovic, 2002). Demirgüç-Kunt and Maksimovic (2002) included only 14 countries that belong to the EU; however, they are relevant countries that represent about 95% of the sample (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, and the UK). Three of the countries are judged to be market-oriented (the Netherlands, Sweden, and the UK). Regressions include a dummy variable *market_based*, which equals 1 if a country is market-based, and 0 otherwise. Results (not reported) resemble those previously obtained regarding the institutional variables. Moreover, the dummy *market_based* turns out to be negatively significant in all small firm regression models, indicating that small firms in market-based countries are less leveraged than their small counterparts in bank-based countries. Regarding large firm regression models, the dummy variable *market_based* yields varying results depending on the model, although its coefficient is primarily positive; large firms show the opposite behavior. Furthermore, we have run a baseline model with all firm-level and macroeconomic variables, including the dummy *market_based*, with no institutional variables. The purpose is to capture the isolated effect on leverage of belonging to a market-based or a bank-oriented country. The results for the dummy *market_based* are coherent and show negative and positive coefficients for small and large firms, regardless of the chosen dependent variable. These results align with the descriptive data shown in Table A2, where both *financial_leverage* and *total_leverage* of small firms in bank-oriented countries are higher than those of small firms in market-based countries, whereas, in the large group, they are equivalent magnitudes.

Seventh, most of the research that has differentiated between constrained and unconstrained firms used univariate sorting criteria, mainly size and age, as they are considered exogenous. These criteria are also considered particularly appropriate for private firms. Nevertheless, some researchers proposed complex indexes as sorting criteria (Hadlock & Pierce, 2010; Kaplan & Zingales, 1997; Whited & Wu, 2006). To further corroborate our results, we applied the SA_index of Hadlock and Pierce (2010), based on size and age, to split the sample into constrained and unconstrained firms. After estimating all our models again, results resemble those previously

obtained, regardless of the dependent variable used (not reported).

Lastly, we consider the possibility that the aftermath of the 2007–2008 financial crisis may be an additional factor influencing EU firms' decision-making, at least during the first years of our analysis period, 2010–2018 (Krivogorsky, Joh, & De Boskey, 2018). To do so, we included a dummy variable named *crisis* in all our regression models (those included in Tables 3 to 5 for both financial and total leverage and small and large firms). This variable takes a value of 1 if a country is in crisis in a particular year and 0 otherwise. To determine whether a country is going through a financial crisis in a particular year, we use the criterion of the World Bank (The World Bank Group, 2022).[7] According to the World Bank, 16 countries were not in crisis in any years of the analysis, and 10 countries were in crisis for only 3 years, 2010–2012. Lastly, Cyprus was deemed in crisis from 2011 to 2015, and the UK for only 2 years, from 2010 to 2011. Our new results (not reported) resemble those previously shown in Tables 3–5 for all institutional variables, regardless of the model. The dummy *crisis* shows a significant positive coefficient only for small firm regressions, which is coherent with our general view that they face higher financial constraints than large firms; therefore, they are more affected by the institutional environment. These results reveal that small firms were affected by the financial crisis and took on more leverage, whereas large firms did not.

7. Conclusions

This study examines the effects of the European institutional environment on private firms' leverage. We use data from the 28 countries in the EU at the time of the study, 2010–2018. We assume that small firms are financially constrained; therefore, we posit that they are particularly susceptible to changes in business regulation, enforcement of contracts, and financial development. After controlling for some relevant firm-level and macroeconomic variables, our results seem unaffected by either multicollinearity or endogeneity problems; our regressions are also robust to heteroskedasticity and clustering.

We find that the EU's regulatory or legal environment significantly influences firms' leverage, with a greater impact on smaller firms, as predicted. The difference between the two groups of firms, small and large, is significant in terms of corruption and the strength of the legal system. Moreover, the rationale for the effects of business regulation on firms' leverage is consistent with the pecking order theory, particularly in small firms. Therefore, improving the institutional environment can reduce the typical informational asymmetries, which give rise to agency costs that borrowers bear.

The contract enforcement regulation and the development of the financial system also significantly affect a firm's debt ratio in both small and large firms, as expected; however, we cannot confirm notable differences between the impact on the two types of firms except for that of the credit market (*bank_assets*), which has a greater effect on constrained (small) firms.

Additionally, the institutional variables have a substantial economic impact on private firms' leverage, particularly those of *bank_assets* and *financial_institutions*.

Overall, our empirical evidence corroborates the conventional idea that small firms have worse external financing conditions than large firms. Furthermore, improving the institutional environment in terms of trusted institutions (that is, less corruption) and efficient judicial procedures (that is, better enforcement of debt contracts) can help close the gap between constrained and unconstrained firms. Likewise, better financial system development can improve the credit conditions offered to private firms, particularly those financially constrained. Moreover, our results show that financially constrained firms operating in market-based countries are less leveraged than their constrained counterparts in bank-oriented countries; conversely, the difference is less marked in the unconstrained group. Being financially constrained hinders access to financing other than leverage in bank-oriented countries more than in market-based countries; however, this is not the case for unconstrained firms.

The results have some interesting implications. From a policy-making standpoint, our findings may contribute to a better understanding of small firms' difficulties in accessing external financing, particularly equity. Given the importance of this sector in the economy (in terms of GDP and employment), it makes sense for the EU authorities to undertake reforms to improve the statutory environment and reduce inequalities between countries, thereby facilitating better lending conditions. Likewise, academics can benefit from this research as the empirical evidence highlights the value of considering firm-level variables and institutional factors as determinants of firms' capital structure. This represents a challenging new avenue of research, still underexplored, particularly concerning financially constrained firms. Finally, the results may also interest practitioners as they point to the relevance of financial frictions when accessing external financing.

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[7] A financial crisis is defined as systemic if two conditions are met: (i) significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system or bank liquidations), and (ii) significant banking policy intervention measures in response to significant losses in the banking system. The first year that both criteria are met is when the crisis becomes systemic.

Declaration of Competing Interest

None

Data availability

Data will be made available on request.

Appendix

Table A1
Definition of variables.

Dependent variable	Description	Source
financial_leverage (Firm debt rate)	$\frac{\text{total financial debt}}{\text{net worth} + \text{total financial debt}}$	ORBIS
total_leverage (Firm debt rate)	$\frac{\text{total liabilities}}{\text{total assets}}$	ORBIS
Explanatory variables		
Panel A: Financial variables (firm)		
Notation	Description	Source
distress	$\frac{\text{st deviation of operating cash flow}}{\text{total assets}}$	ORBIS
growth	$\frac{\text{sales}_t - \text{sales}_{t-1}}{\text{sales}_{t-1}}$	ORBIS
profit	$\frac{\text{operating net income}}{\text{total assets}_{t-1}}$	ORBIS
sector-financial_lev	Average sector indebtedness for each country and year. Calculated in terms of financial leverage	ORBIS
sector-total_lev	Average sector indebtedness for each country and year. Calculated in terms of total leverage	ORBIS
size	ln (total assets)	ORBIS
tangibility	$\frac{\text{tangible fixed assets}}{\text{total assets}}$	ORBIS
Panel B: Macroeconomic variables		
Notation	Description	Source
capital_formation	Annual gross capital formation to GDP (percentage)	The World Bank Group (World Development Indicators)
gdp_growth	The growth rate of real GDP per capita (percentage)	The World Bank Group (World Development Indicators)
inflation	The annual rate of change in the Consumer Price Index (percentage)	The World Bank Group (World Development Indicators)
Panel C: Institutional variables (legal)		
Notation	Description	Source
corruption	An index ranging from 0 to 100, with larger values indicating increased corruption	Transparency International
freedom[a]	Proxy of the strength of the legal system ranked on a scale of 0–100, where 0 indicates the lowest level of economic freedom and 100 the highest	The Heritage Foundation
enforce_procedures[b]	The number of procedures to enforce a contract refers to the number of independent actions mandated by law or courts that require interaction between the parties of a contract or between them and the judge or court officer. The component indicator is computed based on the methodology in the DB04–15 studies.	The World Bank Group (Doing Business)
recovery_rate	The recovery rate is recorded as cents on the dollar recovered by secured creditors through judicial reorganization, liquidation, or debt enforcement (foreclosure or receivership) proceedings. The calculation considers the outcome: whether the business emerges from the proceedings as a going concern or the assets are sold piecemeal. Then the costs of the proceedings are deducted	The World Bank Group (Doing Business)
Panel D: Institutional variables (financial development)		
Notation	Description	Source
bank_assets	Total financial assets of financial corporations to GDP	Eurostat
bank_concentration	Share of the five largest credit institutions in total banking sector assets	European Central Bank (Statistical Data Warehouse)
financial_institutions	This index summarizes how developed financial institutions are in terms of their depth, access, and efficiency. It ranges from 0 to 1, with higher values indicating more financial development.	International Monetary Fund (Financial Development Index Database)

[a] It includes 10 items grouped into 4 broad categories designated as (i) the rule of law, (ii) limited government, (iii) regulatory efficiency, and (iv) open markets.
[b] The World Bank Group denotes this variable as Enforcing Contracts-Procedures (Number) and only reports data until 2015.

Table A2
Sample distribution by country and size.

	Small			Large		
Country	Obs.	Mean financial_leverage	Mean total_leverage	Obs.	Mean financial_leverage	Mean total_leverage
Austria	689	0.5152	0.6046	1246	0.4776	0.5919
Belgium	1270	0.3983	0.6233	1296	0.3654	0.5771
Bulgaria	8	0.3342	0.5199	4	0.4450	0.6815
Croatia	12	0.2467	0.3737	13	0.3861	0.7151
Cyprus	42	0.3001	0.4856	73	0.4866	0.6249
Czech Republic	11	0.4205	0.5171	48	0.3388	0.5388
Denmark	1113	0.3160	0.5778	1133	0.3057	0.5557
Estonia	0			3	0.2125	0.1794
Finland	1453	0.3351	0.5730	1238	0.3804	0.5697
France	2743	0.3967	0.6380	2755	0.4229	0.6510
Germany	7018	0.3574	0.5958	10,541	0.3374	0.5732
Greece	431	0.4989	0.6427	395	0.4926	0.6128
Hungary	309	0.3032	0.5336	207	0.1904	0.6169
Ireland	836	0.3423	0.5140	706	0.4758	0.6759
Italy	7148	0.4325	0.6545	8710	0.4199	0.6394
Latvia	194	0.3592	0.6043	90	0.3307	0.4611
Lithuania	217	0.4053	0.5587	168	0.3420	0.5294
Luxembourg	58	0.3676	0.6188	458	0.3931	0.5972
Malta	16	0.7209	0.7871	10	0.5187	0.6903
Netherlands	4456	0.3330	0.5940	4466	0.4030	0.6115
Poland	1207	0.2477	0.5263	797	0.2581	0.5368
Portugal	474	0.4464	0.6169	644	0.4786	0.6427
Romania	3	0.5051	0.6760	1		0.9730
Slovakia	71	0.3160	0.5550	86	0.4666	0.5683
Slovenia	7	0.2619	0.3736	10	0.7819	0.8094
Spain	3857	0.3663	0.5338	3905	0.4295	0.5906
Sweden	3622	0.3821	0.6189	2894	0.3799	0.6425
United Kingdom	14,591	0.3416	0.5309	9959	0.4405	0.6045
TOTAL	51,856	0.3689	0.5815	51,856	0.3983	0.6052

The variable *financial_leverage* is total financial debt divided by the sum of net worth and total financial debt, while *total_leverage* is total liabilities divided by total assets. The sample is split into small (40% smallest observations) and large (40% largest) groups by size.

Table A3
Sample distribution by year and size.

Year	Small	Large
2010	5147	4462
2011	5444	4883
2012	5821	5274
2013	6389	5487
2014	6690	6437
2015	6870	7241
2016	6624	7252
2017	5899	7058
2018	2972	3762
TOTAL	51,856	51,856

Table A4
Sample distribution by industry sector.

		Number of firms	Percentage of total firms
Sector 1:	Agriculture, livestock, forestry, fishing and mining, and quarrying	363	1.66%
Sector 2:	Manufacturing	3818	17.41%
Sector 3:	Construction	1259	5.74%
Sector 4:	Wholesale and retail trade; repair of motor vehicles and motorcycles	2716	12.39%
Sector 5:	Transportation and storage	846	3.86%
Sector 6:	Accommodation and food service activities	328	1.50%

(*continued on next page*)

Table A4 (*continued*)

		Number of firms	Percentage of total firms
Sector 1:	Agriculture, livestock, forestry, fishing and mining, and quarrying	363	1.66%
Sector 7:	Information and communication	812	3.70%
Sector 8:	Real estate, professional, scientific, and technical activities. Administration and auxiliary services and the like	10,161	46.34%
Sector 9:	Public administration and defense; mandatory social security; education, health, and social services; artistic and leisure activities and entertainment; other services	1625	7.41%
TOTAL		21,928	100%

Note: The distribution of the sample (total sample) by sectors is based on the European Union's standard classification of economic activities NACE Rev. 2 (Regulation [EC] No 1893/2006 of December 20, 2006).

Table A5
Correlation matrix.

Panel A. Firm-level variables

	1	2	3	4	5	6	7	8	9
1 financial_leverage	1.000								
2 total_leverage	0.753[a]	1.000							
3 distress	−0.127[a]	−0.099[a]	1.000						
4 growth	0.036[a]	0.028[a]	0.031[a]	1.000					
5 profit	−0.186[a]	−0.143[a]	0.142[a]	0.137[a]	1.000				
6 sector-financial_lev	0.279[a]	0.222[a]	−0.070[a]	0.034[a]	−0.047[a]	1.000			
7 sector-total_lev	0.213[a]	0.301[a]	−0.096[a]	0.029[a]	−0.019[a]	0.742[a]	1.000		
8 size	0.063[a]	0.067[a]	−0.179[a]	0.007[a]	−0.064[a]	0.048[a]	0.064[a]	1.000	
9 tangibility	0.179[a]	−0.007[a]	−0.119[a]	−0.008[a]	−0.107[a]	−0.012[a]	−0.104[a]	0.081[a]	1.000

Panel B. Macro and institutional variables

	1	2	3	4	5	6	7	8	9	10	11	12
1 financial_leverage	1.000											
2 total_leverage	0.753[a]	1.000										
3 capital_formation	−0.045[a]	0.001	1.000									
4 gdp_growth	−0.048[a]	−0.035[a]	0.252[a]	1.000								
5 inflation	0.039[a]	0.019[a]	−0.071[a]	−0.227[a]	1.000							
6 corruption	0.054[a]	0.054[a]	−0.319[a]	−0.180[a]	−0.146[a]	1.000						
7 freedom	−0.037[a]	−0.068[a]	0.065[a]	0.246[a]	0.133[a]	−0.882[a]	1.000					
8 enforce_procedures	0.012[b]	0.002	−0.281[a]	−0.196[a]	−0.106[a]	0.651[a]	−0.569[a]	1.000				
9 recovery_rate	−0.002	−0.041[a]	−0.007[c]	0.111[a]	0.204[a]	−0.689[a]	0.761[a]	−0.441[a]	1.000			
10 bank_assets	0.016[a]	0.005	−0.073[a]	−0.001	0.024[a]	−0.161[a]	0.204[a]	−0.247[a]	−0.102[a]	1.000		
11 bank_concentration	0.019[a]	0.008[c]	0.213[a]	−0.025[a]	−0.063[a]	−0.087[a]	0.004	−0.098[a]	0.067[a]	−0.063[a]	1.000	
12 financial_institutions	0.047[a]	−0.016[a]	−0.274[a]	−0.101[a]	0.174[a]	−0.119[a]	0.158[a]	−0.012[a]	0.284[a]	0.195[a]	−0.289[a]	1.000

Significance levels at 1%, 5%, and 10% are indicated by [a], [b], and [c], respectively. Correlations are based on the whole sample. Table A1 in the Appendix provides definitions of all the variables.

Table A6
Fixed-effect baseline regressions.

Dependent variable				
	Financial_leverage		Total_leverage	
	1	2	3	4
distress	−0.3772 (0.0404)***	−0.3772 (0.0742)***	−0.3313 (0.0354)***	−0.3313 (0.0955)***
growth	0.0079 (0.0007)***	0.0079 (0.0093)***	0.0083 (0.0006)***	0.0083 (0.0006)***
profit	−0.3185 (0.0128) ***	−0.3185 (0.0306) ***	−0.1966 (0.0096) ***	−0.1966 (0.0197) ***
sector-financial_lev	0.6604 (0.0288) ***	0.6604 (0.0382) ***		
sector-total_lev			0.6520 (0.0255) ***	0.6520 (0.0531) ***
size	0.0674 (0.0037) ***	0.0674 (0.0034) ***	0.0453 (0.0039) ***	0.0453 (0.0034) ***
tangibility	0.2062 (0.0137) ***	0.2062 (0.0389) ***	0.0945 (0.0109) ***	0.0945 (0.0286) ***
capital_formation	−0.0048 (0.0006)***	−0.0048 (0.0020)**	−0.0022 (0.0004)**	−0.0022 (0.0014)
gdp_growth	0.0006 (0.0003)**	0.0006 (0.0003)	0.0004 (0.0002) *	0.0004 (0.0005)
inflation	0.0048 (0.0005)***	0.0048 (0.0005)***	0.0039 (0.0004)***	0.0039 (0.0006)***
constant	−0.6233 (0.0463)***	−0.6233 (0.0463)***	−0.3030 (0.0414)***	−0.3030 (0.0442)***

(*continued on next page*)

Table A6 (*continued*)

Dependent variable				
	Financial_leverage		Total_leverage	
	1	2	3	4
Observations	89,127	89,127	93,712	93,712
F-statistic	234.01	161.68	202.15	305.15
P-value	0.0000	0.0000	0.0000	0.0000
R-Squared	0.1028	0.1028	0.1035	0.1035

The variable *financial_leverage* is total financial debt divided by the sum of net worth and total financial debt, while total_*leverage* is total liabilities divided by total assets. Regressions based on the whole sample. Robust fixed-effect regression coefficients estimated with standard errors in parentheses are reported in Columns 1 and 3. Cluster-robust standard errors are in Columns 2 and 4. Significance levels at 1%, 5%, and 10% are indicated by ***, **, and *, respectively. F-statistic tests the null hypothesis that all coefficients of the explanatory variables are equal to zero. Table A1 in the Appendix provides definitions of all the variables.

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