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Hierarchical determinants of capital structure

Eduardo K. Kayo [a,*], Herbert Kimura [b]

[a] Universidade de São Paulo, São Paulo, Brazil
[b] Universidade Presbiteriana Mackenzie, São Paulo, Brazil

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ABSTRACT

We analyze the influence of time-, firm-, industry- and country-level determinants of capital structure. First, we apply hierarchical linear modeling in order to assess the relative importance of those levels. We find that time and firm levels explain 78% of firm leverage. Second, we include random intercepts and random coefficients in order to analyze the direct and indirect influences of firm/industry/country characteristics on firm leverage. We document several important indirect influences of variables at industry and country-levels on firm determinants of leverage, as well as several structural differences in the financial behavior between firms of developed and emerging countries.

1. Introduction

The preponderance of the studies on capital structure mainly focuses on the analysis of certain firm characteristics – e.g., profitability, tangibility, size, etc. – as determinants of leverage. In addition, capital structure may vary across time (e.g., Korajczyk and Levy, 2003), albeit oftentimes converging on relatively stable capital structures (Lemmon et al., 2008), which suggests the existence of an optimal level of leverage. Incidentally, the issue of a given capital structure that may increase the shareholder value is one of the most important discussions in the finance field, both theoretically and empirically. Since Modigliani and Miller's (1958) irrelevance propositions, we have been witnessing the development of many theoretical points of view in this arena.

Several studies analyze the role of countries and industries on financing policies. These authors (including Booth et al., 2001; Bancel and Mittoo, 2004; Antoniou et al., 2008; Beck et al., 2008; de Jong et al., 2008) suggest that, along with firm characteristics, country-specific factors may also influence firm capital structure. These studies compare the capital structure of firms from different countries, taking into account factors such as gross domestic product (GDP), development of stock markets, levels of investor protection, etc. Furthermore, some papers (e.g., Burgman, 1996; Chen et al., 1997; Mansi and Reeb, 2002; Desai et al., 2004) compare financing policies of multinational firms *versus* domestic firms based on the argument that global factors might influence financial leverage. If, on the one hand, it is easy to find studies that analyze firm/country characteristics as determinants of capital structure, on the other hand, the literature often neglects the role of industry. Although the majority of capital structure studies include dummy variables representing different industries, only a few include variables that characterize – but do not classify – each industry. Notable exceptions are the studies of Simerly and Li (2000) and MacKay and Phillips (2005).

Our paper seeks to analyze the influence of time-, firm-, industry- and country-level determinants of leverage of firms from 40 countries. Because of the multilevel nature of these determinants, we use hierarchical linear modeling (HLM) – also called multilevel analysis – with maximum likelihood estimation in order to assess all levels simultaneously. As we shall discuss further, the capital structure determinants can be nested in at least three levels: level 1 (time), level 2 (firm characteristics) and level 3 (the industry/country interaction). In this context, we assume that the characteristics of higher levels may influence the characteristics of lower levels. For example, firms (lower level) working in a given industry (higher level) have similar patterns of behavior and, hence, would have similar leverage ratios. Thus, such firms will tend to have a strong within-cluster correlation. However, these firms may differ from other firms of different industries, leading to significant

* Corresponding author. Tel.: +55 11 8346 5722; fax: +55 11 2206 1745.
E-mail addresses: kayo@usp.br (E.K. Kayo), hkimura@mackenzie.br (H. Kimura).

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differences across clusters. HLM is able to mitigate the econometric problems raised by Fama and French (2002) regarding the characteristics of the data. They state that (i) the use of cross-section regressions ignores the correlations of residuals across firms and (ii) panel regressions lead to problems of correlated residuals across years. In addition to addressing problems of time and firm effects, HLM also allows us to include the effects of industry and country in our analysis.

In this context, our objective is twofold. First, we assess the relative importance of each of these levels on the variance of firm leverage. We achieve this objective by using an empty model (i.e., without covariates) through which we find that the levels of time and firm are responsible for the majority of firm leverage variance. Second, we extend this basic model with the inclusion of random-intercepts and random-slopes in order to analyze, respectively, the direct and indirect influences of the characteristics of firm, industry and country on firm leverage. In pursuing our second objective, while we include traditional determinants of leverage at both firm and country levels, we also analyze three important characteristics of industries, i.e., munificence, dynamism and concentration (Herfindahl–Hirshman index). While we can find some studies examining the relationship between industry concentration and firm leverage (e.g., MacKay and Phillips, 2005), the study of munificence and dynamism is somewhat novel in the literature of capital structure. Munificence represents the abundance of resources in a given industry; dynamism is the instability or volatility of that industry (Boyd, 1995). To the best of our knowledge, our study is the first to analyze the direct influence of these variables on firm leverage. Simerly and Li (2000), while they analyze industry dynamism, it is only as a moderator variable of leverage on firm return-on-assets. Moreover, in the present study we expand the discussion in order to include macroeconomic determinants of firm leverage. Finally, we build on previous studies (e.g., de Jong et al., 2008) with the discussion of the indirect influences of country- and industry-specific variables on firm-specific determinants of leverage.

The main results of our paper show that a significant part of the leverage variance – empty model reports nearly 42% – is due to intrinsic firm characteristics. Second, time-level is also responsible for a relevant part of leverage (36%). The industry-level characteristics, in turn, account for nearly 12% of leverage variance, and country-level, for only 3%. The remaining 7% of leverage variance is due to combined industry/country effects. Although the variances attributable to industry and country are relatively low, this is not tantamount to stating that industry- and country-level factors are unimportant. In fact, some of these factors are quite important to explain the firm leverage. The industry characteristics of munificence, dynamism and concentration, for instance, influence leverage significantly.

We organize the remaining of the paper as follows. The next section sets out the theoretical discussion on determinants of capital structure at the levels of firm, industry and country. Following, we describe the methodological procedures regarding data gathering, sampling, construction of measures and empirical models. The subsequent section shows our empirical results. The final section concludes our paper with the main theoretical and managerial implications of our results.

2. Determinants of capital structure

2.1. Firm-level determinants

Concerning firm-level determinants of leverage, three main theoretical approaches are particularly important: the trade-off, the agency and the pecking order hypotheses. These theories, in contrast to Modigliani and Miller's (1958) assumption of a perfect market, suggest that several factors may determine firm leverage, either firm-internal or firm-external. A particular factor might be positive or negative depending on the theoretical lens. Therefore, we analyze five firm-level determinants of capital structure: growth opportunities, profitability, distance from bankruptcy, size and tangibility.

Competitive theories and predictions involve the relationship between growth opportunities and leverage. While the agency theory suggests a negative relationship between growth opportunities and leverage, the pecking order theory predicts this relationship is positive. The agency theory explanation for the negative relationship is based on the disciplinary role that debt can play in mitigating the opportunistic behavior of managers. This kind of behavior is more pronounced when firm free cash flow is high. When the firm is in a high growth phase and investment opportunities with positive net present value are abundant, free cash flow is low and manager/shareholder conflicts are less intense. In this phase, debt may lead to underinvestment problems (Stulz, 1990) which explains why firms tend to show high levels of equity rather than leverage. On the other hand, when growth opportunities are scarce, excess free cash flow may give rise to typical agency problems such as adverse selection, moral hazard and excessive perquisites. In this scenario, debt plays an important role in motivating managers to be more efficient (Jensen, 1986). D'Mello and Miranda (2010) show recent empirical evidence that debt issues decrease excessive cash ratios, lowering abnormal capital expenditures and increasing the firm's value. However, there are evidences that this disciplinary role of debt is more likely to occur in the absence of managerial entrenchment (Zwiebel, 1996; de Jong and Veld, 2001).

A negative relationship between growth opportunities and leverage may also reflect the uniqueness – or specificity – of firms, especially their intangibility. Bah and Dumontier (2001) and O'Brien (2003), for instance, show that companies with higher research & development (R&D) and advertising expenses – both proxies of intangibility – have smaller levels of leverage. O'Brien (2003) argues that the low leverage in intangible-intensive companies is due to equity flexibility, ensuring the accomplishment of investment-goals in R&D, the launch of new products and the acquisition of other companies in order to increase the knowledge base. The long period of maturation of such investments makes leverage an inappropriate source of funding. Accordingly, Brown et al. (2009) state that R&D-intensive firms (e.g., young public high-tech firms) mostly rely on internal or external equity to fund their projects, since they are subject to high asymmetric information, high uncertain returns, and low collateral value.

Nevertheless, growth opportunities can also correlate positively with leverage, according to the pecking order theory. The pecking order of capital structure derives from the asymmetric information between managers and investors. According to Myers and Majluf (1984), managers tend to issue new shares when prices are overvalued, thus benefiting old shareholders. Aware of this possibility, new shareholders might demand a discount on the stock price in order to acquire it. Thus, managers avoid issuing new shares, even though this decision can make firms ignore profitable investments. Myers (1984), therefore, suggests that companies seeking to reduce the costs of asymmetric information have a preference of funding resources. In this sense, companies would prefer using retained earnings in first place, then low-risk debt, high-risk debt and, as the last resource, new equity. Hence, companies that have good investment opportunities but lack internal cash flow could turn to debt to fund their projects first, thereby affording such companies high leverage. In contrast, Autore and Kovacs (2010) show that firms may issue new equity even in conditions of high asymmetric information, since such asymmetry is lower than the recent past.

A fundamental difference between the assumptions of the agency theory and the pecking order theory may partially explain the contrasting predictions regarding the influence of growth opportunities on leverage. The agency theory assumes that managers behave opportunistically and rationally, trying to maximize their own utility at the shareholder expense. Leverage, in this case, would discipline their behavior, making companies with few investment opportunities and high free cash flow to increase the use of debt. On the other hand, pecking order implicitly assumes that managers are rational, though not necessarily opportunistic. Thus, in the maturity phase, debt would not have the same disciplinary effect as the agency theory predicts. In this controversial context, we test whether the relationship between growth opportunities and leverage is positive or negative. A positive relationship would confirm the pecking order theory and a negative relationship would confirm the agency theory. In our paper, our proxy for growth opportunities is the ratio of the firm total market value (i.e., debt plus equity market value) to total assets.

There is also no consensus regarding the influence of profitability on capital structure. The pecking order theory, mainly based on the work of Myers (1984) and Myers and Majluf (1984), states a hierarchy of preference in the choice of funding sources, which is defined by the level of information asymmetry. In this context, external equity would be the last resort because of its high level of asymmetric information; debt would come in second, and retained earnings would be the first choice. In this sense, Titman and Wessels (1988) suggest that firm profitability is an important capital structure determinant since it reflects the amount of earnings that may be possible to firm retain. Thus, Fama and French (2002) suggest that in a simple pecking order model, by holding the investment level fixed, leverage would correlate negatively with profitability. Debt will grow as investment needs is higher than retained earnings. While profitability is frequently treated as a capital structure determinant, Shyam-Sunder and Myers (1999) propose a more direct approach to test the pecking order and also corroborate the theory, contrarily to the studies that show evidence that pecking order does not hold (e.g., Frank and Goyal, 2003; Leary and Roberts, 2010).

The trade-off hypothesis, in turn, states a positive relationship because low profitability may increase bankruptcy risk (Fama and French, 2002), thus forcing firms in such a position to adjust their leverage to lower levels. Besides, profitable firms should be more levered as they would benefit from corporate debt tax shields (Frank and Goyal, 2003; Wu and Yue, 2009) in addition to improving the firm performance (Margaritis and Psillaki, 2010) due to the disciplinary role of debt (Jensen, 1986). Again, this controversial context leads us to test whether the relationship between profitability and leverage is positive or negative. A positive relationship would confirm the trade-off theory and a negative relationship would confirm the pecking order. In our paper, profitability is defined as the ratio of operating income to total assets.

For the same reason, the trade-off hypothesis also predicts a negative relationship between distance from bankruptcy and leverage. Thus, financially healthy companies (i.e., with low bankruptcy likelihood) tend to have smaller levels of debt. Corroborating this hypothesis, Byoun (2008) find evidence that the larger the Altman Z score (used as proxy for distance of the bankruptcy), the smaller the firm leverage. Hence, our hypothesis is that the longer the distance from bankruptcy, the lower the leverage. Our proxy for distance from bankruptcy is the Altman Z score modified by MacKie-Mason (1990) and is given by $Z = 3.3$(earnings before interest and taxes/total assets) + 1.0(sales/total assets) + 1.4(retained earnings/total assets) + 1.2(working capital/total assets).

The firm size is also a very common determinant in capital structure studies. Titman and Wessels (1988) state that larger firms may be more diversified, thereby making them less prone to bankruptcy risk. Also as a function of size, larger firms may have a greater debt capacity. Furthermore, larger companies, being in general more transparent, tend to have larger debt levels and can issue larger amounts of debt, thus allowing them to spread the issuing costs (Byoun, 2008). However, Rajan and Zingales (1995) suggest that this relationship could also be negative. They say asymmetric information problems are likely to be smaller in larger companies. Thus, it would be possible for larger companies to issue new shares (i.e. reducing leverage) with no reduction in the market value. Again, by testing the relationship between firm size and leverage we have two possible results supported by different theoretical perspectives. A positive relationship indicates the importance of diversification and the opposite relationship supports the role of information asymmetry. In our paper, we use the logarithm of sales as a proxy for size.

Finally, tangibility plays an important role on capital structure, as the collateral aspects of assets in place tend to increase leverage. In this way, we test the hypothesis of a positive relationship between tangibility and leverage. As Titman and Wessels (1988) suggest, since tangible assets can be used as collateral for a given debt, the borrower is forced to use the resources in a pre-determined project, thus curtailing the incentive to assume high risks. Almeida and Campello (2007) show that tangibility is particularly important when the firm is financially constrained and thus has restricted access to external resources. However, according to the results of Almeida and Campello, tangibility is less important when firms are unconstrained. In our paper, tangibility is defined as the ratio of fixed assets to total assets.

2.2. Industry-level determinants

Studies on capital structure often employ dummy variables to control the effect of industry on leverage. Nevertheless, few studies analyze determinants of leverage that characterize rather than classify each industry. A rare exception is the study of Simerly and Li (2000), in the strategy field. It is important to remember that one of the theoretical streams in strategy emphasizes the importance of external factors to the firm when determining corporate strategies so as the environmental characteristics similarly affect all organizations of a given industry (Simerly and Li, 2000). In this context, it would be reasonable to suppose that specific characteristics of a given industry could also influence the firm capital structure. However, even Simerly and Li (2000) do not analyze the direct influence of an industry characteristic on leverage. They analyze the influence of leverage moderated by the environmental dynamism of the industry on firm performance. Environmental dynamism, as suggested by Dess and Beard (1984), reflects the degree of instability or non-predictable change of a given industry. The results of Simerly and Li (2000) suggest that firms working in more dynamic – or less predictable – environments have smaller levels of debt. Specifically, the interaction variable between dynamism and leverage show a negative and significant influence on firm return on assets.

The concept of industry dynamism, from a certain point of view, is related to the concept of an individual firm's business risk. Business risk can be defined as the expected variability in future income (Ferri and Jones, 1979). It is predicted that the larger the business risk, the smaller the level of firm leverage because, according to Ferri and Jones, profit variability is an estimate of the firm's ability to pay for their fixed obligations (e.g., financial expenses related to debt). High profit volatility can potentially result in firm financial distress, thus, making lower levels of leverage more attractive. According to Ferri and Jones (1979), firms of a given industry tend to show similar patterns of business risk because they produce similar products, have similar costs of skilled labor and raw material, and depend on similar technologies. In this

sense, in the same way that riskier firms show lower leverage, we can presume an industry that aggregates these riskier firms also have lower average leverage. Thus, we hypothesize that the higher the industry dynamism, the lower the firm leverage.

Another concept we can derive from the strategy field is munificence, which can also play an important role on capital structure. Munificence is the environment's capacity to support a sustained growth (Dess and Beard, 1984). According to Dess and Beard, environments with high munificence have abundant resources, low levels of competition and, as a consequence, high profitability. Given this type of environment, it is reasonable to suppose that companies working in munificent industries tend to have high levels of profitability. If we generalize the predictions regarding the influence of firm profitability on leverage to an aggregate industry, again, it would not be possible to define an *a priori* relation between industry munificence and leverage. This is because, at the firm level, two theoretical streams compete in their predictions regarding the influence of profitability on leverage. As we mention earlier, the pecking order theory recognizes a negative relationship between profitability and leverage, whereas the trade-off theory defends a positive one. In this context, we test whether the relationship between industry munificence and firm leverage is positive or negative. Expanding the firm-level theories of capital structure to the industry-level, a positive relationship would confirm the pecking order theory and a negative relationship would confirm the agency theory. To our knowledge, there are no studies on capital structure that consider industry munificence as a determinant of leverage and this aspect is, we believe, one of the relevant contributions of our paper. In addition, we test the indirect effect of munificence on the relationship between growth opportunities and leverage as well as between profitability and leverage. In both cases, an eventual positive sign indicates that munificence increases the effects of growth opportunities and profitability in determining low (high) levels of leverage when the direct effect of growth and profitability on leverage is negative (positive).

In our paper, we follow Boyd (1995) in order to build our measures of munificence and dynamism. We obtain munificence by (1) regressing time against sales of an industry over the previous 5 years of the period under analysis and (2) taking the ratio of the regression slope coefficient to the mean value of sales over the same period. Dynamism is the standard error of the munificence regression slope coefficient divided by the mean value of sales over this period.

Lastly, we analyze the influence of industry concentration on firm leverage using the traditional Herfindahl–Hirshman (HH) index. Previous studies show that high-concentrated industries (high HH index) have higher levels of leverage and lower intra-industry dispersion (MacKay and Phillips, 2005), in contrast to low-concentrated industries in which leverage is lower. This is mainly due to different characteristics of these two types of industries. In higher-concentrated industries, profitability and size are also higher (MacKay and Phillips, 2005) as well as firm risk. Brander and Lewis (1986) relate this higher risk to the incentive of equity holders in pursuing riskier strategies when debt is high. Thus, we test the hypothesis of a positive relationship between HH index and firm leverage. However, it may also be the case that debt decreases investments expenditures since equity holders do not receive full benefit of firm investment, especially in a harsh scenario and bankruptcy likelihood (Clayton, 2009). In our paper, HH index is defined as the sum of the squares of market shares of firms within a given industry. The market share of a firm is given by the ratio of its sales to the total sales in the industry. It is important to notice that all calculations are based on data of public companies, which do not represent all the participants in a given industry. Nevertheless, the calculated HH index may be considered a proxy of industry concentration.

2.3. Country-level determinants

The study on capital structure in a global perspective has at least two streams. In one of these streams, several studies compare financing policies of multinational and domestic firms. However, results are mixed. Lee and Kwok (1988), Burgman (1996) and Chen et al. (1997), for instance, find evidence that multinational companies have lower financial leverage compared to domestic ones. The explanation for this phenomenon is based on the higher cost of capital due to agency problems, exchange rate risk and political risk. On the other hand, Mansi and Reeb (2002) find the opposite, i.e., that international activity increased firm leverage.

More recently, several studies (e.g., Rajan and Zingales, 1995; Booth et al., 2001; Antoniou et al., 2008; Beck et al., 2008; de Jong et al., 2008) analyze the role of country characteristics as determinants of firm leverage. A first important observation is that financing policy seems to have similar patterns of behavior around the world, despite the evident institutional differences (Rajan and Zingales, 1995; Booth et al., 2001). Accordingly, Booth et al. (2001) find evidence that variables that explain capital structure in developed markets (e.g., United States and Europe) also explain capital structure in emerging markets. Profitability, for instance, is one of the firm-level variables that shows high convergence in the comparison between countries.

In addition, these studies emphasize that country macroeconomic/institutional factors and even culture differences (Sekely and Collins, 1988; Chui et al., 2002) may have a marked influence on capital structure. De Jong et al. (2008) provide evidence that these factors have direct or indirect influences on leverage. They show that, for instance, the more developed the country's bond market, the larger the leverage of firms. The indirect effect, in turn, takes place when macroeconomic and institutional variables affect the determinants of leverage. We extend the study of these direct and indirect influences by applying a more appropriate method that simultaneously analyzes firm, industry and country levels, while taking into account the hierarchical characteristics of leverage determinants.

Specifically, we analyze the role of four different country variables, namely stock market development, bond market development, financial system and GDP growth. De Jong et al. (2008) remind us that when bond market in a given country is highly developed and, hence, issuing and trading these bonds are easier, firm leverage tends to be higher. In contrast, when stock market is developed, firm leverage is lower because the broader supply of funds decreases the cost of equity. We test these two direct effects of stock and bond market development on firm leverage hypothesizing that (i) the higher the country stock market development, the lower the firm leverage and (ii) the higher the country bond market development, the higher the firm leverage. In our paper, stock market development is the ratio of stock market capitalization to GDP and bond market development is the ratio of private and public bond market capitalization to GDP.

In addition to these direct effects of stock and bond market development on firm leverage, we also examine the moderating role of these variables in the relationship between leverage and its firm-level determinants. In other words, we test the indirect effects of country markets development on leverage. We test several different indirect effects using all the firm-level determinants, but we only find maximum likelihood convergence in the models that include the interactions of bond market development $\times$ tangibility and stock market development $\times$ growth opportunities. Thus, we only report these convergent models.

Our third country variable is the financial system, which defines if the country is market or bank-based. As Antoniou et al. (2008) remind us, firms in market-based countries have a less concentrated ownership structure, while in bank-based countries the

concentration is higher. Assuming that in the agency perspective debt plays an important disciplinary role against the manager's opportunistic behavior, we hypothesize that firm leverage is higher in market-based countries. In our paper, financial system is a dummy variable that equals 1 if the country's financial system is market-based and zero if bank-based. Finally, our fourth country variable is GDP growth. Following de Jong et al. (2008), we include GDP in order to control for the effect of countries economic conditions.

We are aware of the important role of institutional country characteristics such as the creditor protection, the rule of law, the corruption level, and other factors. De Jong et al. (2008), for instance, analyze several factors like those. However, when we include these variables in our multilevel analysis, we do not find any statistically significant results. Besides, the inclusion of these institutional variables does not modify the results of our main model. Therefore, we do not include the discussion of these institutional variables in our study.

3. Methodology

3.1. Data, sample and measures

Following Rajan and Zingales (1995), Demirgüç-Kunt and Maksimovic (1999) and de Jong et al. (2008), the firm financial data are from the Compustat Global Vantage database, which serves as a starting point for our sample. The initial sample includes all nonfinancial companies of countries that have more than 100 firm/year observations and a positive book value during the period under analysis. The initial group number comprises 17,061 companies from 40 different countries. We collect data from 1997 through 2007, totaling 127,340 firm/year observations. However, due to missing values, the number of observations might be as low as 114,788 by the time we analyze the complete model.

Table 1 shows the summary statistics for our main dependent variable market long-term leverage. We find similar means for country leverage when compared to the study of de Jong et al. (2008), although they analyze a different period (i.e., 1997–2001). For instance, de Jong et al. (2008) report a leverage of 16.2% for Brazil, exactly the same as in our study. When considering countries with low leverage, Turkey has a leverage of 5.9% in the study of de Jong et al. which is comparable to the 6.6% in our sample. The United States, in turn, had a leverage of 14.4% in de Jong et al. versus 13.4% in our study. We observe the largest difference between these two studies in the leverage of Greece, which increases 110% (from 5.5% to 11.57%), and in Australia, which decreases 40% (from 11.6% to 6.96%).

Another preliminary insight we can extract from Table 1 is that, corroborating de Jong et al. (2008), it is difficult to observe a direct relationship between the level of country development and its leverage. Some developed countries (e.g., United Kingdom, Germany and Japan), for instance, have low leverage ratios, whereas others have high leverage ratios (e.g., Canada and United States). The same happens with emerging countries, where we can find low leverage (e.g., Singapore and Taiwan) as well as high leverage (e.g., Argentina and India). At this point in our analysis, however, it is not possible to state that country characteristics are insignificant. We further analyze this issue through HLM in order to assess the relative importance of country-level in the leverage variance and the influence of certain country factors (of each country) on leverage.

Following de Jong et al. (2008), our dependent variable is the long-term leverage, which is defined as the ratio of total long-term debt to total firm value, where total firm value is the sum of total long-term debt and firm equity market value. Table 2 shows the description of our independent variables at the levels of firms, industries and countries, as well as the source of these data. We extract all firm-level variables from Compustat Global Vantage, for the period from 1997 through 2007. For the calculation of the industry-level variables – munificence and dynamism – we also extract raw data from Compustat; however, in this case, the period is longer because their constructions require 5 years of previous data. As such, the data dated from 1992. Data regarding the type of financial system of each country (i.e., whether market- or bank-based) are based on Demirgüç-Kunt and Levine (2004). Finally, we collect macroeconomic data from the World Bank, as we describe in Table 2.

Table 1
Summary statistics of leverage by country.

Country	Mean	Standard deviation	Observations
South Africa	6.46	9.74	1379
Turkey	6.59	9.46	415
Australia	6.96	11.53	6410
United Kingdom	7.37	10.81	9323
Singapore	8.28	11.91	3435
Taiwan	8.46	10.25	4335
Germany	8.87	11.21	4418
Malaysia	9.40	12.86	5752
Netherlands	9.59	9.97	1113
Hong Kong	9.70	12.73	1389
Ireland	9.75	11.78	410
Japan	9.83	10.94	29,691
Sweden	9.88	12.55	1728
Italy	10.35	10.23	1535
France	10.38	11.05	4051
South Korea	10.79	12.30	3526
Philippines	11.01	16.04	1088
Colombia	11.14	12.30	113
Austria	11.14	11.00	534
Greece	11.57	13.79	658
Spain	12.02	11.10	894
Finland	12.11	11.28	919
Pakistan	12.12	15.71	443
Belgium	12.13	11.37	666
Denmark	12.24	12.31	870
Switzerland	12.33	12.93	1494
Thailand	12.37	17.15	3000
Peru	12.54	13.54	261
New Zealand	12.72	12.28	516
Israel	12.87	13.56	424
United States	13.43	15.49	22,394
Canada	13.66	14.83	4254
Chile	14.25	12.97	918
Brazil	16.16	14.69	949
Mexico	16.23	14.46	578
Indonesia	16.37	20.11	1781
Portugal	17.75	12.10	300
India	17.79	18.73	4226
Norway	18.20	19.68	907
Argentina	19.64	18.73	243
Mean/total	10.90	13.37	127,340

This table shows mean and standard deviation for leverage and the number of observations by country. The sample consists of 127,340 firm-year observations from 40 countries from 1997 to 2007. Leverage is the ratio of long-term debt to total firm value, where total firm value is the sum of total long-term debt and firm equity market value. The table is sorted by leverage mean.

3.2. The empty model

Although several studies empirically analyze the influence of firm, industry and country variables on capital structure, they do so in an isolated way. To the best of our knowledge, our study is the first to simultaneously analyze all such levels and use a method that adequately takes into account the nested effects between the different levels. In other words, characteristics of a higher level are likely to influence the characteristics of a lower level (e.g., industry

Table 2
Construction of Dependent and Independent Variables at Levels of Firm, Industry, and Country.

Variables	Description	Source	Full sample		Developed countries		Emerging countries	
			Mean	SD	Mean	SD	Mean	SD
Dependent variables								
Market leverage	Ratio of long-term debt to total firm value, where total firm value is the sum of debt and market value of firm equity	Compustat Global Vantage	10.9%	13.4%	10.8%	12.9%	12.6%	15.5%
Book leverage	Ratio of long-term debt to total firm book value and total firm book value is the sum of debt and book value of firm equity	Compustat Global Vantage	16.1%	340.2%	15.2%	94.4%	14.2%	58.4%
Firm-level variables								
Growth opportunities	Growth opportunities are the ratio of the firm's total market value – financial debt plus equity market value – to total assets	Compustat Global Vantage	2.85	227.28	2.03	19.79	6.34	588.45
Profitability	Profitability is defined as the ratio of operating income to total assets	Compustat Global Vantage	3.2%	312.0%	4.1%	181.2%	10.6%	21.9%
Distance from bankruptcy (Altman's Z modified by MacKie-Mason (1990))	Distance from bankruptcy is given by $Z = 3.3$(EBIT/total assets) + 1.0(sales/total assets) + 1.4(retained earnings/total assets) + 1.2(working capital/total assets)	Compustat Global Vantage	−14.16	3765.89	−1.74	138.17	0.34	7.48
Size	Size is defined as the logarithm of sales. Descriptive statistics are in US$ millions	Compustat Global Vantage	1493	7570	2081	9579	630	3032
Tangibility	Tangibility is defined as the ratio of fixed assets to total assets	Compustat Global Vantage	30.9%	23.0%	27.9%	22.0%	38.9%	21.4%
Industry-level variables								
Munificence (adapted from Boyd (1995))	Munificence is obtained by (1) regressing time against sales of an industry over the previous 5 years of the period under analysis and (2) taking the ratio of the regression slope coefficient to the mean value of sales over the same period	Compustat Global Vantage	0.07	0.08	0.07	0.09	0.06	0.07
Dynamism (adapted from Boyd (1995))	Dynamism is measured by the standard error of the munificence regression slope coefficient divided by the mean value of sales over this period	Compustat Global Vantage	0.03	0.04	0.03	0.04	0.03	0.03
HH index	HH index is measured by the sum of the squares of market shares of firms within a given industry	Compustat Global Vantage	0.33	0.28	0.25	0.24	0.35	0.28
Country-level variables								
Stock market development	Ratio of stock market capitalization to GDP	Financial structure database (World Bank)	1.04	0.56	1.04	0.39	0.74	0.50
Bond market development	Ratio of private and public bond market capitalization to GDP, as suggested by de Jong et al. (2008)	Financial structure database (World Bank)	0.91	0.52	1.23	0.47	0.56	0.29
Financial system (Market vs. Bank)	Dummy variable that equals 1 if the country's financial system is market-based and zero if bank-based	Demirgüç-Kunt and Levine (2004)	–	–	–	–	–	–
GDP growth	Annual growth of gross domestic product	World development indicators (World Bank)	3.0%	2.6%	2.2%	1.5%	4.8%	3.8%

This table shows independent variables construction, detailing the name and the description of the variables at the levels of firm, industry and country used in the HLM regressions. Table also shows the source of the data and descriptive statistics (mean and standard deviation) for full sample and sub-samples of developed and emerging countries. The list of developed countries is based on Rajan and Zingales (1995) and comprises the G7 countries United States, Japan, Germany, France, Italy, United Kingdom and Canada. The list of emerging countries is based on Booth et al. (2001): Brazil, Mexico, India, South Korea, Malaysia, Pakistan, Thailand and Turkey. Jordan and Zimbabwe are not included because of sampling restrictions.

characteristics may influence firm characteristics). This type of multilevel effect may lead to the violation of several of the statistical assumptions made by traditional OLS regressions (Luke, 2004). Especially in the case of our study, having firms nested in the same industry could lead to problems of correlated errors. In this context, we apply an appropriate HLM with a maximum likelihood estimation procedure in order to account for all relevant levels of analysis.

In our study, we propose to analyze three levels of determinants of capital structure. The first level is time; the second, firm; and the third is a combination of industry and country. Industry and country are in the same level as it makes no sense to suggest that industries are nested in countries or vice-versa, simply because a given firm j, for instance, can be nested in a combination of industry k in country l; however, there could be a combination of the same kind of industry in another country in which firm j is not present.

By applying HLM to our research problem, we assume that observations across time are correlated amongst themselves, once they belong (i.e., are nested) to a given firm, therefore, generating a strong within-cluster correlation. Likewise, it is reasonable to suppose that firms working in the same industry have similar behavior regarding financing decisions, although such patterns differ across industries. The first step in our analysis is to develop the so-called empty model, in which we do not include independent variables. In doing so, we initially ignore fixed effects and the focus is on random effects, which, in turn, provide information germane to the variance decomposition of the dependent variable. Hence, the HLM empty model estimates the relative importance of each level in the variance of leverage. Eqs. (1a)–(1c) specify the empty model

we test in our paper. Eq. (1a) shows the specification of the first level, where the leverage (LEV_{ijkl}) of the year i, of the firm j, within the industry k and country l is a function of the mean leverage of firm j within industry k and country l (β_{0jkl}) plus a random error (e_{ijkl}) representing the variance across time, normally distributed with mean zero and variance of σ^2.

$$LEV_{ijkl} = \beta_{0jkl} + e_{ijkl}. \tag{1a}$$

Eq. (1b) shows the second level of analysis, where the mean leverage across time of firm j of the industry k and country l (β_{0jkl}) is a function of a mean leverage of industry k at country l (γ_{00kl}) plus a random error (r_{0jkl}) representing the variance between firms.

$$\beta_{0jkl} = \gamma_{00kl} + r_{0jkl}. \tag{1b}$$

Finally, the Eq. (1c) formalizes the analysis of the third level, where the mean leverage of the industry k in country l (γ_{00kl}) is then a random variable that is a function of the grand mean of the sample (δ_{0000}) plus the random errors of the third level, respectively, of the industry (s_{00k0}), country (t_{000l}), and the crossed random error of industry and country (u_{00kl}).

$$\gamma_{00kl} = \delta_{0000} + s_{00k0} + t_{000l} + u_{00kl}. \tag{1c}$$

By consolidating Eqs. (1a)–(1c), we obtain a mixed-effect model in Eq. (1d), where the terms s_{00k0}, t_{000l}, u_{00kl}, r_{0jkl} and e_{ijkl} correspond to the random effects, whose variances represent the relative importance of industry, country, the interaction between industry and country, firm, and time levels, respectively. This is our Model 1.

$$LEV_{ijkl} = \delta_{0000} + s_{00k0} + t_{000l} + u_{00kl} + r_{0jkl} + e_{ijkl}. \tag{1d}$$

3.3. Random-intercept models with covariates

After the completion of the variance decomposition of leverage through the empty model, we extend the basic model with the inclusion of explanatory variables as determinants of random intercepts. These inclusions are made gradually in subsequent models according to the hierarchical levels of the variables. In other words, we include in our analysis the variables related to time-level, firm-level, industry-level and country level, in this order. Eq. (2a) shows the construction of our Model 2 with the inclusion of dummy variables ($YEAR_{ijkl}$) representing each year in our analysis (except for the first year) and some of the traditional determinants of leverage at firm-level according to capital structure theories. The determinants we include in our model are growth opportunities ($GROW_{ijkl}$), profitability ($PROF_{ijkl}$), distance from bankruptcy ($DBKRT_{ijkl}$), size ($SIZE_{ijkl}$) and tangibility ($TANG_{ijkl}$). We include these firm variables at the first-level of analysis because they also vary within-firms – i.e., across the years – besides the variation between-firms.

$$\begin{aligned} LEV_{ijkl} = {} & \beta_{0jkl} + \beta_{1jkl}(YEAR_{ijkl}) + \beta_{2jkl}(GROW_{ijkl}) + \beta_{3jkl}(PROF_{ijkl}) \\ & + \beta_{4jkl}(DBKRT_{ijkl}) + \beta_{5jkl}(SIZE_{ijkl}) + \beta_{6jkl}(TANG_{ijkl}) + e_{ijkl}. \end{aligned} \tag{2a}$$

In the sequence, we add to the analysis the variables related to the industry-level leading to our Model 3. These variables are the munificence ($MUNIF_{00kl}$), the dynamism ($DYNAM_{00kl}$) and the concentration (HH_{00kl}) of each industry k at the country l. The mean leverage at the firm level (β_{0jkl}) is then a random variable determined by industry factors munificence and dynamism plus a random error (r_{0jkl}) representing the variance between firms.

$$\beta_{0jkl} = \gamma_{00kl} + \gamma_{01kl}(MUNIF_{00kl}) + \gamma_{02kl}(DYNAM_{00kl}) + \gamma_{03kl}(HH_{00kl}) + r_{0jkl}. \tag{2b}$$

Eq. (2c) shows that the mean leverage of industry k at country l (γ_{00kl}) is an outcome of certain country-level variables, i.e., stock market development at country l (STK_{000l}), bond market development at country l ($BOND_{000l}$), a dummy variable (MKT_{000l}) that equals 1 if the financial system of the country l is market-based or zero if bank-based, and the annual growth of gross domestic product of country l (GDP_{000l}). The random part of Eq. (2c) includes the random error between industries (s_{00k0}), between countries (t_{000l}), and the interaction between industries and countries (u_{00kl}). The addition of country covariates leads to our Model 4.

$$\begin{aligned} \gamma_{00kl} = {} & \delta_{0000} + \delta_{0001}(STK_{000l}) + \delta_{0002}(BOND_{000l}) \\ & + \delta_{0003}(MKT_{000l}) + \delta_{0004}(GDP_{000l}) + s_{00k0} + t_{000l} + u_{00kl}. \end{aligned} \tag{2c}$$

Eq. (2d) consolidates 2a, (2b) and (2c), showing the mixed-effect model where we consider the intercepts of the three levels to be random. Thus, it is simple to see that leverage is a function of firm-, industry-, and country-level covariates and their respective random errors.

$$\begin{aligned} LEV_{ijkl} = {} & \delta_{0000} + \delta_{0001}(STK_{000l}) + \delta_{0002}(BOND_{000l}) + \delta_{0003}(MKT_{000l}) \\ & + \delta_{0004}(GDP_{000l}) + \gamma_{01kl}(MUNIF_{00kl}) + \gamma_{02kl}(DYNAM_{00kl}) \\ & + \gamma_{03kl}(HH_{00kl}) + \beta_{1jkl}(YEAR_{ijkl}) + \beta_{2jkl}(GROW_{ijkl}) \\ & + \beta_{3jkl}(PROF_{ijkl}) + \beta_{4jkl}(DBKRT_{ijkl}) + \beta_{5jkl}(SIZE_{ijkl}) \\ & + \beta_{6jkl}(TANG_{ijkl}) + s_{00k0} + t_{000l} + u_{00kl} + r_{0jkl} + e_{ijkl}. \end{aligned} \tag{2d}$$

3.4. Random-coefficient models with covariates

We now turn to a more complex hierarchical model in which, in addition to the random intercept, we also assume the slopes of some firm-level variables are random and influenced by industry and country factors. In doing so, we analyze the indirect influences of industry and country characteristics levels on leverage. The system of equations from (3a)–(3f) shows these hierarchical relations. Eqs. (3b) and (3f) show the random intercept models with industry and country factors as covariates. Eqs. (3c)–(3e) show that we treat the firm-level variables *GROW*, *PROF* and *TANG* as random variables and determined by some covariates. Firstly, we analyze the influence of industry-level variable munificence (*MUNIF*) as well as the country variable stock market development (*STK*) on firm-level growth opportunities (*GROW*). Our hypothesis is that the higher the level of munificence and stock market development, the higher the opportunities will be for firms to grow. In second place, we hypothesize that the higher the munificence of a given industry, the higher will be its potential to earn profits (*PROF*). In third place, we analyze the influence of bond market development on tangibility (*TANG*). We also made additional tests – which we do not report here – with models including other random slopes, but estimations by maximum likelihood do not show any convergence at all. This result suggests that in a hierarchical model these relations are, quite possibly, not statistically relevant.

$$\begin{aligned} LEV_{ijkl} = {} & \beta_{0jkl} + \beta_{1jkl}(YEAR_{ijkl}) + \beta_{2jkl}(GROW_{ijkl}) + \beta_{3jkl}(PROF_{ijkl}) \\ & + \beta_{4jkl}(DBKRT_{ijkl}) + \beta_{5jkl}(SIZE_{ijkl}) + \beta_{6jkl}(TANG_{ijkl}) + e_{ijkl}, \end{aligned} \tag{3a}$$

$$\beta_{0jkl} = \gamma_{00kl} + \gamma_{01kl}(MUNIF_{00kl}) + \gamma_{02kl}(DYNAM_{00kl}) + \gamma_{03kl}(HH_{00kl}) + r_{0jkl}, \tag{3b}$$

$$\beta_{2jkl} = \gamma_{20kl} + \gamma_{21kl}(MUNIF_{00kl}) + \delta_{2001}(STK_{000l}) + r_{2jkl}, \tag{3c}$$

$$\beta_{3jkl} = \gamma_{30kl} + \gamma_{31kl}(MUNIF_{00kl}) + r_{3jkl}, \tag{3d}$$

$$\beta_{6jkl} = \gamma_{60kl} + \delta_{6001}(BOND_{000l}) + r_{6jkl}, \tag{3e}$$

$$\begin{aligned} \gamma_{00kl} = {} & \delta_{0000} + \delta_{0001}(STK_{000l}) + \delta_{0002}(BOND_{000l}) \\ & + \delta_{0003}(MKT_{000l}) + \delta_{0004}(GDP_{000l}) + s_{00k0} + t_{000l} + u_{00kl}, \end{aligned} \tag{3f}$$

Finally, Eq. (3g) shows the consolidated mixed-effect model with the complete set of hierarchical variables in a simultaneous analysis of time, firm, industry and country levels. We apply this model to the global analysis of all 40 countries in our sample. Additionally, in order to test the applicability of capital structure theories among countries with different development levels, we perform the same analysis with two subsamples: developed countries and emerging countries. We choose the developed countries sample based on Rajan and Zingales (1995) who analyze G7 countries (United States, Japan, Germany, France, Italy, United Kingdom and Canada). Regarding the emerging countries, we include in our sample 8 out of the 10 countries Booth et al. (2001) analyze (Brazil, Mexico, India, South Korea, Malaysia, Pakistan, Thailand and Turkey). We do not include Jordan and Zimbabwe due to the sampling restrictions we mention earlier.

$$\begin{aligned} LEV_{ijkl} = {} & \delta_{0000} + \delta_{0001}(STK_{000l}) + \delta_{0002}(BOND_{000l}) + \delta_{0003}(MKT_{000l}) \\ & + \delta_{0004}(GDP_{000l}) + \gamma_{01kl}(MUNIF_{00kl}) + \gamma_{02kl}(DYNAM_{00kl}) \\ & + \gamma_{03kl}(HH_{00kl}) + \beta_{1jkl}(YEAR_{ijkl}) + \gamma_{20kl}(GROW_{ijkl}) \\ & + \gamma_{30kl}(PROF_{ijkl}) + \beta_{4jkl}(DBKRT_{ijkl}) + \beta_{5jkl}(SIZE_{ijkl}) \\ & + \gamma_{60kl}(TANG_{ijkl}) + \delta_{2001}(STK_{000l} \times GROW_{ijkl}) \\ & + \gamma_{21kl}(MUNIF_{00kl} \times GROW_{ijkl}) + \gamma_{31kl}(MUNIF_{00kl} \times PROF_{ijkl}) \\ & + \delta_{6001}(BOND_{000l} \times TANG_{ijkl}) + s_{00k0} + t_{000l} + u_{00kl} + r_{0jkl} \\ & + r_{2jkl}(GROW_{ijkl}) + r_{3jkl}(PROF_{ijkl}) + r_{6jkl}(TANG_{ijkl}) + e_{ijkl}. \end{aligned} \tag{3g}$$

4. Results

4.1. Variance decomposition analysis of leverage

Table 3 shows the results of the variance decomposition analysis of leverage through the estimation of our four first models of random intercepts. For our purposes, the results from Model 1 – empty model – are of special interest. Without the inclusion of covariates, we can observe the relative importance of each level on the variance of leverage. As we can see, a large proportion of leverage variance is due to the level of the firm, suggesting that intrinsic firm characteristics are responsible for a significant portion of financing decisions. Its estimated residual intraclass correlation accounts for 42.5% of the leverage variance. From a certain point of view, the vast number of studies dedicated to the analysis regarding the influence of intrinsic firm characteristics (e.g., profitability, tangibility, growth opportunities, etc.) on capital structure reflects this relatively high influence of firm-level. Most importantly, it may reflect the managerial tendency to focus on internal factors for purposes of defining corporate policies.

In second place, accounting for 35.6% of the leverage variance, time-level plays an important role in the capital structure. It reflects, for instance, the important influence of macroeconomic shocks that firms may feel in a given year. At first sight, such a finding seems to contradict the results of Lemmon et al. (2008), who find evidence that capital structure is significantly stable over time, i.e., low (high) leveraged firms tend to maintain their capital structures for a long period. Consequently, they observe that the variance of firm debt is larger than the variance of time. However, we must be careful when comparing these results.

We also find that firm-level accounts for a higher variance of leverage than time-level; however, our results suggest that time cannot be ignored in the capital structure evolution. This discrepancy (i.e., the importance of time when comparing these two studies) may be primarily due to differences in the samples. While Lemmon et al. (2008) analyze only North-American firms from Compustat files, our sample comprises 40 countries – from Compustat Global Vantage – that differ from each other with respect to their development level. The fact that our sample includes such a heterogeneous set of countries may increase the importance of time. Perhaps, in a more economically stable country such as the USA, the firm financial policy may be time-invariant. On the other hand, firms of emerging countries may be more prone to changes in their policies – both investment and financing – arising from macroeconomic instabilities. These differences are important issues that future studies may address.

The effect of industry-level, accounting for 11.6%, also influences the capital structure in a significant manner. This result suggests that the analysis of industry characteristics is also important to explain the leverage heterogeneity between firms. Previous studies on industry influences show mixed results. Remmers and Stonehill (1974), for instance, find significant differences in leverage between industries in France and Japan, but not in Netherlands, Norway or the United States.

More recently, MacKay and Phillips (2005) find significant differences in between- as well as in within-industries leverages, suggesting that industries may differ in multiple ways. They state that in order to fully understand the effects of industry on firm decisions, an appropriate analysis must offer us a richer treatment

Table 3
HLM estimations of leverage variance.

	Model 1	Model 2	Model 3	Model 4
Variance decomposition				
Country-level, t_{000l}	5.8894 (1.5394)	4.8984 (1.2953)	4.8953 (1.2949)	4.9014 (1.3466)
Industry-level, s_{000k}	20.4888 (3.2690)	7.1845 (1.2765)	7.3671 (1.3081)	7.5669 (1.3508)
Country × industry-level, u_{00kl}	12.1185 (0.9601)	10.5245 (0.8386)	10.4413 (0.8361)	10.4761 (0.8625)
Firm-level, r_{0jkl}	74.9976 (0.9715)	65.2223 (0.8683)	65.2140 (0.8682)	67.2642 (0.9200)
Time-level, e_{ijkl}	62.8139 (0.2668)	58.5806 (0.2584)	58.4804 (0.2579)	58.7905 (0.2635)
Percentage of total variances				
Between countries	3.3%	3.3%	3.3%	3.3%
Between industries	11.6%	4.9%	5.0%	5.1%
Between countries and industries	6.9%	7.2%	7.1%	7.0%
Between firms	42.5%	44.5%	44.5%	45.1%
Across time	35.6%	40.0%	39.9%	39.5%

This table shows the random-effects results from hierarchical linear modeling. The sample comprises all Compustat Global Vantage firm-year observations – except financial companies – from 1997 through 2007. We show the variance decomposition estimates for the country-level (t_{000l}), the industry-level (s_{000k}), the interaction between country- and industry-level (u_{00kl}), the firm-level (r_{0jkl}) and the time-level (e_{ijkl}). Standard errors are in parentheses following the percentage with respect to the ratio of each level variance to total variance. Our main interest relies on model 1 (empty model), which shows the relative importance of each level on leverage variance, without the inclusion of determinants of capital structure. Models 2, 3 and 4 gradually include the variables of firm, industry and country, respectively. Estimates of these fixed effects are reported in Table 4. The dependent variable is the long-term market leverage, defined as the ratio of long-term debt to total firm value, where total firm value is the sum of debt and market value of firm equity. The construction of explanatory variables is described in Table 2.

rather than only accounting for industry fixed effects. Incidentally, many studies on firm-level determinants of capital structure include industry dummy variables as controls. However, as we previously mention, few studies analyze the characteristics rather than the classification of industries and their influence on financing decisions. Regardless, studies in this line of inquiry are encouraging, since research on this level is not as common as on firm-level or even on country-level. We hope to extend this line of research by including two industry-level variables (i.e., munificence and dynamism).

The isolated influence of the country-level, in turn, is relatively low, accounting for only 3.3% of variance. It might be surprising, then, to observe such a low relative importance of country-level on the variance of firm leverage, since in recent years we have witnessed a proliferation of studies that compare the capital structure of different countries. However, some of these previous studies only show that financing decisions appear to be similar between countries, i.e., capital structure would be determined by the same factors regardless of country. Booth et al. (2001), for instance, when comparing the determinants of capital structure of emerging and developed countries, find that in spite of deep institutional differences among countries, the variables that explain capital structures in the USA and Europe would also explain those in emerging countries.

Thus far, an important point we can derive from the results is that the lower levels (i.e., time and firm) are the main responsible for the majority of leverage variance, which are more likely to change across time than higher levels (i.e., industry and country). That is, although both industry and country characteristics are subject to change, such change is more likely to occur over a long period. Firm characteristics, on the other hand, tend to be more dynamic and volatile. Given the above, we cannot say that industry- and country-levels are less important just because their roles in leverage variance are lower. It may be the case that their portion of variance is lower only because they vary less than firm leverage. The inclusion of industry- and country-level covariates shows that some characteristics of these levels are actually significant to explain firm-level leverage.

4.2. Random intercept models

Table 4 shows the results of the HLM analysis, through which we estimate the fixed effects of the year, firm, industry and country levels. In this first step of our analysis, we only consider random intercept models. In the following section, we discuss the inclusion of random slopes. In addition to the parameters estimation, we also report the model fit statistics – Deviance, AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) – in order to provide us with the necessary information to compare the different models. As we can see, the gradual inclusion of covariates increases the model fit (the lower the statistics, the better the fit). The complete intercept model 4 has the best fit, suggesting that all levels of covariates are relevant in explaining firm capital structure.

Model 1 shows the results of the empty model. The intercept estimate is 10.954%, which we can take as the grand mean leverage of our sample. Models 2–4 gradually add covariates. Model 2 includes the variables of the firm level, in addition to year dummies. Except for the variable distance from bankruptcy, all other traditional determinants of the capital structure are significant. These results hold true even after the inclusion of industry and country variables in subsequent models. Two firm variables – tangibility and size – show a positive and significant relation with leverage. The positive influence of tangibility suggests that the collateral aspect of fixed assets is an important leverage driver for the countries in our sample. Rajan and Zingales (1995) find the same relation for the G7 developed countries (except for Italy, whose relationship is positive, but not significant). Booth et al. (2001) also find a positive

Table 4
HLM results with random intercepts for full sample.

	Model 1	Model 2	Model 3	Model 4
Fixed effects				
Intercept	10.954 (0.000)	1.917 (0.000)	3.365 (0.000)	7.369 (0.000)
Year fixed effects	No	Yes	Yes	Yes
Firm variables				
Growth opportunities		−0.010 (0.000)	−0.010 (0.000)	−0.009 (0.000)
Profitability		−0.001 (0.000)	−0.001 (0.000)	−0.001 (0.000)
Distance from bankruptcy		0.000 (0.400)	0.000 (0.374)	0.000 (0.361)
Size		0.777 (0.000)	0.792 (0.000)	0.776 (0.000)
Tangibility		0.146 (0.000)	0.144 (0.000)	0.143 (0.000)
Industry variables				
Munificence			−6.369 (0.000)	−4.883 (0.000)
Dynamism			−7.414 (0.000)	−10.405 (0.000)
HH index			−1.506 (0.000)	−1.304 (0.000)
Country variables				
Stock market development				−1.160 (0.000)
Bond market development				−2.321 (0.000)
Financial system (market vs. bank)				−0.764 (0.333)
GDP growth				−0.176 (0.000)
Model-fit statistics				
Deviance	927077.2	857699.4	857515.0	827899.2
AIC	927089.1	857739.4	857561.0	827953.2
BIC	927147.7	857933.1	857783.8	828213.8
Observations	127,340	118,965	118,965	114,788

This table shows the fixed-effect results from hierarchical linear modeling with random intercepts. The sample comprises all Compustat Global Vantage firm-year observations – except financial companies – from 1997 through 2007. Model 1 is the empty model, which does not include any covariate. Model 2 shows estimates for firm level determinants of leverage. Model 3 adds industry variables and Model 4 adds country variables. The dependent variable is the long-term market leverage, defined as the ratio of long-term debt to total firm value, where total firm value is the sum of debt and market value of firm equity. The construction of explanatory variables is described in Table 2. Year fixed effects are added in models 2, 3 and 4. *P*-values are in parenthesis. Model-fit statistics and numbers of firm-year observations are reported at the bottom of the table.

relationship between tangibility and leverage for most of the emerging countries in their sample.

The second positive and significant relationship is that between size and debt. However, the results on this relationship in previous studies are mixed. For instance, Rajan and Zingales (1995) and Booth et al. (2001) find different results depending on the country. A positive relation is based on the assumptions that bigger companies are more transparent and are able to spread the costs of debt issues through a higher volume (Byoun, 2008) or because they are more diversified and can reduce the bankruptcy risk (Titman and Wessels, 1988). On the other hand, a negative relationship corroborates the hypothesis of Rajan and Zingales (1995) that smaller levels of asymmetric information in larger companies can allow them to issue new equity without a concomitant decrease in market value.

Growth opportunities show a negative and significant relationship with leverage, corroborating the studies of Rajan and Zingales (1995) and Booth et al. (2001). We can explain this outcome through the disciplinary role of debt in reducing the conflicts of interest between managers and shareholders caused by excessive free cash flow (Jensen, 1986). However, depending on the way we build this variable, there may be a theoretical overlap. Following previous studies, we define this variable as firm market-to-book value. In general, it is a proxy for growth opportunities (as in Almeida and Campello (2007)), but it can also be a proxy for firm intangibility, as Villalonga (2004) suggests. In the latter view, intangibility could represent the singularity of a bundle of assets within a firm. Either way, both theoretical streams predict a negative relationship of market-to-book ratio with leverage.

Profitability also shows a negative and significant relationship with leverage. Like growth opportunities, different point of views can explain the influence of profitability on leverage. While pecking order predicts a negative relationship, trade-off states a positive relation. In our study, the hypothesis of pecking order prevails as an explanation for the lowest levels of debt at the most profitable companies. Some earlier studies also show negative relationships between profitability and leverage. For emerging countries, Booth et al. (2001) find negative relationships for all the countries that had enough data for the analysis of this variable. Rajan and Zingales (1995) also find negative relationships for almost all countries, although not all are statistically significant. The only exception is Germany with a positive, but not significant, relationship.

Model 3 adds industry level variables: munificence, dynamism and concentration (i.e., HH index). As we expect, both munificence and dynamism show negative and significant relationships with leverage. Munificence represents the abundance of resources in a given industry, while dynamism represent the instability or volatility of an industry (Boyd, 1995). The results indicate that companies working in industries with good growth opportunities (i.e., greater munificence) and larger risk because of a more dynamic environment (i.e., larger dynamism) tend to use leverage with less intensity. In a first analysis, this result reinforces the negative relationship between firm-level growth opportunities and leverage. It seems that firm growth opportunities play a similar role to industry growth on financial decision-making. In this case, we can expand trade-off or agency theories to industries in order to explain the negative relationship between the industry variables and leverage. From a certain point of view, our empirical tests corroborate the theoretical hypotheses Miao (2005) raises regarding capital structure and industry dynamics. Among other propositions, Miao hypothesizes that riskier industries with high technology growth have lower leverage.

Industry concentration (HH index) is also negatively related to leverage, indicating that high concentrated industries may lead their firms to have a lower debt. Our results contrast with the results of MacKay and Phillips (2005), who find that in their sample of North-American firms debt is higher in more concentrated industries. Our results for a global sample suggest that industrial organization may affect firm leverage in different ways depending on the country perspective.

Model 4 adds country macroeconomic variables. Previously, Booth et al. (2001), analyzing the influence of several macroeconomic variables on mean leverage of 17 developed and emerging countries, do not find statistically significant results. They explain this result with the fact that their sample is very small, leading to excessively high standard errors. It seems that our multilevel approach mitigates this problem, resulting in a better picture of the influence of country variables on leverage. As we expect, stock market development reduces firm leverage. As companies have an alternative to finance investments and growth through a more flexible source of capital (i.e., equity), they prefer to have less leverage. However, contrary to our expectations, bond market development also shows a negative relation with leverage. GDP growth also has a negative relationship with debt, a result that we expect if we consider GDP growth as an aggregate to the munificence of a given country, and providing investors with a good growth opportunity. The only variable that is not statistically significant is financial system. Purda (2008) suggests that in bank-based countries it is possible to identify financial distress earlier and credit renegotiation is easier. Thus, we expect that our measure of financial system is negatively related to leverage. However, for our sample, firm leverage is not affected with respect to country financial system being market- or bank-based.

4.3. Random coefficient models

Table 5 shows the results of random coefficient models. These extensions do not affect the influence of isolated covariates at levels of firm, industry and country on firm leverage, but, rather, show important additional relationships. Model 5 includes the estimations of interaction variables representing the indirect influences of industry-level covariates on leverage. In other words, industry-level variables munificence and dynamism affects certain firm-level covariates – growth opportunities and profitability – which in turn become random variables. As we can see, the munificence of the industries has a significant influence on firm profitability, but not on firm growth opportunities. Thus, industry munificence decreases the effect of profitability in driving low leverage. Profitability is still negatively related to leverage, but the fact that a firm is working in a munificent industry is also important in determining the level of leverage.

In Model 6, Table 5, with the inclusion of interaction variables representing the indirect influences of country-level covariates on leverage, the effect of munificence on growth opportunities becomes positive and significant. Despite a p-value of only 0.076, the positive sign of the interaction variable munificence $\times$ growth opportunities indicates that the munificence of the industry increases the effects of growth opportunities in driving low firm leverage. Thus, firms with high growth opportunities working in munificent industries – i.e., best positioned within their industry – have lower levels of leverage when compared to their competitors working in low munificent environments. This effect is even stronger in emerging countries but insignificant for developed nations, as we are going to see in the analysis of subsamples for developed and emerging countries.

Both country variables we include in the analysis are significant indirect drivers of leverage, in addition to their significant direct influences. First, we can see from Model 6, Table 5, that bond market development decreases the effect of tangibility. In other words, if a country has a more developed bond market, the collateral offered by fixed assets is less important to increase the leverage. Following de Jong et al. (2008), when bond markets are developed we expect that robust legal systems that protect debt holders

Table 5
HLM results with random coefficients – intercepts and slopes – for full sample.

	Model 5	Model 6
Fixed effects		
Intercept	13.607 (0.000)	12.082 (0.000)
Year fixed effects	*Yes*	*Yes*
Firm variables		
Growth opportunities	−3.380 (0.000)	−3.491 (0.000)
Profitability	−0.107 (0.000)	−0.104 (0.000)
Distance from bankruptcy	0.000 (0.965)	0.000 (0.957)
Size	0.644 (0.000)	0.634 (0.000)
Tangibility	0.120 (0.000)	0.167 (0.000)
Industry variables		
Munificence	−1.715 (0.002)	−2.046 (0.000)
Dynamism	−3.739 (0.003)	−3.986 (0.001)
HH index	−1.165 (0.000)	−1.011 (0.000)
Country variables		
Stock market development	−0.625 (0.000)	−0.931 (0.000)
Bond market development	−2.303 (0.000)	−0.856 (0.000)
Financial system (market vs. bank)	−1.028 (0.094)	−0.955 (0.108)
GDP growth	−0.092 (0.000)	−0.079 (0.000)
Interaction variables		
Munificence × growth opportunities	0.113 (0.233)	0.163 (0.076)
Munificence × profitability	−0.092 (0.000)	−0.083 (0.000)
bond market development × tangibility		−0.048 (0.000)
Stock market development × growth opportunities		0.220 (0.000)
Model-fit statistics		
Deviance	816070.0	810239.8
AIC	816138.0	810319.9
BIC	816466.1	810705.9
Observations	114,788	114,788

This table shows the fixed-effects results from hierarchical linear modeling with random coefficients – intercepts and slopes. The sample comprises all Compustat Global Vantage firm-year observations – except financial companies – from 1997 through 2007. Model 5 shows the estimates of fixed effects regarding the covariates of firm, industry, and country as well as the interaction variables representing the indirect effects of industry factors on firm-level determinants of leverage. Model 6 adds the interaction variables representing indirect effects of country factors on firm-level determinants of leverage. The dependent variable is the long-term market leverage, defined as the ratio of long-term debt to total firm value, where total firm value is the sum of debt and market value of firm equity. The construction of explanatory variables is described in Table 2. Year fixed effects are added in Models 5 and 6. *P*-values are in parenthesis. Model-fit statistics and numbers of firm-year observations are reported at the bottom of the table.

mitigate potential agency problems. Finally, the positive sign of the interaction variable stock market development × growth opportunities indicates that the more highly developed are stock markets, the higher the effect of growth opportunities in negatively influencing firm leverage. Hence, a well developed stock market is able to provide high growth firms with the necessary equity funding, making it possible for them to decrease leverage.

5. Robustness tests

5.1. Developed and emerging countries

Table 6 shows the complete random coefficient model we apply to two subsamples: developed countries and emerging countries. For our sample of developed countries, we follow Rajan and Zingales (1995) and analyze the G7 countries. We include the following countries: United States, Japan, Germany, France, Italy, United Kingdom and Canada. Our sample of emerging countries is based on Booth et al. (2001), who consider Brazil, Mexico, India, South Korea, Malaysia, Pakistan, Thailand and Turkey. We only exclude two out of 10 countries – Jordan and Zimbabwe – because of the sampling criteria we mention earlier. By analyzing these two

Table 6
HLM results with random coefficients for sub-samples of developed and emerging countries.

	Developed countries	Emerging countries
Fixed effects		
Intercept	9.868 (0.000)	17.740 (0.000)
Year fixed effects	*Yes*	*Yes*
Firm variables		
Growth opportunities	−3.022 (0.000)	−4.941 (0.000)
Profitability	−0.134 (0.000)	−0.149 (0.000)
Distance from bankruptcy	0.000 (0.714)	−0.003 (0.916)
Size	0.707 (0.000)	0.630 (0.000)
Tangibility	0.200 (0.000)	0.209 (0.000)
Industry variables		
Munificence	−0.647 (0.352)	−3.932 (0.099)
Dynamism	−2.538 (0.070)	3.921 (0.413)
HH index	−1.480 (0.000)	−1.576 (0.015)
Country variables		
Stock market development	0.947 (0.004)	−7.002 (0.000)
Bond market development	−1.069 (0.000)	−7.209 (0.000)
Financial system (market vs. bank)	0.801 (0.492)	2.101 (0.509)
GDP growth	−0.054 (0.084)	0.047 (0.146)
Interaction variables		
Munificence × growth opportunities	0.109 (0.606)	4.252 (0.000)
Munificence × profitability	−0.078 (0.000)	−0.421 (0.000)
Bond market development × tangibility	−0.061 (0.000)	−0.121 (0.000)
Stock market development × growth opportunities	−0.264 (0.002)	0.979 (0.000)
Model-fit statistics		
Deviance	477682.6	131989.6
AIC	477762.7	132069.6
BIC	478129.0	132380.8
Observations	70,114	17,696

This table shows the fixed-effect results from hierarchical linear modeling with random coefficients – intercepts and slopes – for subsamples of firm-year observations from developed and emerging countries with data available in Compustat Global Vantage – except financial companies – from 1997 through 2007. The list of developed countries is based on Rajan and Zingales (1995) and comprises the G7 countries United States, Japan, Germany, France, Italy, United Kingdom and Canada. The list of emerging countries is based on Booth et al. (2001): Brazil, Mexico, India, South Korea, Malaysia, Pakistan, Thailand and Turkey. Jordan and Zimbabwe are not included because of sampling restrictions. We analyzed the complete random-coefficient model for both samples. The dependent variable is the long-term market leverage, defined as the ratio of long-term debt to total firm value, where total firm value is the sum of debt and market value of firm equity. The construction of explanatory variables is described in Table 2. Year fixed effects are added in both models. *P*-values are in parenthesis. Model fit statistics are reported only for reference, but they cannot be compared with one another since samples are different. The numbers of firm-year observations are reported at the bottom of the table.

blocks of countries separately we intend to verify whether the same firm leverage drivers apply to developed as well as emerging countries. In other words, we are interested in observing if theories developed in the USA might apply to other environments.

As we can see from Table 6, four out of five covariates regarding firm characteristics – growth opportunities, profitability, size and tangibility – show the same signs and statistical significances between the two blocks of countries. The only variable that is not significant is distance from bankruptcy, to both developed and emerging countries.

However, the covariates regarding industry characteristics – munificence, dynamism and concentration – show different effects depending on the country development level. In developed countries, industry munificence is insignificant to explain firm leverage. Contrarily, industry dynamism and concentration are negative and significantly related to leverage. For emerging countries, in turn, munificence and concentration turn out to be significant and negatively related to leverage.

The most important differences between the two subsamples bear on certain country variables and interaction variables. Stock

market development has a positive relation with leverage in firms of developed countries, whereas for firms in emerging countries the relation is negative. These results contrast with the findings of Demirgüç-Kunt and Maksimovic (1996), who find a negative relation in developed stock markets and vice versa. Our paper raises important issues that future studies should further analyze. For instance, our result suggests that in countries where the stock market is developed, firms tend to rely more heavily on debt. However, the findings of Demirgüç-Kunt and Maksimovic (1996), over ten years ago, show exactly the opposite. Could the difference be a sign that stock markets in developed countries are close to their limit and, in this context, firms have to increase their leverage in order to maintain their investment projects?

Two interaction variables show different effects when we compare developed and emerging countries; both relate to firm growth opportunities. Munificence appears to be more important in emerging countries. In these countries, industry munificence increases the effects of growth opportunities in driving low firm-leverage. However, this effect is not significant in developed countries. When we analyze the effect of stock market development on growth opportunities, we observe an inverse role for developed and emerging countries. In the latter, the effect is negative, in the former, positive. In developed countries, stock market development decreases the effect of growth opportunities in determining low firm-leverage. On the other hand, in emerging countries, the development of stock markets increases the role of firm growth in determining low levels of leverage.

5.2. Book leverage

Empirical studies on capital structure usually assume different measures of leverage to be dependent variables. One important difference between the alternative measures refers to what kind of equity value – market or book – should be used to calculate the leverage ratio. Some studies only rely on market leverage (Balakrishnan and Fox, 1993; de Jong et al., 2008); others rely on book leverage alone (e.g., Ferri and Jones, 1979; MacKay and Phillips, 2005), or on both (e.g., Booth et al., 2001; Byoun, 2008; Lemmon et al., 2008).

Barclay, Smith and Morellec (2006) state that book leverage would be a better measure because it captures the value of assets in place and not growth options reflected by current market values. They argue that this procedure is a better way to identify a negative marginal debt capacity of growth options. Shyam-Sunder and Myers (1999) pose a similar argument, on which the debt issue decision based on market value can distort future investment decisions. It is important to notice that current funding should finance assets in place rather than discretionary growth option investments that are likely to occur in the future. In addition, Graham and Harvey (2001) find evidence that managers do not rebalance firm capital structure to reflect changing prices.

On the other hand, arguments against the use of book value may rely on distortions rooted in accounting rules, the fact that book equity may be negative and because the correlation between book and market value may be weak when firms are still small (Welch, 2004). In these cases, market leverage may provide a more realistic measure of leverage, since market value is closer to the intrinsic firm value. In addition, we argue that market leverage may reflect a more precise perspective of the potential for future leverage. In other words, if book leverage reflects the debt in use to finance assets in place, market leverage may be a reflection of the level of firm financial slack. The arguments for the use of market or book leverage are numerous, there even being controversy regarding which measure would be more appropriate. To address this issue, we run our models again using book leverage instead of market leverage as the dependent variable. We report the results in Table 7.

As we can see from Table 7, there are several differences in coefficients estimation. In the random-intercept model, we observe a change in the role of distance from bankruptcy, here positive and significantly related to book leverage. The same result appears in the random-coefficient model. We can interpret this to mean the longer the distance from bankruptcy, the higher the leverage. Following the arguments above regarding book leverage being tantamount to current funding for assets in place, it seems reasonable to find a positive relation. Under pecking order assumptions, we can say that if a given firm is financially healthy, it is able to increase the use of leverage in order to finance current projects (i.e., assets in place). On the other hand, one might expect a negative relationship with market leverage. To the extent that market value should also incorporate the present value of potential financial distress, a short distance from bankruptcy would reflect a high present value of financial distress, thereby causing firm value to decrease and, as a corollary, market leverage to increase.

Another important difference refers to industry variables, which turn out to have no significance in accounting for book leverage in the random-intercepts model. However, the negative and significant relation reappears in the random-coefficient model, but only for industry dynamism. Since model-fit statistics show that the random-coefficient is better than the random-intercept model, we are inclined to accept that dynamism does have a negative relation with book leverage. By analyzing country variables, we see that stock market development and GDP growth are no longer

Table 7
Robustness tests with book leverage.

	Random intercepts	Random coefficients
Fixed effects		
Intercept	2.606 (0.120)	7.010 (0.000)
Year fixed effects	*Yes*	*Yes*
Firm variables		
Growth opportunities	−0.042 (0.000)	−0.151 (0.229)
Profitability	−0.388 (0.000)	−0.119 (0.000)
Distance from bankruptcy	0.004 (0.000)	0.004 (0.000)
Size	2.536 (0.000)	1.343 (0.000)
Tangibility	0.186 (0.000)	0.176 (0.000)
Industry variables		
Munificence	−5.206 (0.059)	−0.231 (0.798)
Dynamism	−7.020 (0.322)	−6.566 (0.002)
HH index	0.144 (0.899)	−0.429 (0.334)
Country variables		
Stock market development	−1.258 (0.046)	−0.167 (0.512)
Bond market development	−2.201 (0.009)	−2.603 (0.000)
Financial system (market vs. bank)	−0.858 (0.516)	−2.233 (0.062)
GDP growth	0.018 (0.813)	−0.028 (0.202)
Interaction variables		
Munificence × growth opportunities		0.307 (0.048)
Munificence × profitability		−0.228 (0.000)
Bond market development × tangibility		−0.011 (0.170)
Stock market development × growth opportunities		0.014 (0.857)
Model-fit statistics		
Deviance	1201561.8	924419.4
AIC	1201616.0	924499.5
BIC	1201876.0	924885.5
Observations	114,788	114,788

This table shows robustness tests taking long-term book leverage as the dependent variable, where book leverage is defined as the ratio of long-term debt to total firm book value and total firm book value is the sum of debt and book value of firm equity. We test the models of random-intercepts as well as random-coefficients. The sample comprises all Compustat Global Vantage firm-year observations – except financial companies – from 1997 through 2007. The construction of explanatory variables is described in Table 2. Year fixed effects are added in both models. *P*-values are in parenthesis. Model fit statistics and numbers of firm-year observations are reported at the bottom of the table.

significant in accounting for book leverage. Finally, some differences appear on interaction variables regarding bond and stock market development.

6. Conclusion

This paper aims to (i) assess the relative importance of the levels of time, firm, industry and country on the variance of firm leverage and (ii) analyze direct and indirect influences of the characteristics of firm, industry and country on firm leverage. In order to take into account the hierarchical relations between these different levels, we apply a multilevel analysis, i.e., hierarchical linear modeling.

Not surprisingly, we find that the levels of firm and time are the most relevant when explaining the variances of leverage. Somewhat surprisingly is the relatively low importance of the country level. One could view this result as an argument for the analysis of country characteristics as a determinant of leverage not being worthy of further investigation. However, this is not so: our complete models – including covariates representing firm, industry and country determinants of leverage – show significant roles of all those factors. Thus, we believe our findings add an important perspective to the literature on capital structure *vis-à-vis* international financing policy.

Another relevant result concerns munificence and dynamism as determinants of leverage. Since there are relatively few papers analyzing the influence of industry characteristics as compared to papers focusing on firm and country factors, we believe this empirical stream continues to be underexplored. Nevertheless, more importantly, we extend the discussion of the importance of interactions between different levels – or environments – in the formulation of corporate policy. Moreover, our results have important managerial implications: they show that the majority of leverage variance is due to the firm level, which suggests that managers should focus a significant part of their attention on intrinsic firm characteristics when making financing decisions. Concomitantly, they cannot ignore the importance of external environments (e.g., industry and country) which have the power to influence internal firm characteristics including capital structure itself.

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References

Almeida, H., Campello, M., 2007. Financial constraints, asset tangibility, and corporate investment. Review of Financial Studies 20, 1429–1460.
Antoniou, A., Guney, Y., Paudyal, K., 2008. The determinants of capital structure: Capital market-oriented versus bank-oriented institutions. Journal of Financial and Quantitative Analysis 43, 59–92.
Autore, D.M., Kovacs, T., 2010. Equity issues and temporal variation in information asymmetry. Journal of Banking and Finance 34, 12–23.
Bah, R., Dumontier, P., 2001. R&D intensity and corporate financial policy: Some international evidence. Journal of Business Finance and Accounting 28, 671–692.
Balakrishnan, S., Fox, I., 1993. Asset specificity, firm heterogeneity and capital structure. Strategic Management Journal 14, 3–16.
Bancel, F., Mittoo, U.R., 2004. Cross-country determinants of capital structure choice. A survey of European firms. Financial Management 33, 103–132.
Barclay, M.J., Smith Jr., C.W., Morellec, E., 2006. On the debt capacity of growth options. The Journal of Business 79, 37–59.
Beck, T., Demirgüç-Kunt, A., Maksimovic, V., 2008. Financing patterns around the world: Are small firms different? Journal of Financial Economics 89, 467–487.
Booth, L., Aivazian, V., Demirgüç-Kunt, A., Maksimovic, V., 2001. Capital structures in developing countries. The Journal of Finance 56, 87–130.
Boyd, B.K., 1995. Ceo duality and firm performance. A contingency model. Strategic Management Journal 16, 301–312.
Brander, J.A., Lewis, T.R., 1986. Oligopoly and financial structure: The limited liability effect. The American Economic Review 76, 956–970.
Brown, J.R., Fazzari, S.M., Petersen, B.C., 2009. Financing innovation and growth: Cash flow, external equity, and the 1990s R&D boom. The Journal of Finance 64, 151–185.
Burgman, T.A., 1996. An empirical examination of multinational corporate capital structure. Journal of International Business Studies 27, 553–570.
Byoun, S., 2008. How and when do firms adjust their capital structures toward targets? The Journal of Finance 63, 3069–3096.
Chen, C.J.P., Cheng, C.S.A., He, J., Kim, J., 1997. An investigation of the relationship between international activities and capital structure. Journal of International Business Studies 28, 563–577.
Chui, A.C.W., Lloyd, A.E., Kwok, C.C.Y., 2002. The determination of capital structure: Is national culture a missing piece to the puzzle? Journal of International Business Studies 33, 99–127.
Clayton, M.J., 2009. Debt, investment, and product market competition: A note on the limited liability effect. Journal of Banking and Finance 33, 694–700.
D'Mello, R., Miranda, M., 2010. Long-term debt and overinvestment agency problem. Journal of Banking and Finance 34, 324–335.
de Jong, A., Kabir, R., Nguyen, T.T., 2008. Capital structure around the world: The roles of firm- and country-specific determinants. Journal of Banking and Finance 32, 1954–1969.
de Jong, A., Veld, C., 2001. An empirical analysis of incremental capital structure decisions under managerial entrenchment. Journal of Banking and Finance 25, 1857–1895.
Demirgüç-Kunt, A., Levine, R., 2004. Bank-based and market-based financial systems: Cross-country comparisons. SSRN Working Paper Series.
Demirgüç-Kunt, A., Maksimovic, V., 1996. Stock market development and financing choices of firms. The World Bank Economic Review 10, 341–369.
Demirgüç-Kunt, A., Maksimovic, V., 1999. Institutions, financial markets, and firm debt maturity. Journal of Financial Economics 54, 295–336.
Desai, M.A., Foley, C.F., Hines, J.J.R., 2004. A multinational perspective on capital structure choice and internal capital markets. The Journal of Finance 59, 2451–2487.
Dess, G.G., Beard, D.W., 1984. Dimensions of organizational task environments. Administrative Science Quarterly 29, 52–73.
Fama, E.F., French, K.R., 2002. Testing trade-off and pecking order predictions about dividends and debt. The Review of Financial Studies 15, 1–33.
Ferri, M.G., Jones, W.H., 1979. Determinants of financial structure: A new methodological approach. The Journal of Finance 34, 631–644.
Frank, M.Z., Goyal, V.K., 2003. Testing the pecking order theory of capital structure. Journal of Financial Economics 67, 217–248.
Graham, J.R., Harvey, C.R., 2001. The theory and practice of corporate finance. Evidence from the field. Journal of Financial Economics 60, 187–243.
Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. The American Economic Review 76, 323–329.
Korajczyk, R.A., Levy, A., 2003. Capital structure choice: Macroeconomic conditions and financial constraints. Journal of Financial Economics 68, 75–109.
Leary, M., Roberts, M., 2010. The pecking order, debt capacity, and information asymmetry. Journal of Financial Economics 95, 332–355.
Lee, K.C., Kwok, C.C.Y., 1988. Multinational corporations vs. domestic corporations: International environmental factors and determinants of capital structure. Journal of International Business Studies 19, 195–217.
Lemmon, M.L., Roberts, M.R., Zender, J.F., 2008. Back to the beginning: Persistence and the cross-section of corporate capital structure. The Journal of Finance 63, 1575–1608.
Luke, D.A., 2004. Multilevel Modeling. Sage Publications, Thousand Oaks.
MacKay, P., Phillips, G.M., 2005. How does industry affect firm financial structure? The Review of Financial Studies 18, 1433–1466.
MacKie-Mason, J.K., 1990. Do taxes affect corporate financing decisions? The Journal of Finance 45, 1471–1493.
Mansi, S.A., Reeb, D.M., 2002. Corporate international activity and debt financing. Journal of International Business Studies 33, 129–147.
Margaritis, D., Psillaki, M., 2010. Capital structure, equity ownership and firm performance. Journal of Banking and Finance 34, 621–632.
Miao, J., 2005. Optimal capital structure and industry dynamics. The Journal of Finance 60, 2621–2659.
Modigliani, F., Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. American Economic Review 48, 261–297.
Myers, S.C., 1984. The capital structure puzzle. The Journal of Finance 39, 575–592.
Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187–221.
O'Brien, J.P., 2003. The capital structure implications of pursuing a strategy of innovation. Strategic Management Journal 24, 415–431.
Purda, L.D., 2008. Risk perception and the financial system. Journal of International Business Studies 39, 1178–1196.
Rajan, R.G., Zingales, L., 1995. What do we know about capital structure? Some evidence from international data. The Journal of Finance 50, 1421–1460.
Remmers, L.E.E., Stonehill, A., 1974. Industry and size as debt ratio determinants in manufacturing internationally. Financial Management 3, 24–32.
Sekely, W.S., Collins, J.M., 1988. Cultural influences on international capital structure. Journal of International Business Studies 19, 87–100.

Shyam-Sunder, L., Myers, S.C., 1999. Testing static tradeoff against pecking order models of capital structure. Journal of Financial Economics 51, 219–244.
Simerly, R.L., Li, M., 2000. Environmental dynamism, capital structure and performance. A theoretical integration and an empirical test. Strategic Management Journal 21, 31–49.
Stulz, R.M., 1990. Managerial discretion and optimal financing policies. Journal of Financial Economics 26, 3–27.
Titman, S., Wessels, R., 1988. The determinants of capital structure choice. The Journal of Finance 43, 1–19.
Villalonga, B., 2004. Intangible resources, Tobin's q, and sustainability of performance differences. Journal of Economic Behavior and Organization 54, 205–230.
Welch, I., 2004. Capital structure and stock returns. The Journal of Political Economy 112, 106–131.
Wu, L.S., Yue, H., 2009. Corporate tax, capital structure, and the accessibility of bank loans: Evidence from China. Journal of Banking and Finance 33, 30–38.
Zwiebel, J., 1996. Dynamic capital structure under managerial entrenchment. The American Economic Review 86, 1197–1215.