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Determinants of corporate debt maturity in South America: Do institutional quality and financial development matter?

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ABSTRACT

We test whether a country's level of financial development or institutional quality (or both) has a first-order effect on corporate debt maturity decisions on a sample of 359 non-financial firms from five South American countries over a 12-year period. We find that there is a substantial dynamic component in the determination of a firm's debt maturity, and firms face moderate adjustment frictions toward their optimal maturities. More importantly, the level of financial development does not influence debt maturity, whereas the institutional quality of a country has a significant positive effect on the level of long-term debt in a firm's financial structure. Our results support the hypothesis that the quality of national institutions is an important determinant of corporate financing in general and of debt maturity in particular.

1. Introduction

The literature in law and finance shows that laws and the quality of their enforcement are important determinants of the shape and complexity of financial contracts pertaining to debt and equity. According to this literature, the level of protection investors receive determines their disposition toward providing funding to firms. Therefore, corporate financial decisions may critically rely on the legal framework and the quality of legal enforcement (La Porta et al., 1998). Further, some authors argue that corporate finance decisions are also affected by a country's financial development, since markets and financial intermediaries source capital to firms and provide information to investors (Demirgüç-Kunt and Maksimovic, 1998).

Empirical work seems to confirm these predictions: differences in investor protection and/or the degree of financial development across countries help to explain why firms in different countries have, e.g., differing access to external financing (Demirgüç-Kunt and Maksimovic, 1998; La Porta et al., 1997), differing ownership structures (La Porta et al., 1998), differing dividend payouts (La Porta et al., 2000a), and differing leverage and debt maturity (Booth et al., 2001; Demirgüç-Kunt and Maksimovic, 1999; Fan et al., 2012; Giannetti, 2003; González and González, 2008; Jong et al., 2008).

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However, as pointed out by La Porta et al. (2000b), more developed financial markets may be an outcome of better investor protection (institutional framework, property rights, etc.). According to Levine (1999), the development of financial intermediaries may depend on the quality of legal systems and of accounting standards, since financial activities are based on contractual arrangements and information about corporations. If financial development is simply an outcome of better investor protection, it should not have a first-order effect on corporate financial decisions, after controlling for the quality of investor protection. In our opinion, previous empirical work fails to test this prediction because: 1) it does not recognize this relation explicitly[2]; and 2) it uses a few single variables (time-invariant in most cases) to represent these constructs, increasing the probability that the estimated coefficients suffer from omitted variables bias.

In this paper, we try to shed light on this issue. Specifically, we analyze, in a focus-country setting, how firm characteristics, quality of national institutions, and country level of financial development affect the debt maturity of firms from a sample of South American countries. Moreover, and more importantly, we are able to provide novel evidence on the question of whether financial development or institutional quality (or both) have a first-order effect on corporate debt maturity decisions.

Among other financial decisions that may be strongly influenced by a country's level of financial development and/or the quality of its institutions, the maturity of debt seems particularly sensitive to these determinants. Indeed, recent studies document that debt maturities in emerging market countries are substantially shorter than in developed markets (e.g., Fan et al., 2012). Therefore, a debt maturity variable is appropriate to the kind of empirical investigation conducted here.

Given the relationship between institutional quality and financial development, if one or both constructs are misrepresented in the regression analysis, there is a substantial likelihood that the coefficients of the included variables are contaminated by an omitted variable bias. Suppose that the hypothesis that financial development is simply an outcome of a better institutional environment is true and that the researcher overlooks this. In this case the variables that proxy for the level of financial development may present (spurious) significant coefficients due to correlation with the omitted institutional quality variables, leading to an incorrect conclusion. In order to address this concern, we construct our financial development and quality of institutions indicators based on a broader array of variables, summarized in continuous, time-varying factors that we hope represent more closely the underlying theoretical constructs than do arbitrary single variables.

This paper also contributes to the existing body of knowledge in other ways. First, we focus on a sample of developing countries in South America that have thus far received little attention in empirical studies. South American countries warrant increased attention for several reasons: the empirical literature relies mainly on U.S. evidence, and the robustness of its results should be compared with evidence from countries whose economic structures differ; the growing significance of emerging markets in general, and South America in particular, in the world economy in terms of output, trade, investment, and stock market capitalization; South America's political and corporate systems have practices that differ from those of industrialized countries; and finally, to the best of our knowledge, no study has yet thoroughly analyzed the influence of national institutions and financial development on the debt maturity of firms in South America.[3]

Second, we employ two databases seldom explored in the maturity literature: the World Bank Financial Structure and the Governance Indicators datasets. These databases provide, respectively, a thorough perspective on the level of financial development and the quality of the institutional environment in each country. They do so by documenting a wide array of variables that describe various aspects of the institutional and financial structures of each country.

Finally, in order to consolidate the information available in the above mentioned databases, the variables are summarized via factor analysis. Such an approach presents many advantages: the extracted factors are time-varying continuous variables in contrast to the time-invariant proxies usually employed in the literature; the extracted factors account for a larger proportion of the underlying variation and represent more closely a given theoretical construct than do single variables; single variables are usually highly correlated, which prevents the use of more than a few simultaneously in the estimation of the models; and finally, the weights attributed to each variable in each extracted factor are objectively determined rather than arbitrarily set, as in indexes that are simple sums of binary variables (e.g., La Porta et al., 1998). Each of these advantages is related to our primary concern of measuring both constructs (institutional quality and financial development) with greater accuracy. Along with the ample coverage (in terms of the aspects measured) of both databases employed, this approach gives us confidence that the likelihood that our results are contaminated by omitted variables biases is reduced.

The paper closest to our own is Fan et al. (2012). However, there are marked differences between the two papers. First, beyond institutional characteristics, our study attempts to capture the effects of country financial development on the firm maturity decision. Also, and even more importantly, as pointed out by La Porta et al. (2000b), more highly developed markets may be an outcome of better investor protections (institutional framework, property rights, etc.); accordingly, whether institutional characteristics or financial development (or both) have a first-order effect on firm debt maturity remains an empirical question.

Second, there is a difference of scope: while ours is a focused-country study, Fan et al. (2012) is a cross-country study. According to Fan et al. (2011, p. 207): "*An advantage of focused-country studies over cross-country studies is that the former can*

[2] Kusnadi and Wei (2011), to the best of our knowledge, is an exception. These authors test whether legal protection of investors or financial development is the first-order effect in influencing the cash flow sensitivity of cash. Their results suggest that legal protection predominates over financial development.

[3] Recent research documents several particularities of the institutional setting in South American countries: a predominance of French civil law legal tradition (La Porta et al., 1998), weaker public law enforcement (La Porta et al., 2006), lower degree of investor protection (La Porta et al., 2000b), financial markets more likely to be bank-based (Levine, 2002), smaller stock markets (La Porta et al., 1997), higher degree of public firm ownership concentration (La Porta et al., 1999a), higher presence of state ownership of banks (La Porta et al., 2002), less efficient governments (La Porta et al., 1999b), and more regulated labor markets (Botero et al., 2004).

control data quality better, (…) while holding constant other factors that might be difficult to disentangle in cross-country studies." Moreover, Fan et al. (2012, p. 14) alert the reader that, due to data limitations, some determinants of capital structure choice identified in previous empirical work are not included in their models. This data limitation, inherent to cross-country studies, raises concerns about omitted variable biases, which are less likely in our paper. In this sense, we see our paper as a refinement of Fan et al. (2012), with its advantages (better treatment of particularities) and disadvantages (findings not as generalizable).

Finally, our paper also proposes the following additional improvements (relative to the literature, e.g., Demirgüç-Kunt and Maksimovic, 1999; Fan et al., 2012): the treatment of lagged debt maturity and leverage as endogenous variables. According to Barclay et al. (2003), leverage and maturity are endogenous facets of the firm capital structure decision. We address concerns about simultaneity by using estimation methods that account for the endogenous nature of leverage in the debt maturity decision. Also, as pointed out in Ozkan (2000) and Antoniou et al. (2006), firms may have long-run optimal debt maturity, so they should trade off the costs of being off-target with the costs of adjustment toward the target. In order to control for this possibility, we employ a dynamic model similar to those used in the studies mentioned.

Our main findings are that national financial development is not significantly related to firm debt maturity and country institutional quality affects positively the level of long-term debt in a firm's financial structure. These results are remarkably robust to outliers, methods of estimation, measurement of endogenous variables, and country, industry, and year influences. Our results are in line with those of Kusnadi and Wei (2011) for firms' cash savings decisions. Taken together, these results suggest that national institutions (instead of financial development) have a first-order effect on corporate financial decisions, supporting the claim of La Porta et al. (2000b) that financial development may also be an outcome of better institutions. In the particular case of debt maturity, a better institutional environment would allow firms to borrow long(er)-term. According to our estimates, ceteris paribus, an average firm located in a better quality environment could almost double its share of long-term debt with respect to an identical twin operating in a poor quality environment.

The remainder of this paper is structured as follows. Section 2 presents the determinants of corporate debt maturity analyzed in our study, while Section 3 details research methods, presents data sources, and describes the sample used in the empirical tests. Section 4 reports and comments on the estimation results. Finally, Section 5 presents our conclusions.

2. Determinants of debt maturity

We classify the determinants of corporate debt maturity into two groups: firm-specific and country-specific. Firm-specific determinants are derived from a well-established literature and reflect most of the firm-specific determinants used in previous empirical studies on this subject. We control for firm characteristics such as *Leverage*[4] (Barclay et al., 2003; Giannetti, 2003; Johnson, 2003; Myers, 1977; Stohs and Mauer, 1996), *Asset Maturity* (Morris, 1976), *Firm Size* (Barnea et al., 1980), *Growth Opportunities* (Antoniou et al., 2006; Diamond, 1991; Guedes and Opler, 1996; Myers, 1977), *Profitability* (Demirgüç-Kunt and Maksimovic, 1999; Fan et al., 2012), *Business Risk* (Kane et al., 1985), *Tangibility* (Antoniou et al., 2006; Demirgüç-Kunt and Maksimovic, 1999; Fan et al., 2012), *Tax Effects* (Kane et al., 1985), *Credit Rating* (Diamond, 1991), and *Regulated Industries* (Barclay and Smith, 1996). More details on the computation of these variables are provided in Appendix A.

Regarding country-specific determinants, there is a growing body of literature that argues that a number of country characteristics affect the agent's decisions. According to Demirgüç-Kunt and Maksimovic (1998), an effective legal system is important to making long-term financing viable, because firms must be able to commit credibly to controlling opportunistic behavior by corporate insiders, and because long-term creditors commonly use debt covenants to control for opportunistic behavior. Fan et al. (2012) point out that in countries with weak legal rules and poor quality of law enforcement, financial instruments that allow insiders less discretion, and which are contractually easier to interpret, should prevail. Since short-term debt implies that corporate insiders need to deal with creditors more frequently, we expect that this type of financing prevails in countries with poor creditor protections.

Demirgüç-Kunt and Maksimovic (1998, p. 2108) also argue that the "*existence of developed and active financial markets and a large intermediary sector should make it easier for firms to raise long-term capital.*" Accordingly, we should expect a positive relationship between national financial development and firm debt maturity. However, as pointed out by La Porta et al. (2000b), better protection of investor rights is often necessary to the development of financial markets, and this suggests that more-developed markets may be an outcome of better investor protection. If this is the case, once we control for institutional quality (legal rules and the quality of their enforcement), financial development may have no additional effect on a firm's debt maturity. To evaluate this prediction, we estimate regressions with both factors included (quality of institutions and financial development) as well as regressions with only one or the other factor included. The variables used to construct these two factors (by means of factor analysis) are described in detail in Section 3.

3. Data, variables, and research methods

This section describes our data sources, explains our sample selection procedures and the methods used to construct the firm-specific and country-specific variables, presents the empirical model estimated, and provides details about the estimation methods employed. Also, it presents and discusses the summary statistics of the variables employed in our empirical model.

[4] We list leverage among the determinants of debt maturity just for presentation convenience. Strictly speaking, leverage and debt maturity are jointly determined as part of a firm's overall financial structure. Indeed, we treat them as endogenous in our model. We are thankful to an anonymous referee for this comment.

3.1. Data and variables

Accounting and stock market firm-level data are taken from the Economática Pro® database (Economática, 2009). Data on interest and inflation rates for all countries analyzed are derived from the International Financial Statistics of the International Monetary Fund. Statutory tax rates by country are collected from KPMG's Corporate and Indirect Tax Rate Survey (2007, 2009).[5]

Observations are yearly for the period 1996–2007 (subject to availability), and the unit of analysis is the individual firm. This study includes Argentina, Brazil, Chile, Colombia, Peru, and Venezuela. We exclude all firms pertaining to the financial industry, such as "financial services and insurance," "holding and asset management companies," and "real estate," as well as "others" and "non-classified establishments." We also exclude firms that do not have at least three years of consecutive data, the minimum needed to perform the regressions, and firms with negative book equity, negative sales, or negative long-term debt to total-debt ratio. These selection criteria result in the exclusion of Colombia from our sample. The final sample contains 359 firms and 2734 observations. An overview of the number of firms and observations by country and industry is set forth in Table 1.

From Table 1, it is evident that Brazil heavily influences the sample: it has the most firms included of all sample countries, representing more than 61% of the sample composition. Venezuela, on the other hand, has little influence on the sample with less than 2% of sample firms. Table 1 also shows that "Electricity," "Steel," and "Food and Beverages" are the predominant activities of the sample firms, representing individually more than 10% of the sample each. "Software" lies at the other end of the spectrum, with only one firm and seven observations included.

The dependent variable is a proxy of the maturity ratio of debt carried by each firm, measured as Long-Term Debt over Total Debt. Firm-specific determinant factors for the debt maturity structure are those described in the preceding section. All firm-specific variables are computed from annual financial statement data in U.S. dollars. We use dollar figures in order to ease cross-country comparisons. Independent auditing is mandatory for yearly financial statements in all sample countries, which makes these statements more reliable.

Descriptive statistics for these variables are presented in Table 2. Chilean firms present the largest Debt Maturity ratios among all sample firms, while Argentine firms employ relatively more short-term debt. The typical South American firm in our sample uses a little over 50% long-term debt in its financing. Firms from Argentina and Brazil are, on average, more levered, while Venezuelan firms lie on the other side of the spectrum, employing less debt in their financing. Overall, sample firms seem to use moderate debt in their financial structures (about 26% of firm value).

We identified that the means are influenced by a few large observations for some variables. In order to account for this, here and in the data analyses that follow, we Winsorize the sample as a remedial measure, as suggested by Lien and Balakrishnan (2005).[6] In such an adjusted sample, the mean *Asset Maturity* declines substantially for Brazil, Chile, and Peru. As expected, the volatility of these variables also decreases. Firms from different countries in our sample are roughly comparable in terms of *Size*, *Growth Opportunities*, *Business Risk*, *Tangibility*, *Tax Effects*, *Synthetic Ratings*, and share of *Regulated Industries*. Venezuela often stands apart from the other sample countries, but we attribute this fact in part to the small sample size for this country.

Table 3 presents the correlation matrix for firm-specific variables. Panel A reports the correlations for the original sample. Correlations are generally low, although ranging from −0.37 (*Leverage* versus *Growth Opportunities*) to 0.51 (*Growth Opportunities* versus *Profitability*). The correlation between *Debt Maturity* and *Leverage* is about 0.17, which seems moderate. Outliers also affect the correlation of some variables, especially *Asset Maturity*. Indeed, in Panel B (Winsorized sample) the correlation between this variable and most of the others increases in absolute terms and often becomes significant. Overall, correlations do not decrease in absolute terms and significance increases in the Winsorized sample.

Aside from these variables, we also employ a set of macroeconomic and dummy variables. First, to control for macroeconomic volatility, an important aspect of long-term contractual relationships, we include in our model the standard deviations of the previous year monthly interest and inflation rates. Second, the industry of each firm is included, given the possible systematic effects that the nature of the firm's activities may have on its debt maturity. Firm industry is represented by a set of dummy variables based on the classification in the respective database. Likewise, country dummies are used to account for any remaining country-specific variation that is not captured by our measures of macroeconomic volatility, national institutional quality, and financial development. Finally, year dummies are employed in order to account for common time-shocks to all firms.

3.2. Factor analysis of national institutional quality and financial development

In order to build institutional quality and financial development factors, we use the World Bank Financial Structure and Governance Indicators databases. The Financial Structure database, documented by Beck et al. (2000), covers more than 200

[5] These documents report statutory tax rates for several countries for each year since 1993. There are some gaps for the countries in our sample that are filled by the tax rate in the following year if the initial observation is missing, and by the tax rate in the previous year if middle observations are missing.

[6] We Winsorize the following variables at the 5th and 95th percentiles: *Asset Maturity*, *Profitability*, and *Tangibility*. The remaining variables do not seem to be as affected by extreme observations.

Table 1
Composition of the sample.

Industry	Argentina		Brazil		Chile		Peru		Venezuela		Total		Total %	
	Firms	Obs.	Firms	Obs.	Firms	Obs.	Firms	Obs.	Firms	Obs.	Firms	Obs.	Firms	Obs.
Agriculture	4	29	2	15	1	11	5	33			12	88	3.3%	3.2%
Chemical	5	45	24	172	5	33	1	8	1	5	36	263	10.0%	9.6%
Construction	3	30	8	64			1	5			12	99	3.3%	3.6%
Electricity	5	46	32	215	4	28	3	22	1	11	45	322	12.5%	11.8%
Electronic	2	13	9	64	1	11					12	88	3.3%	3.2%
Food and beverages	4	32	19	142	6	58	8	43			37	275	10.3%	10.1%
Machinery			4	41							4	41	1.1%	1.5%
Mining			4	38	1	11	12	69			17	118	4.7%	4.3%
Non-metallic minerals	3	22	5	33	3	31	1	7			12	93	3.3%	3.4%
Oil and gas	10	81	7	69							17	150	4.7%	5.5%
Pulp and paper	1	6	7	68					1	8	9	82	2.5%	3.0%
Retailing/Wholesaling	1	12	10	76	10	74	1	8			22	170	6.1%	6.2%
Software	1	7									1	7	0.3%	0.3%
Steel	5	46	26	220	4	38	2	10	1	5	38	319	10.6%	11.7%
Telecommunications	2	24	24	163	2	10			1	11	29	208	8.1%	7.6%
Textile	3	19	18	142	1	9	3	19	1	4	26	193	7.2%	7.1%
Transport and logistics	2	12	8	35	2	22					12	69	3.3%	2.5%
Vehicles and parts	3	15	15	134							18	149	5.0%	5.4%
Total	54	439	222	1691	40	336	37	224	6	44	359	2734	100.0%	100.0%
Total %	15.0%	16.1%	61.8%	61.9%	11.1%	12.3%	10.3%	8.2%	1.7%	1.6%	100.0%			

Number of firms and observations by industry and country.

countries over the period 1960–2007, reporting 32 variables designed to measure country financial development and structure. The Governance Indicators database, documented by Kaufmann et al. (2008), also covers more than 200 countries, reporting six aggregate indicators: *Voice and Accountability*, *Political Stability and Absence of Violence*, *Government Effectiveness*, *Regulatory Quality*, *Rule of Law*, and *Control of Corruption*. This latter database covers the period 1996–2007, but for the years 1997, 1999, and

Table 2
Descriptive statistics.

Variable	Country	Debt Matur.	Lever.	Asset Matur.	Firm size	Growth opport.	Profit	Business risk	Tangib.	Tax effects	Synth. high rating	Synth. low rating	Regul. industry
Original mean	Argentina	0.4866	0.2916	14.7936	11.8336	1.0804	0.0619	0.0542	0.5053	0.2876	0.1572	0.2483	0.4396
	Brazil	0.5158	0.2748	12.4224	12.8684	1.1306	0.0807	0.0550	0.4199	0.2640	0.1526	0.2324	0.3454
	Chile	0.5678	0.2058	17.6202	12.1761	1.3659	0.0799	0.0344	0.4767	0.1407	0.1637	0.1280	0.2113
	Peru	0.5020	0.2258	14.2512	11.5696	1.4751	0.1415	0.0896	0.5159	0.2549	0.1518	0.1384	0.4286
	Venezuela	0.5203	0.2014	10.6946	12.6745	0.7693	0.0508	0.0318	0.6417	0.3130	0.2500	0.0909	0.5000
	All	0.5164	0.2638	13.5640	12.5076	1.1739	0.0821	0.0548	0.4520	0.2527	0.1562	0.2121	0.3533
Winsorized mean	Argentina	0.4866	0.2916	11.4396	11.8336	1.0804	0.0637	0.0542	0.5052	0.2876	0.1572	0.2483	0.4396
	Brazil	0.5158	0.2748	6.7508	12.8684	1.1306	0.0808	0.0550	0.4185	0.2640	0.1526	0.2324	0.3454
	Chile	0.5678	0.2058	8.2447	12.1761	1.3659	0.0811	0.0344	0.4750	0.1407	0.1637	0.1280	0.2113
	Peru	0.5020	0.2258	8.9469	11.5696	1.4751	0.1374	0.0896	0.5161	0.2549	0.1518	0.1384	0.4286
	Venezuela	0.5203	0.2014	10.1229	12.6745	0.7693	0.0505	0.0318	0.6407	0.3130	0.2500	0.0909	0.5000
	All	0.5164	0.2638	7.9215	12.5076	1.1739	0.0822	0.0548	0.4509	0.2527	0.1562	0.2121	0.3533
Standard Deviation	Argentina	0.3259	0.2114	37.3339	1.7949	0.3848	0.0815	0.0358	0.2480	0.0939	0.3644	0.4325	0.4969
	Brazil	0.2763	0.1800	206.550	1.6231	0.6201	0.0830	0.0330	0.1946	0.1088	0.3597	0.4225	0.4756
	Chile	0.3238	0.1445	163.084	1.4856	0.5511	0.0665	0.0195	0.1981	0.0456	0.3705	0.3346	0.4088
	Peru	0.3211	0.1850	47.8378	1.2394	1.1675	0.1745	0.1002	0.2308	0.0877	0.3596	0.3461	0.4960
	Venezuela	0.2995	0.1409	8.6889	1.7522	0.2473	0.0403	0.0096	0.1385	0.0629	0.4380	0.2908	0.5058
	All	0.2956	0.1834	173.367	1.6820	0.6543	0.0935	0.0437	0.2117	0.1075	0.3631	0.4089	0.4781
Minimum	Argentina	0.0000	0.0000	0.1931	3.9340	0.3152	−0.4139	0.0046	0.0021	0.0000	0.0000	0.0000	0.0000
	Brazil	0.0000	0.0000	−5.0042	3.6816	0.2751	−0.3915	0.0043	0.0000	0.0000	0.0000	0.0000	0.0000
	Chile	0.0000	0.0001	1.7098	6.5067	0.4654	−0.1631	0.0060	0.1163	0.0000	0.0000	0.0000	0.0000
	Peru	0.0000	0.0004	1.1262	7.9944	0.3030	−0.2292	0.0143	0.1123	0.0000	0.0000	0.0000	0.0000
	Venezuela	0.0000	0.0039	2.4000	6.6233	0.3660	−0.0256	0.0166	0.2985	0.1700	0.0000	0.0000	0.0000
	All	0.0000	0.0000	−5.0042	3.6816	0.2751	−0.4139	0.0043	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	Argentina	1.0000	0.9039	462.161	16.1223	2.8207	0.3833	0.1756	0.9109	0.3500	1.0000	1.0000	1.0000
	Brazil	1.0000	0.9387	8493.88	18.3830	8.8883	0.4747	0.2543	0.9663	0.3700	1.0000	1.0000	1.0000
	Chile	0.9961	0.8706	2994.77	15.8467	3.2560	0.3631	0.0724	0.9644	0.1700	1.0000	1.0000	1.0000
	Peru	1.0000	0.8082	680.320	14.9720	6.2589	0.9895	0.3414	0.9281	0.3000	1.0000	1.0000	1.0000
	Venezuela	1.0000	0.5502	46.4838	15.1687	1.4743	0.1568	0.0517	0.8872	0.3400	1.0000	1.0000	1.0000
	All	1.0000	0.9387	8493.88	18.3830	8.8883	0.9895	0.3414	0.9663	0.3700	1.0000	1.0000	1.0000

Descriptive statistics for each variable by country, for the period 1996–2007. Number of observations by country: Argentina (439), Brazil (1691), Chile (336), Peru (224), and Venezuela (44).

Table 3
Correlation matrix.

Panel A—Original sample								
	Debt Maturity	Leverage	Asset Maturity	Firm Size	Growth Opps.	Profitab.	Business Risk	Tangib.
Leverage	**0.168**							
Asset Maturity	−0.021	**0.040**						
Firm Size	**0.303**	−0.021	**−0.082**					
Growth Opps.	**0.094**	**−0.374**	−0.013	**0.236**				
Profitability	**0.080**	**−0.308**	−0.016	**0.233**	**0.514**			
Business Risk	**−0.034**	**−0.057**	−0.023	−0.026	**0.220**	**0.258**		
Tangibility	**0.260**	**0.241**	−0.015	**0.104**	**−0.133**	**−0.080**	**−0.089**	
Tax Effects	−0.021	**−0.212**	**−0.053**	**0.125**	**0.108**	**0.269**	−0.025	**−0.135**

Panel B—Winsorized sample								
Variables	Debt Maturity	Leverage	Asset Maturity	Firm Size	Growth Opps.	Profitab.	Business Risk	Tangib.
Leverage	**0.168**							
Asset Maturity	**0.144**	**0.199**						
Firm Size	**0.303**	−0.021	**−0.231**					
Growth Opps.	**0.094**	**−0.374**	**−0.163**	**0.236**				
Profitability	**0.070**	**−0.327**	**−0.191**	**0.232**	**0.501**			
Business Risk	**−0.034**	**−0.057**	**−0.155**	−0.026	**0.220**	**0.303**		
Tangibility	**0.259**	**0.246**	**0.537**	**0.097**	**−0.132**	**−0.091**	**−0.093**	
Tax Effects	−0.021	**−0.212**	**−0.081**	**0.125**	**0.108**	**0.270**	−0.025	**−0.138**

Correlation matrix for firm-specific variables, for the period 1996–2007. Coefficients in bold are statistically significant at the 10% level or less.

2001 there are no data available. To minimize problems of data loss, we choose to substitute these missing data with the middle point between the preceding and the succeeding years.

The variables in both databases are highly correlated.[7] In multiple regressions, the concomitant inclusion of highly correlated explanatory variables may result in high multicollinearity and, consequently, in high variance and covariance of the estimates—i.e., less precise estimation (Gujarati, 2004). In order to avoid problems of multicollinearity, we employ factor analysis on the institutional quality and financial development indicators.[8] Details on the factor analysis procedures are not reported, but are available upon request.

Only one factor is extracted from the factor analysis of the Governance Indicators. Table 4 presents descriptive statistics for the institutional quality factor scores or, as we denominate it, the *Institutional Quality* factor. Based on these statistics, it is evident that Chile really stands apart from the other sample countries. The minimum value of its index is far higher than all other country maxima. We conclude that it has the best institutions among the countries of our sample, followed by Brazil, Argentina, Peru, and Venezuela, in this order.

The factor analysis for the Financial Structure database yields four factors, but only one (the first one) is retained for the analyses that follow, since it is the only one whose variables loadings are stable over time and the only one that has a meaningful interpretation. Table 5 displays descriptive statistics for the financial development factor scores, which we denominate *Financial Development* factor. Based on these statistics, we conclude that Chile, again, stands apart from its neighbors. It has by far the highest level of financial development among the sample countries. Again, its minimum index value is higher than any other country's maximum. Chile is followed by Brazil, Argentina, Peru, and Venezuela, in this order, the same order as the *Institutional Quality* factor.

3.3. Empirical model and estimation strategies

We assume that the firm maturity decision is represented by the following dynamic panel data model:

$$MR_{it} = \beta_0 + \alpha_1 MR_{it-1} + \alpha_2 Lev_{it} + \sum_{k=1}^{K} \beta_{1k} X_{ikt} + \sum_{l=1}^{L} \beta_{2l} Z_{ilt} + \upsilon_i + \varepsilon_{it}, \quad (1)$$

where MR_{it} is the dependent variable (the ith-firm *Maturity Ratio* on the tth-period), Lev_{it} is the *Leverage* ratio, which is endogenous in the model, X_{ikt} represents the K firm-specific predetermined variables, Z_{ilt} represents the L exogenous variables,[9] (α, β) are the coefficients to be estimated, υ_i represents firm-specific and time-constant unobserved effects, and ε_{it} represents the idiosyncratic error term. Under this specification, the speed of firm adjustment toward optimal maturity[10] can be estimated as

[7] These correlation matrices are not reported, but are available upon request.

[8] Since we are concerned with the common variability of our databases, we choose factor analysis instead of principal component analysis (PCA). PCA looks for a few linear combinations of the original variables that account for the most part of the *total* variability of those variables. On the other hand, factor analysis focuses on the *common* variability of those variables, thus being a more appropriate tool to our purposes. For more information about this issue see Jolliffe (2002), chapter 7.

[9] See also Appendix A.

[10] Assuming that the optimal maturity is determined by the predetermined variable (X_{ikt}) and exogenous variables (Z_{ilt}).

Table 4
Institutional quality factor—descriptive statistics.

Country	Number of observations	Mean	Standard Deviation	Maximum	Minimum
Argentina	12	−0.113	0.307	0.322	−0.675
Brazil	12	−0.006	0.075	0.135	−0.105
Chile	12	1.217	0.103	1.342	1.051
Peru	12	−0.326	0.061	−0.268	−0.460
Venezuela	12	−0.804	0.280	−0.434	−1.177

Descriptive statistics for the *Institutional Quality* factor by country, for the period 1996–2007.

Table 5
Financial development factor—descriptive statistics.

Country	Number of observations	Mean	Standard Deviation	Maximum	Minimum
Argentina	12	−0.770	0.108	−0.633	−0.931
Brazil	12	−0.625	0.127	−0.400	−0.846
Chile	12	0.035	0.134	0.298	−0.166
Peru	12	−0.803	0.116	−0.634	−1.024
Venezuela	12	−1.351	0.312	−0.797	−1.741

Descriptive statistics for the *Financial Development* factor by country, for the period 1996–2007.

$\lambda = (1 - \alpha_1)$. If adjustment frictions are substantial, the speed of adjustment is expected to be small (λ approaching zero), while a very high speed of adjustment (λ approaching 1) suggests the presence of negligible adjustment frictions.

One important aspect to consider when investigating firm debt maturity choice is that it is usually a decision related to capital structure (amount of debt *vis-à-vis* equity). Many empirical studies overlook such aspects, possibly leading to biased results. In order to deal with this effect properly, we treat the *Leverage* ratio as an endogenous variable in our model. A standard estimation technique for dealing with endogeneity in panel data models would be estimating the model in first-differences using two-stage least squares (2SLS) for instance.[11] However, as emphasized by Bond (2002, p. 146), under the maintained hypothesis of independent errors in the level equation, the first-differences error term are serially correlated and in this case 2SLS is not asymptotically efficient. In this context, according to Bond (2002), the generalized method of moments (GMM), developed by Hansen (1982), provides asymptotically efficient estimators.

Arellano and Bond (1991) suggest a one-step and a two-step estimation procedure, often called GMM-Diff, using lagged level variables as instruments for the first-differences equation. Arellano and Bover (1995) and Blundell and Bond (1998) extend this estimator by making an additional assumption about the initial conditions, specifically that the first difference of the instrumental variables is not correlated with the unobserved effects. This extended estimator, often called GMM-Sys, uses first-differences as instruments for the level equation and can eliminate (mitigate) the bias that arises when the level variables are weak instruments for the first-differences equation. Furthermore, according to Roodman (2006), using the level equations in the estimation permits the inclusion of variables that are time-constant, such as industry and country dummies, something that is not possible in the first-differences approach.

4. Results and discussion

In this section, we present and discuss our empirical results. First, we discuss the main results of our paper, i.e., the results of estimation of Eq. 1, with an eye toward shedding light on the question of whether financial development or institutional quality (or both) have a first-order effect on corporate debt maturity decisions. Finally, we discuss our robustness checks, showing whether and how our results vary according to alternative estimation procedures, alternative measures, and alternative sub-samples used.

4.1. Main results

Eq. 1 is estimated by GMM-Sys.[12] Endogenous variables are instrumented by lagged levels dated $t-2$ to $t-3$ (first-differences equation) and by lagged first-differences (levels equation). Predetermined variables are instrumented by lagged levels dated $t-1$ to $t-2$ (first-differences equation) and by first-differences (levels equation). Exogenous variables are their own instruments.

[11] We are thankful to an anonymous referee for this comment.
[12] We estimate the regressions using the Roodman (2006) *xtabond2* command in Stata©. We also estimate the model by pooled OLS in order to evaluate whether the instrumental approach estimates reduce predicted biases. This seems to be the case, since coefficients for the lagged dependent variable under GMM-Sys are not greater than the OLS ones (results not reported, but available upon request).

Table 6 presents the results of these estimations. The standard errors of all estimations are robust to heteroskedasticity and arbitrary patterns of autocorrelation within individuals.

In the interest of addressing our research question, we run three specifications of the model. Specification I includes only the *Financial Development* factor; Specification II includes only the *Institutional Quality* factor; and Specification III includes both factors. In order to control for the influence of extreme observations, we present the results obtained using the original data as well as the results obtained using the Winsorized data. In all specifications and samples (original and Winsorized), the instrument

Table 6
Multi-country regressions of debt maturity ratios for South America.

Explanatory variables	Specification I		Specification II		Specification III	
	Original data	Winsorized data	Original data	Winsorized data	Original data	Winsorized data
Constant	−0.047	−0.092	−0.016	−0.037	0.124	0.112
	−0.167	*−0.297*	*−0.066*	*−0.129*	*0.468*	*0.357*
Debt Maturity (lagged)	0.407***	0.403***	0.401***	0.398***	0.402***	0.398***
	8.004	*7.788*	*7.901*	*7.731*	*7.894*	*7.715*
Leverage	−0.074	−0.076	−0.041	−0.039	−0.052	−0.051
	−0.564	*−0.611*	*−0.312*	*−0.316*	*−0.401*	*−0.417*
Asset Maturity	0.000	−0.001	0.000	−0.001	0.000	−0.002
	−0.540	*−0.140*	*−0.535*	*−0.399*	*−0.563*	*−0.419*
Income-Interest Rate Hedging	0.001	0.006	0.001	0.005	0.001	0.005
	0.431	*0.740*	*0.418*	*0.628*	*0.449*	*0.713*
Firm Size	0.039**	0.041**	0.038**	0.040**	0.035**	0.036*
	2.189	*2.129*	*2.264*	*2.127*	*2.074*	*1.922*
Growth Opportunities	−0.035	−0.037	−0.036	−0.038	−0.037	−0.038
	−1.292	*−1.416*	*−1.333*	*−1.438*	*−1.344*	*−1.457*
Profitability	−0.100	−0.058	−0.118	−0.080	−0.107	−0.064
	−0.528	*−0.280*	*−0.620*	*−0.385*	*−0.561*	*−0.306*
Business Risk	2.324**	1.971*	2.391**	2.004*	2.439**	2.076*
	2.213	*1.647*	*2.275*	*1.684*	*2.304*	*1.724*
Tangibility	0.319**	0.316**	0.349**	0.354**	0.327**	0.332**
	2.076	*2.261*	*2.307*	*2.539*	*2.126*	*2.350*
Tax Effects	−0.365**	−0.358**	−0.393***	−0.385***	−0.385**	−0.377***
	−2.465	*−2.500*	*−2.617*	*−2.665*	*−2.565*	*−2.610*
Synthetic High Rating	−0.009	−0.011	−0.006	−0.007	−0.007	−0.009
	−0.518	*−0.605*	*−0.331*	*−0.401*	*−0.394*	*−0.484*
Synthetic Low Rating	−0.078**	−0.081**	−0.082**	−0.085**	−0.080**	−0.083**
	−2.298	*−2.375*	*−2.410*	*−2.471*	*−2.354*	*−2.428*
Interest Expenses ≤ 0 and EBIT ≤ 0	−0.021	−0.007	−0.021	−0.006	−0.021	−0.005
	−0.520	*−0.171*	*−0.515*	*−0.149*	*−0.519*	*−0.135*
Interest Expenses ≤ 0 and EBIT > 0	−0.020	−0.018	−0.016	−0.014	−0.018	−0.016
	−0.942	*−0.857*	*−0.745*	*−0.646*	*−0.837*	*−0.748*
Interest Rate Volatility (lagged)	0.003	0.003	0.005	0.005	0.004	0.005
	0.855	*0.899*	*1.389*	*1.473*	*1.315*	*1.393*
Inflation Rate Volatility (lagged)	−0.003	−0.003	−0.003	−0.003	−0.003	−0.003
	−0.668	*−0.628*	*−0.696*	*−0.652*	*−0.665*	*−0.612*
Regulated Industry	0.022	0.039	0.027	0.038	0.027	0.039
	0.315	*0.527*	*0.383*	*0.505*	*0.383*	*0.516*
Financial Development Factor	0.111	0.116			0.095	0.102
	1.406	*1.472*			*1.197*	*1.282*
Institutional Quality Factor			0.167**	0.169**	0.155**	0.157**
			2.592	*2.528*	*2.359*	*2.313*
Number of Observations	2244	2244	2244	2244	2244	2244
Number of Firms	359	359	359	359	359	359
Average Observations per Firm	6.25	6.25	6.25	6.25	6.25	6.25
Number of Instruments	75	75	75	75	76	76
Hansen Test of Overidentifying Restrictions	34.27	31.01	35.15	32.01	34.42	31.32
Hansen p-value	0.13	0.23	0.11	0.19	0.12	0.22
Arellano–Bond AR(1)	10.41	7.97	14.38	12.43	13.73	10.96
Arellano–Bond AR(1) *p*-value	0.66	0.85	0.35	0.49	0.39	0.61
Arellano–Bond AR(2)	−9.79	−9.83	−9.77	−9.83	−9.77	−9.82
Arellano–Bond AR(2) *p*-value	0.00	0.00	0.00	0.00	0.00	0.00

The model (Eq. (1) in the text) is estimated by GMM-Sys for the period 1996–2007 using the collapse option (Calderón et al., 2002; Roodman, 2006, 2009). Country, year, and industry dummies included but not reported. Endogenous variables: *Debt Maturity* (lagged) and *Leverage*. Predetermined variables: *Asset Maturity*, *Income-Interest Rate Hedging* (*Asset Maturity x ΔEBIT/ΔInterest Rate Correlation*), *Firm Size*, *Growth Opportunities*, *Profitability*, *Business Risk*, *Tangibility*, *Tax Effects*, *Synthetic High Rating*, *Synthetic Low Rating*, *Interest Expenses ≤ 0 and EBIT ≤ 0*, and *Interest Expense ≤ 0 and EBIT > 0*. Exogenous variables: lagged *Interest Volatility*, lagged *Inflation Volatility*, *Regulated Industry*, *Financial Development* factor, *Institutional Quality* factor, and country, year, and industry dummies. Instruments used: Endogenous variables are instrumented by lagged levels dated $t-2$ to $t-3$ (first-differences equation) and by lagged first-differences (levels equation). Predetermined variables are instrumented by lagged levels dated $t-1$ to $t-2$ (first-differences equation) and by first-differences (levels equation). Exogenous variables are their own instruments. *t*-statistics (*in italics*) are calculated using heteroskedasticity-robust standard errors and are also robust to arbitrary patterns of autocorrelation within individuals (firms); *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

set used passes the Hansen test of over-identification, i.e., the test statistic cannot reject the null hypothesis, suggesting that the instrument sets used are valid, in the sense that they are not correlated with the residuals. Further, in all specifications and samples, the Arellano–Bond test of autocorrelation in the first-differences equation residuals rejects the null of no first-order autocorrelation, but cannot reject the null of no second-order autocorrelation, which is consistent with independent errors in the levels equation.

The results suggest that debt maturity choice is a dynamic decision, since the lagged dependent variable is positive and highly significant across all specifications and samples, as expected. The estimated speed of adjustment to an optimal debt maturity structure is about 0.60 (1–0.40), suggesting that firms in the sample face moderate adjustment frictions that prevent them from adjusting quickly to their optimal debt maturity ratio.

Our estimations also suggest that larger, more tangible, and riskier firms use more long-term debt in their capital structure, since the coefficients of *Firm Size*, *Tangibility*, and *Business Risk* are all positive and statistically significant, corroborating tradeoff and agency theories of debt maturity. Large firms, in general, have lower bankruptcy, transaction, contracting, and monitoring costs, suffer less from asymmetric information, and have better credit quality than small firms, and thus are better able to finance their operations with long-term debt. Firms with higher tangibility, i.e., more real assets, have better collateral (lower bankruptcy costs) than firms with low tangibility. Collateral has a more relevant role (in reducing risk) in long-term lending than in short-term lending, and thus firms with higher tangibility are better able to borrow in long-term debt markets. This finding highlights the important role of collateralized assets with respect to the ability of the firm to borrow at longer maturities in emerging economies. Lastly, according to tradeoff theory, firms with higher business risk should choose longer debt maturities to reduce expected bankruptcy cost, since higher business risk implies higher probability of bankruptcy. All these results are robust to outliers and different specifications.

Further regarding firm-specific determinants, our results also suggest that taxes and borrower credit quality play important roles in determining firm debt maturity in South America. The coefficients of *Tax Effects*, *Synthetic Low Rating*, and *Synthetic High Rating* are all negative, although the coefficients of this last variable are not statistically significant. Firms with lower marginal corporate tax rate should issue longer term debt to reduce flotation costs associated with debt issues, a recommendation that cannot be rejected by our results. In support of the Diamond (1991) model, our results suggest that firms with very low ratings and those with high ratings issue more short-term debt relative to intermediate-rated firms, although the results with regard to high-ratings firms should be taken with caution. The remaining firm-specific determinants do not present statistically significant effects on firm debt maturity choice.

Regarding country-specific determinants, the variables *Interest Rate Volatility (lagged)* and *Inflation Rate Volatility (lagged)* do not exhibit statistically significant coefficients in our regressions. Contrary to our expectations, these results suggest that macroeconomic volatility does not affect debt maturity decisions of firms in South America. With respect to the main focus of this paper, the *Financial Development* factor shows a positive but statistically insignificant coefficient under Specification I. This cannot support the hypothesis that the level of financial development of a country is associated with the debt maturity of its firms. More developed financial systems do not seem to particularly favor long-term corporate borrowing. This result is robust to outliers. Results in Specification II for the *Institutional Quality* factor are stronger. The coefficient of this factor is positive and statistically significant at the 5% level. This result suggests that firms use more long-term debt in countries with better institutions, confirming a priori expectations. More interestingly, for Specification III, where both factors are entered together, *Financial Development* remains statistically insignificant (albeit still positive) while *Institutional Quality* remains positive and statistically significant at the 5% level. This result suggests that *Institutional Quality* has a first-order effect on corporate debt maturity decisions, while *Financial Development* seems to be an outcome only of the former. Indeed, in our sample, the correlation between these factors is 0.8628.

Our results regarding these factors are in line with Kusnadi and Wei (2011), whose results strongly support the hypothesis that legal protection, rather than financial development, is the first-order effect in determining a firm's cash savings policies. Taken together, these findings suggest that better institutions dominate the development of national financial systems in determining firm financial decisions, also supporting the argument that financial development may be an outcome of better institutions (La Porta et al., 2000b). Our results, however, differ from previous studies on this subject. Demirgüç-Kunt and Maksimovic (1999) and Giannetti (2003), e.g., find that both factors have a first-order effect on firm debt maturity decisions. Despite important sample differences, we believe that this difference comes from the way by which we measure these factors. Instead of using a few single variables, we construct our financial development and institutional quality measures based on a broader array of variables, summarized in continuous and time-varying factors, an approach that we hope reduces the likelihood that our results suffer from omitted variable bias.

The effect of *Institutional Quality* on corporate debt maturity is not only statistically significant, but also economically significant. Among all variables with statistically significant coefficients in Table 6, the *Institutional Quality* factor has the greatest marginal effect.[13] While the most important firm-specific variables in terms of marginal effect exhibit a marginal effect of 0.0906 (*Business Risk*), 0.0673 (*Tangibility*), and 0.0612 (*Firm Size*), the *Institutional Quality* factor shows a marginal effect of 0.1123, an amount that represents 21.75% of the mean firm *Debt Maturity*. This result reinforces previous studies, like Fan et al. (2012), which indicate that a firm's debt maturity is determined more by the country in which it is located than by its specific characteristics.

[13] The marginal effect of a variable is computed as the product of its coefficient in Table 6, Specification III, Winsorized data, and its standard deviation. For country-specific variables, the standard deviation is based on the country-level panel, instead of our firm-level panel.

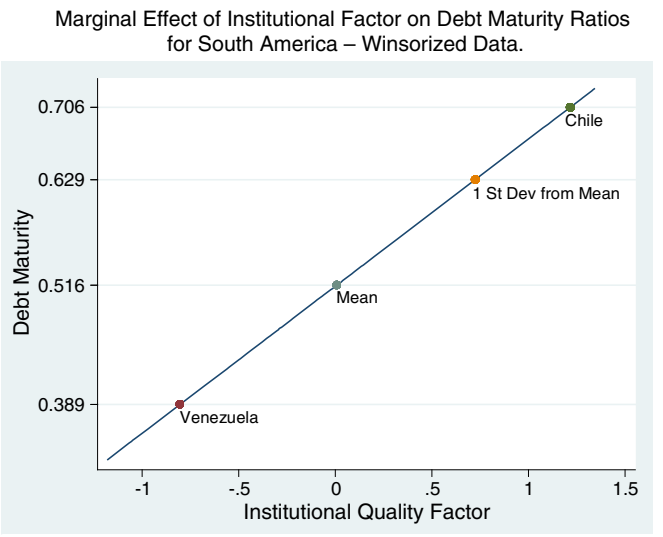

Fig. 1. Marginal effect of institutional factor on debt maturity ratios for South America—Winsorized data.

The economic significance of such results can also be illustrated by a simple example. Suppose two identical firms are established in different countries. One is established in a country with a high quality of institutions such as Chile, and the other in a low institutional quality country such as Venezuela. Ceteris paribus, the firm established in a better quality environment could increase the share of long-term debt in its financial structure from 0.39 to 0.71, i.e., almost twice as much as its identical twin firm operating in a poor quality environment. Fig. 1 illustrates this example. In a rough approximation, this additional long-term debt represents about 8% of average firm value, a very substantial amount.

4.2. Robustness checks

One common criticism of the empirical work in emerging markets regards the quality of measurement of firm-level variables. Indeed, our dependent variable is measured as the share of long-term debt to total debt, where long-term debt is any debt maturing in more than one year. This is admittedly a poor measure of maturity. A better measure would be the duration of a firm's debt as suggested by Morris (1992). However, in order to be computed, this measure would require detailed information on a firm's outstanding debts, which is often difficult to obtain. Such information is sometimes reported in firm financial report footnotes, but disclosure rules in South America usually do not require such information. Besides, data collection would have to be done manually for each firm-year annual report, and the resulting data would likely exclude a large number of firms from our sample due to missing data. Considering the cost–benefit tradeoff of such an approach, we choose to explore other ways to assess the robustness of our results.[14]

In order to check the robustness of the findings, we adopt three approaches. First, we employ two alternative GMM estimation procedures: two-step (Arellano and Bond, 1991; Windmeijer, 2005) and orthogonal deviations (Arellano and Bover, 1995). Also, we exclude industry dummies from the explanatory variables set. Results for the Winsorized sample are presented in Table 7.[15] As is evident in columns I through III, the results are qualitatively unchanged from our baseline estimation, although *Business Risk* is no longer statistically significant. Lagged *Debt Maturity*, *Firm Size* (in column III), *Tangibility*, *Tax Effects*, *Synthetic Low Rating* (in columns I and III) and, more importantly, *Institutional Quality*, are all statistically significantly and have the same signals as before. *Financial Development* remains positive but statistically insignificant (except in column II, orthogonal deviations),[16] just as in our baseline case.

Second, we experiment with alternative measures of *Debt Maturity* and *Leverage*, our endogenous variables. Besides the usual measure of leverage (debt-to-market-firm-value), we also compute a debt-to-book-equity and a debt-to-total-book-assets measure of leverage. Results shown in Table 7, columns IV and V, are qualitatively the same as in our previous estimation.

The alternative *Debt Maturity* is computed as long-term liabilities to total liabilities. This measure differs from that used above by including other contractual obligations of the firm, such as current liabilities, deferred tax obligations, and loans from related firms (parent, sister, and subsidiary firms). Current liabilities are mostly comprised of trade credits. Stohs and Mauer (1996) argue

[14] Barclay and Smith (1995) report that results for the share of long-term debt to total debt yields qualitatively similar results when the long-term debt definition ranges from one to five years, and these authors expect results to be similar to any duration measure, which is simply a linear combination of the amount of debt due in a given range of years.

[15] Results for the original sample are qualitatively the same, so they are not reported but are available upon request.

[16] Results from GMM estimation with orthogonal deviations transformation (column II) should be taken with care, since the instrument set used in this estimation does not pass the Hansen-test of over-identifying restrictions. The same applies to the estimations based on the alternative measure of *Debt Maturity* (columns VI–VIII).

Table 7
Robustness tests of debt maturity for South America—Winsorized data.

Column	I	II	III	IV	V	VI	VII	VIII
Dependent variables	Long-term debt to total debt Estimation procedure			Long-term liabilities to total liabilities Leverage variable				
Explanatory variables	Two step	Orthogonal deviations	Without industry dummies	Debt to equity	Debt to total assets	Debt to firm value	Debt to equity	Debt to total assets
Constant	0.414	0.462	0.034	0.127	0.094	0.199	0.192	0.168
	1.443	*1.520*	*0.111*	*0.430*	*0.316*	*0.849*	*0.899*	*0.753*
Debt Maturity (lagged)	0.451***	0.452***	0.411***	0.396***	0.396***	0.506***	0.501***	0.504***
	8.454	*9.311*	*8.130*	*7.616*	*7.729*	*8.374*	*8.184*	*8.230*
Leverage	−0.091	−0.141	−0.045	−0.019	−0.005	−0.063	−0.003	−0.002
	−0.765	*−1.418*	*−0.359*	*−1.024*	*−0.039*	*−0.664*	*−0.219*	*−0.019*
Asset Maturity	−0.004	−0.006	−0.002	−0.001	−0.001	0.000	0.000	0.001
	−1.137	*−1.418*	*−0.452*	*−0.413*	*−0.278*	*0.038*	*0.116*	*0.250*
Income-Interest Rate Hedging	0.005	0.009	0.003	0.008	0.007	0.003	0.003	0.004
	0.555	*1.299*	*0.350*	*0.948*	*0.940*	*0.669*	*0.599*	*0.742*
Firm Size	0.015	0.010	0.036**	0.034*	0.036**	0.009	0.010	0.011
	0.886	*0.573*	*2.033*	*1.893*	*2.001*	*0.638*	*0.717*	*0.758*
Growth Opportunities	−0.023	−0.025	−0.041	−0.033	−0.036	−0.034**	−0.031**	−0.032***
	−0.882	*−1.039*	*−1.505*	*−1.345*	*−1.465*	*−2.390*	*−2.562*	*−2.675*
Profitability	0.029	−0.055	−0.007	−0.047	−0.047	−0.240*	−0.233*	−0.219
	0.122	*−0.315*	*−0.036*	*−0.220*	*−0.235*	*−1.665*	*−1.679*	*−1.576*
Business Risk	1.192	0.956	1.177	1.890	1.980*	0.468	0.478	0.390
	0.978	*1.082*	*1.419*	*1.455*	*1.685*	*0.584*	*0.618*	*0.500*
Tangibility	0.241*	0.265**	0.360***	0.312**	0.318**	0.202**	0.189**	0.194**
	1.649	*2.182*	*2.671*	*2.355*	*2.282*	*2.240*	*2.149*	*2.134*
Tax Effects	−0.399***	−0.275*	−0.391***	−0.367***	−0.372***	−0.214**	−0.207**	−0.209**
	−2.908	*−1.900*	*−2.797*	*−2.598*	*−2.586*	*−2.495*	*−2.428*	*−2.451*
Synthetic High Rating	−0.009	−0.002	−0.003	−0.010	−0.008	−0.014	−0.013	−0.012
	−0.506	*−0.119*	*−0.149*	*−0.556*	*−0.442*	*−1.392*	*−1.343*	*−1.294*
Synthetic Low Rating	−0.073**	−0.054	−0.087***	−0.080**	−0.085**	−0.056***	−0.056***	−0.057***
	−2.149	*−1.520*	*−2.610*	*−2.342*	*−2.450*	*−2.723*	*−2.683*	*−2.752*
Interest Expenses ≤ 0 and EBIT ≤ 0	−0.025	0.002	−0.001	−0.002	−0.002	−0.011	−0.009	−0.008
	−0.627	*0.034*	*−0.021*	*−0.056*	*−0.045*	*−0.383*	*−0.315*	*−0.293*
Interest Expenses ≤ 0 and EBIT > 0	−0.007	−0.004	−0.021	−0.016	−0.015	−0.015	−0.015	−0.014
	−0.291	*−0.199*	*−0.950*	*−0.734*	*−0.689*	*−1.147*	*−1.162*	*−1.049*
Interest Rate Volatility (lagged)	0.003	0.003	0.005	0.004	0.005	0.002	0.002	0.002
	0.861	*0.822*	*1.434*	*1.354*	*1.398*	*0.825*	*0.844*	*0.857*
Inflation Rate Volatility (lagged)	−0.001	−0.001	−0.003	−0.003	−0.003	−0.002	−0.002	−0.002
	−0.251	*−0.183*	*−0.576*	*−0.563*	*−0.615*	*−0.471*	*−0.474*	*−0.488*
Regulated Industry	0.017	0.064	0.045*	0.061	0.047	0.083	0.081	0.084
	0.189	*0.897*	*1.825*	*0.769*	*0.606*	*1.552*	*1.457*	*1.526*
Financial Development Factor	0.123	0.142**	0.096	0.105	0.103	0.062	0.061	0.060
	1.536	*2.046*	*1.188*	*1.318*	*1.312*	*1.250*	*1.219*	*1.215*
Institutional Quality Factor	0.137**	0.143**	0.154**	0.154**	0.157**	0.058	0.064	0.061
	1.965	*2.316*	*2.246*	*2.291*	*2.319*	*1.196*	*1.292*	*1.249*
Number of observations	2244	2244	2244	2244	2244	2244	2244	2244
Number of firms	359	359	359	359	359	359	359	359
Average observations per firm	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Number of instruments	76	76	60	76	76	76	76	76
Hansen Test of overidentifying restrictions	31.32	37.65	32.80	31.19	30.91	41.83	44.98	42.30
Hansen p-value	0.22	0.07	0.17	0.22	0.23	0.03	0.01	0.02
Arellano–Bond AR(1)	−8.40	−9.97	−9.95	−10.00	−9.63	−8.21	−8.25	−8.01
Arellano–Bond AR(1) *p*-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano–Bond AR(2)	0.94	0.97	0.91	0.90	0.92	1.92	1.93	1.92
Arellano–Bond AR(2) *p*-value	0.35	0.33	0.36	0.37	0.36	0.06	0.05	0.05

The model (Eq. (1) in the text) is estimated by GMM-Sys for the period 1996–2007 using the collapse option (Calderón et al., 2002; Roodman, 2006, 2009). Country, year, and industry dummies included but not reported. Dependent variables: Long-Term Debt to Total Debt (columns I to V) and Long-Term Liabilities to Total Liabilities (columns VI to VIII). Endogenous variables: *Debt Maturity* (lagged) and *Leverage*. Predetermined variables: *Asset Maturity*, *Income-Interest Rate Hedging* (*Asset Maturity x ΔEBIT/ΔInterest Rate Correlation*), *Firm Size*, *Growth Opportunities*, *Profitability*, *Business Risk*, *Tangibility*, *Tax Effects*, *Synthetic High Rating*, *Synthetic Low Rating*, *Interest Expenses ≤ 0 and EBIT ≤ 0*, and *Interest Expense ≤ 0 and EBIT > 0*. Exogenous variables: lagged *Interest Volatility*, lagged *Inflation Volatility*, *Regulated Industry*, *Financial Development* factor, *Institutional Quality* factor, and country, year, and industry dummies. Instruments used: Endogenous variables are instrumented by lagged levels dated $t-2$ to $t-3$ (first-differences equation) and by lagged first-differences (levels equation). Predetermined variables are instrumented by lagged levels dated $t-1$ to $t-2$ (first-differences equation) and by first-differences (levels equation). Exogenous variables are their own instruments. *t*-statistics (*in italics*) are calculated using heteroskedasticity-robust standard errors and are also robust to arbitrary patterns of autocorrelation within individuals (firms); *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

that it is important to include such liabilities because they represent obligations that the firm must meet, similar to short-term financial debt. However, while short-term debt is mostly supplied by banks and commercial paper, trade credit is supplied by other firms in the industry's supply chain. Therefore, a firm may face fewer restrictions to finance its operations with trade credit than with bank loans—and thus be less sensitive to the level of financial development and the quality of institutions of a country.[17] Results are also reported in Table 7 (columns VI to VIII).

We note several changes with respect to our baseline measure. Under this measure of debt maturity, *Firm Size* and *Business Risk* are no longer statistically significant, while *Profitability* (negative) and *Growth Opportunities* (negative) become significant. Regarding *Profitability*, once we realize that the dependent variable is actually a measure of liability maturity (instead of debt maturity), the differences observed with respect to our previous results can be easily reconciled with theory. Given that *Profitability* influences total leverage negatively (Pecking Order Theory) but should have no effect on trade credit (among other non-debt liabilities), more profitable firms use less debt (short- and long-term) and, since trade credit is mostly short-term, the share of long-term liabilities diminishes. Most remarkably, *Institutional Quality* becomes statistically insignificant. However, this is not at all in contradiction to our previous conclusions, since, as stated above, this alternative measure of *Debt Maturity* is more heterogeneous than straight debt and, therefore, may be subject to other kinds of effects. As mentioned above, industry practices in the supply chain may compensate for a poor institutional environment, making it less sensitive to our *Institutional Quality* factor.

Third and finally, we apply the Leamer (1985) global sensitivity approach to the sample. We re-estimate Eq. (1) (by GMM-Sys), successively dropping countries, industries, and years, one at a time. The results are not reported for conciseness, but are available upon request. The sensitivity analyses yield coefficients very similar to those estimated originally, and standard deviations are small. Coefficients reported as positive and statistically significant in Table 6 have at least 91% positive coefficients in the sensitivity analyses, while those reported as negative and statistically significant have at least 97% negative coefficients. Moreover, we compute the percentage of *t*-statistics with absolute value above 1.96 (the usual 5% significance level threshold). With respect to the main focus of this paper, the *Institutional Quality* factor displays, respectively, 89% and 83% positive and statistically significant coefficients in Specifications II and III, while the *Financial Development* factor displays only 6% and 3% statistically significant coefficients in Specifications I and III, respectively.

The results from these complementary analyses largely support the robustness of the previous findings. Coefficients for explanatory variables are similar to the results reported above and do not seem to be sensitive to a particular estimation procedure, measurement of endogenous variables, country, industry, year, or outliers. Thus, we conclude that the results reported in this paper are robust.

5. Summary and concluding remarks

This paper investigates the determinants of debt maturity for a sample of 359 non-financial firms from five economies in South America over a 12-year period. Employing dynamic panel data analysis, we test the effect of some of the best-known explanatory variables suggested by theory, covering agency cost, signaling, tradeoff, and maturity-matching arguments. Moreover, we test whether financial development or institutional quality (or both) have a first-order effect on corporate debt maturity decisions.

Our main findings indicate that: (1) there is a substantial dynamic component in the determination of firm maturity structure; (2) firms face moderate adjustment frictions with respect to optimal maturity; (3) *Firm Size*, *Business Risk*, and *Tangibility* have positive and significant effects on firm debt maturity, corroborating tradeoff and agency theory; (4) *Tax Effects* and *Synthetic Low Rating* have negative and significant effects on firm debt maturity; (5) the level of financial development is not significantly related to debt maturity; and (6) the quality of national institutions has a positive effect on maturity structure. Thus, we find support for the La Porta et al. (2000b) claim that the quality of national institutions influences corporate financing and that the level of financial development may be an outcome of better institutions.

The main conclusion of this study is that well functioning, high-quality institutions (i.e., democracy, freedom of expression, freedom of association, accountability, political stability, absence of violence, quality of public services and policy formulation, regulatory quality, rule of law, and corruption control) have a first-order effect in the maturity of corporate debt. We find no evidence that financial development has such an effect, corroborating the findings of Kusnadi and Wei (2011) for cash management policies. We wonder whether other financial decisions may be similarly affected by such factors. Empirical investigation of their effect on corporate capital structure, capital budgeting, dividend policy, and risk management policy are natural future directions for this stream of research.

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[17] For instance, firms in the supply chain may have more efficient ways to secure the payment of their credits such as suspending the supply of goods to the defaulting firm.

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Appendix A. Firm-specific variables

Explanatory variables	Empirical proxies	Nature	Formulas
Leverage	Debt-firm value ratio	Endogenous	Book Debt ÷ Market Firm Value
Asset Maturity	Asset maturity ratio	Predetermined	[Current Assets ÷ (Current Assets + Net Fixed Assets)] × (Current Assets ÷ Cost of Goods Sold) + [Net Fixed Assets ÷ (Current Assets + Net Fixed Assets) × (Net Fixed Assets ÷ Depreciation)]
Income-Interest Rate Hedging	Asset maturity times income-interest rate correlation[a]	Predetermined	Asset Maturity × Correlation(ΔEBIT[b]; ΔInterest Rate)
Size	Log of sales	Predetermined	Ln(Sales)
Growth Opportunities	Market-to-book ratio	Predetermined	(Book Liabilities + Market Equity) ÷ (Total Book Assets)
Profitability	Return on assets	Predetermined	EBIT ÷ Total Book Assets
Business Risk	Volatility of profitability	Predetermined	Standard Deviation{Profitability} (*a time-invariant measure*)
Tangibility	Degree of asset immobilization	Predetermined	Net Fixed Assets ÷ Total Book Assets
Tax Effects	Graham's (1996) trichotomous proxy	Predetermined	The top statutory tax rate if both taxable income and income tax in the previous year are positive, one-half of the top statutory tax rate if either taxable income or income tax are positive in the previous year while the others are negative, and zero otherwise
Synthetic Rating	Ranges of the interest coverage ratio[c, d]	Predetermined	High Rating Dummy: 1 if EBIT ÷ Interest Expense > Upper Quintile, zero otherwise; Low Rating Dummy: 1 if EBIT ÷ Interest Expense < 1, zero otherwise
Macroeconomic Volatility	Interest and inflation rate volatilities	Exogenous	Standard deviations of the previous year monthly interest and inflation rates
Regulated Industry	Dummy variable	Exogenous	1 if firm industry belongs to: Construction, Electricity, Gas and Oil, Mining, Telecommunications, and Transport and Logistics, zero otherwise
Financial Development	Scores of the factor analysis	Exogenous	See Section 3.2
Institutional Quality	Scores of the factor analysis	Exogenous	See Section 3.2

Table A1. Determinants of debt maturity.

[a]The relationship between asset and debt maturity should be a negative function of the correlation between firm operational income and the market interest rate. Therefore, we compute the correlation between changes in the firm's operating income and changes in the market interest rate, as suggested by Morris (1976), along the entire sample period. This correlation is then multiplied by *Asset Maturity* and included as an additional explanatory variable, for which we expect a negative sign.

[b]EBIT stands for *Earnings Before Interest and Taxes*.

[c]The interest coverage ratio is one of the main indicators for the rating of a firm (see for instance Damodaran, 2009, p. 89).

[d]Firms whose interest expenses are negative are controlled for by two additional dummy variables, one for firms with non-positive EBIT and one for firms with positive EBIT.

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