



HAL
open science

Regulatory quality and corporate leverage: Evidence from a large international sample

Samia Belaounia, Pascal Nguyen, Nahid Rahman, Ruoyun Lucy Zhao

► **To cite this version:**

Samia Belaounia, Pascal Nguyen, Nahid Rahman, Ruoyun Lucy Zhao. Regulatory quality and corporate leverage: Evidence from a large international sample. 2024. hal-04729296

HAL Id: hal-04729296

<https://hal.science/hal-04729296v1>

Preprint submitted on 10 Oct 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Regulatory quality and corporate leverage: Evidence from a large international sample

Samia Belaounia
Associate Professor
NEOMA Business School
Finance Department
1 Avenue du Maréchal Juin
76825 Mont Saint Aignan, France
samia.belaounia@neoma-bs.fr

Pascal Nguyen
Professor
University of Montpellier
Management Institute
Rue Vendémiaire - Bât. B
34960 Montpellier, France
pascal.nguyen@umontpellier.fr

Nahid Rahman
Senior Lecturer
Australian National Institute
of Management and Commerce
1 Central Avenue, Eveleigh
NSW 2015 Sydney Australia
nahid.rahman@imc.edu.au

Ruoyun Zhao
Lecturer
University of Technology Sydney
UTS Business School
14-28 Ultimo Rd, Ultimo
NSW 2007, Australia
ruoyun.zhao@uts.edu.au

November 2023

Regulatory quality and corporate leverage: Evidence from a large international sample

Abstract

Research question

Corporate leverage is strongly related to firm characteristics. However, this relationship varies across countries, and country-level institutions play an important role in corporate financing. In this study, we investigate whether country-level regulatory quality indirectly affects corporate leverage by moderating the effects of firm-level determinants of capital structure.

Methodology

We use a sample of 547,864 firm-year observations for 46,184 firms from 70 countries sourced from the Worldscope database and country-level regulatory quality from the World Bank. The moderating effect of regulatory quality is evaluated by including interaction terms with standard firm-level determinants of leverage. Our main regressions are consistent with existing studies, and include country, industry, and year fixed effects.

Results / contribution

We show that the positive influence of firm size and asset tangibility on leverage is attenuated with higher regulatory quality, while the negative influence of growth opportunities, R&D intensity, and profitability is similarly moderated. These results highlight the benefit of robust country-level regulatory quality in facilitating the access to debt financing of small, R&D intensive, and growth-oriented firms with few tangible assets to pledge as collateral.

Keywords: capital structure, leverage, regulatory quality, cross-country analysis

Introduction

According to the trade-off theory, leverage is closely related to a number of firm characteristics due to their effects on bankruptcy costs. Because of their lower bankruptcy costs, larger firms and firms with more tangible assets can afford to use more debt. In contrast, firms with higher R&D investments and growth opportunities are required to use less debt because of their higher expected costs of financial distress. Besides, the pecking-order theory (Myers, 1984) posits that leverage is inversely related to profitability as firms prefer to rely on internal cash flows before issuing debt or equity.

In a classic study, Rajan and Zingales (1995) reveal that leverage is determined in a very similar way in each of the G7 economies. However, country-specific factors still have a role to play (Booth et al., 2001). Fan et al. (2012) indicate that leverage is related to institutional factors such as the quality of the legal system and law enforcement. More specifically, Cho et al. (2014) show that creditor rights have a negative impact on long-term debt ratios.

In this paper, we examine the influence of country-level regulatory quality (RQ) on leverage. While we provide some results regarding the direct impact of RQ on leverage, our primary goal is to analyze the indirect impact of RQ, i.e., the moderating influence of RQ on the determinants of leverage. The intuition is that firm-level variables associated with higher bankruptcy costs should have a less pronounced effect on leverage the higher the country's RQ is. This implies that smaller firms, and firms with fewer tangible assets, higher growth opportunities and higher R&D intensity are able to use higher leverage ratios in high RQ countries. Leverage should also be less negatively correlated with internal cash flows as firms can more easily access external financing in high RQ countries.

Our analysis is carried out using a large international sample of 547,864 firm-year observations for 46,184 firms across 70 countries. In line with our predictions, we find that RQ attenuates the negative influence of firm characteristics associated with higher bankruptcy costs (smaller firm size, fewer tangible assets, higher R&D intensity, and higher growth opportunities). The negative relationship between internal cash flows and leverage is also weaker, consistent with the idea that RQ moderates the adverse effects of information asymmetry that underpin the pecking-order theory. These results are robust to the inclusion of several governance variables and to the use of firm fixed effects.

Beside statistical significance, we stress the importance of RQ in affecting the determinants of corporate leverage. For instance, the influence of asset tangibility on leverage is found to be one third larger in low RQ countries compared to high RQ countries. The effect of profitability is even more pronounced in low RQ countries with a coefficient estimate up to 3 times larger. The comparison of two similar countries, Italy and the UK, with sharply different RQ frameworks also makes clear the large impact that RQ can make on a firm's leverage.

Overall, this study contributes to the international finance and corporate finance literature by showing that the quality of a country's regulatory framework is a key determinant of corporate financing, and specifically debt financing, through the moderating influence it exerts on firm characteristics. Most notably, smaller firms with fewer tangible assets are expected to face greater difficulty in securing loans in low RQ countries compared to high RQ countries. Firm growth and innovation (signaled by higher R&D expenditures) may also be hindered by greater lender reluctance to provide funding in low RQ countries. The study thus highlights a mechanism by which countries could benefit from better RQ to improve corporate funding access and spur investment and economic growth.

The rest of the paper is structured as follows. In the next section, we review the literature on leverage and articulate our hypotheses. We then describe the sample and the methodology. The results are presented in the following section. We then conclude.

Literature review and hypotheses

THEORIES OF CAPITAL STRUCTURE

The most common approaches to explain the capital structure and financing behavior of firms are the trade-off and pecking order theories. According to the trade-off theory, firms weigh up the tax-saving benefits of debt against the expected costs of bankruptcy (Bradley et al. 1984; Frank and Goyal, 2009; Oztekin, 2015). The benefits of debt may additionally include the alleviation of agency conflicts, such as enabling greater managerial ownership (Jensen and Meckling, 1976) and restraining overinvestment (Jensen, 1986).

In the pecking order theory, firms are assumed to select their capital structure by taking into account their risk of adverse selection and the sensitivity of their securities to information asymmetry (Shyam-Sunder and Myers, 1999). Given the higher sensitivity of equity value relative to debt value in regard to information asymmetry, the theory predicts that firms will prefer internal cash to debt, and once their debt capacity has been exhausted, will issue equity

as a last resort (Myers and Majluf, 1984; Myers, 1984). Leverage will thus depend on each firm's profitability and investment opportunities.

In the understanding of corporate financing, both theories should be viewed as complementary, and not as mutually exclusive (Fama and French, 2002; Frank and Goyal, 2003). As a matter of fact, studies of capital structure do not unconditionally validate one theory over the other (Titman and Wessels, 1988; Frank and Goyal, 2003). For example, the trade-off theory prevails in explaining the influence of firm size, asset tangibility and growth opportunities, while the effect of profitability is better explained using the pecking order model (Oztekin, 2015; Belkhir et al., 2016).

FIRM-LEVEL DETERMINANTS OF LEVERAGE

We review below the expected influence of commonly used firm characteristics.

Firm size. Large firms are characterized by lower bankruptcy costs since they have more stable earnings given their greater potential for risk diversification. The trade-off theory thus predicts firm size to be positively associated with leverage (Frank and Goyal, 2009). On the other hand, the pecking order theory suggests a negative relationship. The reason is that large firms tend to be more transparent and subject to less information asymmetry, which exposes investors to lower informational risk and makes equity issuance more attractive relative to debt (Bharath et al., 2009; Bessler et al., 2011; Gao and Zhu, 2015). In practice, however, almost all empirical studies validate the trade-off perspective (Belkhir et al., 2016).

Asset tangibility. Tangible assets represent collateral that is relatively easier to evaluate due to more predictable liquidation values (Frank and Goyal, 2009). By reducing expected creditor losses, they increase debt capacity and allow firms to use higher leverage. In addition, tangible assets are less likely to be involved in risk shifting which might come at the expense of creditors (Jensen and Mecking, 1976). In contrast, the pecking order theory associates tangible assets with lower information asymmetry, which makes equity issues cheaper and reduces the proportion of debt in a firm's capital structure. Nonetheless, the empirical evidence overwhelmingly points to a positive relationship (Rajan and Zingales, 1995; López-Iturriaga and Rodriguez-Sanz, 2008; Bharath et al., 2009; Frank and Goyal, 2009; Fan et al., 2012; Cho et al., 2014; Shah et al., 2015).

R&D intensity. Firms with high R&D expenditures are highly sensitive to financial distress. They hold more intangible assets that would incur significant losses in the event of a

bankruptcy. One of the main threats is the loss of workers with the highest cognitive skills (Baghai et al., 2021). R&D expenses also involve a greater potential for asset substitution (Jensen and Mecking, 1976). The trade-off theory thus predicts leverage to be negatively related to R&D investments, while the pecking order theory foresees a positive relationship due to the lower sensitivity of debt to the information asymmetry involved in R&D investments. In practice, the few empirical studies that include R&D among the determinants of leverage point to a negative influence (Wald, 1999; Cho et al., 2014; Shah et al., 2015).

Growth opportunities. Firms with more growth opportunities should use lower leverage given their higher costs of financial distress. As a matter of fact, financial distress might lead to organizational disruption and loss of critical resources, such as highly skilled workers (Baghai et al., 2021), making previously valuable projects no longer viable. Besides, this scenario might force highly leveraged firms to pass up valuable investments due to the unwillingness of shareholders to contribute financing that would transfer value to debtholders — the so-called underinvestment problem (Myers, 1977). On the other hand, firms with more growth opportunities are less susceptible to managerial agency conflicts since their higher cash requirements and lower free cash flows make debt less useful as a monitoring device (Jensen, 1986). In practice, empirical studies report mixed results. While some indicate a negative relationship (Rajan and Zingales, 1995; Bharath et al., 2009; Park et al., 2013; Chen et al., 2019) others document a positive relationship (Frank and Goyal, 2009; Fan et al., 2012).

Profitability. In the trade-off model, higher profitability should be associated with higher leverage due to lower bankruptcy risk and higher tax savings (Frank and Goyal, 2009). Besides, debt becomes more useful to prevent the overinvestment problem (Jensen, 1986). In contrast, the pecking order theory predicts that more profitable firms should have lower leverage since they can rely on higher internal cash flows to finance investments. In effect, empirical studies strongly support the latter over the former, regardless of whether profitability is measured by EBITDA to total assets (López-Iturriaga and Rodríguez-Sanz, 2008; Frank and Goyal, 2009; Park et al., 2013), EBIT to total assets (Cho et al., 2014) or net income to total assets (Fan et al., 2012).

DIRECT EFFECT OF RQ ON LEVERAGE

Despite the large volume of literature on the determinants of leverage, significant differences in leverage across countries remain unexplained, which has led researchers to analyze the role of country-level variables. Following the pioneering work of La Porta et al. (1997, 1998),

several studies have examined the influence of country-specific institutions (e.g., Lopez-Iturriaga and Rodriguez-Sanz, 2008; Alves and Ferreira, 2011; Fan et al., 2012; Cho et al., 2014; Oztekin, 2015; Shah et al., 2015). In this study, we focus on RQ as a key dimension of institutional quality.

Alongside other institutional arrangements, RQ seeks to foster economic growth by facilitating private sector development through the provision of sound public policies and regulations. Of particular importance is the assurance of a level playing field so that efficient producers prevail and innovative firms are able to raise financing and grow unimpeded. Consistent with this objective, RQ is assessed using surveys of various stakeholders regarding their perceptions of how easy setting up a new business is, how accessible capital markets are, or how efficient legislation is at preventing unfair competition. Perception-based measures matter most because the aim of regulation is to influence behaviors and because it is the way in which actors perceive regulation that affects their behavior (Black, 2002). For example, Bielen et al. (2015) show that higher perceived RQ is associated with a shorter disposition time of commercial disputes in court whereas actual RQ does not affect the average duration of a trial. Ultimately, RQ should be evaluation by its outcomes. In this regard, Jalilian et al. (2007) and Haidar (2012) provide evidence that higher RQ leads to a significant increase in GDP growth.

There are a few potential channels through which RQ may affect leverage. One of them is by enhancing firm performance (Bhaumik et al., 2018). In point of fact, poor RQ is likely to hinder efficiency. Luo and Junkunc (2008) show that bureaucratic burden increases transaction costs and impairs responsiveness and flexibility. Nee and Opper (2009) add that the lower the bureaucratic quality, the higher the level of uncertainty, and the more difficult it is for firms to carry out long-term plans. In particular, the number of procedures needed to enforce a contract negatively impacts corporate efficiency (Commander and Svejnar, 2011). According to the trade-off model, high RQ should thus be associated with higher leverage since higher firm performance decreases bankruptcy costs. Furthermore, high RQ should mitigate bankruptcy costs through effective bankruptcy resolution (Oztekin, 2015). It may also better protect the rights of creditors (Fan et al., 2012). In contrast, the pecking order model suggests a negative relation between RQ and leverage given the lower information asymmetry and easier access to equity capital associated with higher RQ.

Based on the above discussion, we thus formulate our first hypothesis in the following way.

H1-A: Leverage is positively related to RQ if its effects on bankruptcy costs matter more.

H1-B: Leverage is negatively related to RQ if its effects on information asymmetry prevail.

INDIRECT EFFECTS OF RQ ON LEVERAGE

Besides its direct effect on leverage, RQ is expected to moderate the effects of firm characteristics by influencing their effects on bankruptcy costs and information asymmetry. Consider the fact that RQ alleviates expected bankruptcy costs by facilitating the firm's rehabilitation or preventing the sale of its assets at distressed values. It follows that firm characteristics associated with lower bankruptcy costs should have a less significant influence the higher the country's RQ is. Conversely, given that RQ reduces information asymmetry, one would expect that firm characteristics associated with greater disclosure and transparency have a less significant impact on leverage the higher the country's RQ is.

RQ and firm size

Consider first the role of firm size. Low RQ is expected to disproportionately weigh on small firms, thus handing a competitive advantage to large firms (Beck et al., 2005). Conversely, high RQ should overwhelmingly benefit small firms by reducing their expected bankruptcy costs. As a result, high RQ is likely to weaken the positive influence of firm size on leverage. High RQ should also reduce the gap between large firms and small firms in terms of transparency and information disclosure. The pecking order model would thus predict that small firms have easier access to equity capital, which implies a lower leverage, the higher RQ is. Given the amount of evidence supporting the trade-off model, we emphasize the weaker effect of firm size that it suggests in high RQ countries. Besides, Lopez-Iturriaga and Rodriguez-Sanz (2008) show that better law enforcement decreases the positive effect of firm size on leverage. Cho et al. (2014) also report that creditor rights have the same moderating effect. This leads to our second hypothesis.

H2: RQ mitigates the positive influence of firm size on leverage

RQ and asset tangibility

Tangible assets are expected to facilitate corporate borrowing all the more when RQ is low. In effect, their physical nature make them easier to evaluate and to assign as collateral for getting loans. Their value is also less likely to depreciate under financial distress and less susceptible

to asset substitution, which alleviates potential agency concerns. The trade-off model thus predicts that higher RQ will weaken the positive influence of asset tangibility on leverage. Belkhir et al. (2016) provide results consistent with this prediction using institutional quality in the case of emerging markets. On the contrary, the pecking order model suggests that higher RQ decreases the benefit of tangible assets in facilitating equity issues by reducing information asymmetry, which implies that higher RQ weakens the negative influence of asset tangibility on leverage. Given the strong empirical evidence regarding the positive effect of asset tangibility predicted by the trade-off model (Oztek, 2015), our third hypothesis is outlined as follows.

H3: RQ mitigates the positive influence of asset tangibility on leverage

RQ and R&D intensity

Since they represent intangible assets, R&D investments stand to benefit from the country's higher RQ in the sense that their value should be easier to ascertain and that they would be better protected against misappropriation. As a result, RQ is expected to decrease the negative influence of R&D intensity on leverage predicted by the trade-off model. In contrast, the greater transparency that comes with higher RQ suggests that R&D intensive firms would have easier access to equity financing, and thus would have lower debt ratios in high RQ countries. Based on the few studies that provide unequivocal support for the trade-off perspective, we propose the following hypothesis.

H4: RQ mitigates the negative influence of R&D intensity on leverage

RQ and growth opportunities

Since they are also intangible by nature, growth opportunities can easily evaporate or lose substantial value under financial distress. In addition, they involve greater managerial discretion, which means that their value can more easily be diverted away at the expense of creditors. Furthermore, shareholders may be unwilling to inject new equity in the firm for fear that the funds would mainly serve to prop up debtholders (Myers, 1977). Poor RQ can only make things worse by adding an extra layer of uncertainty. As a result, firms with more growth opportunities should use lower leverage ratios the lower the country's RQ is. Conversely, higher RQ should weaken the negative influence of growth opportunities on leverage. This leads to our fifth hypothesis.

H5: RQ mitigates the negative influence of growth opportunities on leverage

RQ and profitability

According to the trade-off theory, more profitable firms should use higher leverage since they would benefit from greater tax savings. They are also exposed to lower bankruptcy risk due to their higher earnings and greater distance to default. However, all the evidence indicates that these firms use lower leverage, consistent with the pecking-order prediction that firms will use internal cash flows before issuing debt. Underpinning this outcome is the information asymmetry that exists between the firm's insiders and outside capital providers (Myers, 1984; Myers and Majluf, 1984). In high RQ environments, information asymmetry should be less severe, reducing the need for firms to rely on internal cash flows. As a result, the negative relationship between leverage and profitability should be attenuated the higher the RQ is. Somewhat in line with this prediction, Lopez-Iturriaga and Rodriguez-Sanz (2008) indicate that better law enforcement positively moderates the negative effect of profitability on leverage for their European sample. We can then state our last hypothesis as follows.

H6: RQ mitigates the negative influence of profitability on leverage

Data and methodology

SAMPLE AND DATA SOURCES

To construct our sample, we start with all publicly listed firms around the world covered in the Worldscope database from 1986 to 2017 with a minimum of \$10 million in total assets. Consistent with previous studies, financial firms are excluded since their leverage policies are subject to specific regulations (Rajan and Zingales, 1995). We also eliminate observations with missing data or for which book equity is negative in order to rule out firms undergoing severe financial distress. Our final sample consists of 547,864 firm-year observations for 46,184 distinct firms across 70 countries. Unsurprisingly, the largest group is represented by US firms with 100,185 firm-year observations (18.29%) corresponding to 12,175 firms (26.36%).

Country-level regulatory quality (RQ) is sourced from the World Bank. To reflect the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development, the RQ index relies on surveys and reports from a variety of informed stakeholders (firms, experts from the private sector, international organizations,

multilateral development and public sector agencies, etc.) regarding their views of how easy it is to enter product markets and access capital, and how effective regulation is in mitigating market imperfections and providing a level playing field.

Since the primary data may be reported on different scales, the first step consists in normalizing the data. The next step involves extracting a signal from each data source using a method known as Unobserved Components Model (UCM) before aggregating the signals to form the RQ index (Kaufmann et al., 2009). An advantage of this method is that when a data source does not cover a specific country or period, the signal is considered to be nil and the signals from the other (available) data sources are overweighted. We then backfill the missing values for the years prior to 1996, when the RQ index is not available, and retain the previous year's values when the RQ index is not updated.

FIRM-LEVEL VARIABLES

We use two measures of leverage. Consistent with Frank and Goyal (2009) and Park et al. (2013), the first measure is the ratio of total debt to market value of assets (TDMA) in which the latter is proxied by total assets plus market capitalization minus book value of equity. The second is the ratio of total debt to market value of equity (TDME).

We focus on the following determinants of leverage and briefly recall their expected effects.

- Firm size (LNTA) is measured by the natural log of total assets. Larger firms are better able to diversify away their risk, which means that their expected bankruptcy costs are lower. According to the trade-off theory, this should allow them to take on more debt.
- Tangible assets (PPE) are measured by net property, plant, and equipment over total assets. Tangible assets can be pledged as collateral (Fan et al. 2012) thus allowing firms to finance a greater proportion of their assets using debt.
- Growth opportunities (MBA) are measured by the natural log of the market-to-book value of assets. Since they could depreciate in case of financial distress, growth opportunities should be associated with lower leverage.
- R&D intensity (RD) is measured by the natural log of R&D expenditures over total assets after incrementing the ratio by one unit. The intangible capital that R&D represents should incentivize firms to use a lower debt ratio in order to protect its value.

- Profitability (PROFIT) is measured as in Frank and Goyal (2009) and Park et al. (2013) by the ratio of EBITDA to total assets. Since firms are expected to finance investments using their earnings before issuing debt, the pecking order model predicts a negative effect on leverage.

CAPTURING RQ'S MODERATING EFFECTS

The country-level moderating variable is the World Bank's index of regulatory quality (RQ). In addition to its direct effect on leverage, RQ is expected to affect the influence of firm-level variables. To evaluate these effects, we interact each of the firm-level determinants of leverage with RQ of the firm's country.

Providing credit to large firms is likely to be safer, particularly in low RQ countries, given that large firms have lower bankruptcy costs. In addition, their greater transparency should alleviate concerns that creditors might have regarding information asymmetry. Accordingly, the coefficient of the interaction term $LNTA \times RQ$ is expected to be negative. Firms with a high proportion of tangible assets should likewise benefit from their lower information asymmetry and lower expected bankruptcy costs, all the more that they are located in low RQ countries. For this reason, the coefficient of the interaction term $PPE \times RQ$ is expected to be negative.

In contrast, high R&D intensity should raise more concerns from lenders, especially in low RQ countries, for the reason that R&D investments involve higher information asymmetry and greater potential for risk shifting. Moreover, their value could suffer disproportionately in case of bankruptcy. Growth opportunities expose lenders to the same consequences. It follows that the coefficients of the interaction terms $RD \times RQ$ and $MBA \times RQ$ should both be positive. Lastly, RQ is expected to facilitate external financing by decreasing information asymmetry. This should make firms less dependent on their earnings, meaning that RQ should attenuate the negative relationship between profitability and leverage. In other words, the coefficient on the $PROFIT \times RQ$ interaction term is expected to be positive.

REGRESSION MODEL

In addition to these explanatory variables, we include country, year, and industry fixed effects in the regression model which can be written as follows, with the subscripts i and t denoting firms and years.

$$\begin{aligned}
& \text{TDMA}_{it} \text{ or } \text{TDME}_{it} \\
& = \alpha + \beta_1 \text{LNNTA}_{it} + \beta_2 \text{PPE}_{it} + \beta_3 \text{MBA}_{it} + \beta_4 \text{RD}_{it} \\
& + \beta_5 \text{PROFIT}_{it} + \beta_6 \text{RQ}_{it} + \beta_7 \text{LNNTA}_{it} \times \text{RQ}_{it} + \beta_8 \text{PPE}_{it} \times \text{RQ}_{it} \\
& + \beta_9 \text{MBA}_{it} \times \text{RQ}_{it} + \beta_{10} \text{RD}_{it} \times \text{RQ}_{it} + \beta_{11} \text{PROFIT}_{it} \times \text{RQ}_{it} \\
& + \xi \text{Country}_i + \gamma \text{Year}_t + \varphi \text{Industry}_i + \varepsilon_{it}
\end{aligned}$$

As in most studies (see e.g., Frank and Goyal, 2009; Fan et al., 2012; Cho et al., 2014), the model is estimated using OLS regressions with standard errors clustered by firm.

Results

DESCRIPTION OF THE SAMPLE

Table 1 provides the descriptive statistics for the sample. On average, debt financing represents about 19.8% of the value of a firm's assets and 35.6% of its market value of equity. The associated medians are somewhat lower reflecting positive skewness in the leverage ratios. Nevertheless, many firms appear to avoid using leverage as almost a quarter of them have debt amounting to less than 3.2% of their equity or asset values. Concerning the other variables, it can be seen that tangible assets account for over 30% of total assets. Despite the application of a log transform, the R&D variable remains unbalanced due to the large number of firms reporting zero R&D investments. Lastly, the profitability ratio is found to be centered around 9.2% with a mean below 8%.

Table 2 presents the correlation between the variables. The two leverage ratios appear to be highly, but imperfectly, correlated. Nevertheless, both ratios are positively correlated with firm size and with the proportion of tangible assets. On the other hand, they are negatively correlated with R&D intensity and growth opportunities. These results are consistent with the trade-off theory. One can also note that the correlation coefficients are materially larger using debt over market value of assets compared to debt over market value of equity. In contrast, the correlation with profitability is stronger using debt to equity value. The next line reveals the significant negative relationship between RQ and leverage. While it may facilitate debt financing, RQ simultaneously helps firms to issue equity at a lower cost by decreasing information asymmetry and alleviating potential agency conflicts.

Among the other firm characteristics, R&D intensity and growth opportunities exhibit a strong positive correlation. At the same time, R&D intensive firms are associated with a lower

profitability while larger firms with more tangible assets are associated with a higher profitability. Finally, high RQ appears to be associated with significantly higher R&D investments and a lower reliance on tangible assets, signaling that better RQ facilitates the growth of firms with more intangible assets.

MAIN RESULTS

Table 3 presents the main regression results. Columns 1-2 show the influence of firm characteristics on leverage. The results confirm that firms with a larger size and a higher proportion of tangible assets are able to use a higher leverage as they present lower expected costs of bankruptcy and have the available collateral to pledge against the debt they raise. Conversely, firms with higher growth opportunities and R&D investments tend to use less debt as they may be concerned about the larger losses they would incur in case of bankruptcy. The effect of profitability on leverage is similarly negative, in close alignment with the predictions of the pecking order theory (Myers, 1984). The VIF in column 3 indicate that multicollinearity is not an issue with all values well below 10.

The regression coefficients appear about twice as large using the ratio of debt over the value of equity (TDME) compared to the ratio of debt over the value of assets (TDMA) which is linked to the fact that the former's standard deviation is about 2.5 times larger than the latter's. In terms of economic magnitude, a one standard deviation increase in the proportion of tangible assets is associated with an increase in the debt-to-asset ratio of about $0.1880 \times 0.2365 = 0.0444 = 4.44\%$, which is quite significant considering the 19% standard deviation in that leverage ratio. Similarly, a one standard deviation increase in the proxy for growth opportunities (MBA) is expected to generate a $0.0964 \times 0.5698 = 0.0549 = 5.49$ percentage points decrease in the debt-to-asset ratio which is even more substantial.

Columns 4-5 evaluate the effect of RQ on leverage. Consistent with hypothesis 1-B, the RQ coefficient is negative, which suggests that the lower information asymmetry associated with greater RQ is more beneficial to equity issues than it is to debt issues. This result reflects the fact that the value of equity is more sensitive to information asymmetry compared to the value of debt (Myers, 1984). Accordingly, firms in high RQ countries have more incentive to issue equity and less incentive to issue debt. Cho et al. (2014) find likewise that leverage decreases as creditor rights increase while Fan et al. (2012) report that leverage increases with perception

of the country's corruption. In column 6, the high VIF value associated with RQ simply reflects the fact that RQ is largely explained by the (unreported) country dummies.

Columns 7-8 include interaction terms between RQ and firm characteristics. The results show that, for both measures of corporate leverage, firm size and asset tangibility have a weaker positive impact on leverage, the higher RQ is, which is consistent with the predictions of hypotheses 2 and 3. This implies that smaller firms with fewer tangible assets, as is the case of startups in the services industry, can borrow more easily in countries with better RQ. In line with hypotheses 4 and 5, the negative influence of a firm's R&D intensity and growth opportunities is attenuated by the country's RQ. This indicates that, in high RQ countries, firms with relatively high R&D investments and growth opportunities are less constrained in their use of leverage. Similarly, the negative effect of profitability is moderated by the country's RQ, consistent with the prediction of hypothesis 6. Finally, the VIF values reported in column 9 are seen to be higher compared to those in columns 3 and 6, as could be expected from the inclusion of interaction terms.

ROBUSTNESS CHECKS

To confirm these results, we perform a series of robustness checks. First, we use firm fixed effects (instead of industry and country fixed effects) and regressions in which the observations are weighted by firm size (measured by the log of firm value). The former allows for the control of unobservable firm characteristics, assuming they remain invariant over time, while the latter reduces the excessive impact that small firms might have on the coefficient estimates.

The results presented in table 4 appear to be very similar to those displayed in table 3. All the variables, and specifically the interaction terms, have the posited effects. Firm size and asset tangibility play a lesser role when the country's RQ is higher. Growth opportunities and R&D investments have likewise a less negative impact on leverage. Finally, higher RQ ensures that corporate leverage is less related to internal cash flows as firms can more easily borrow thanks to lower information asymmetry.

We then include additional control variables in order to mitigate potential biases due to missing variables. As a matter of fact, the extended trade-off theory suggests that leverage is partially determined by the intensity of agency conflicts. According to Jensen (1986), a major benefit of debt is to discipline corporate managers by forcing them to curb wasteful expenditures. Firms with weaker governance structures should therefore operate under higher leverage. In

addition, the use of debt allows business owners to raise external financing without diluting their equity stake. To account for these agency-related effects, we include the percentage of shares owned by all board members (INSIDER OWN) as well as the percentage of shares owned by institutional investors (INST OWN). We also include a governance indicator (GOV SCORE) that reflects the quality of a firm's internal governance, such as a high proportion of independent directors and the lack of restrictions of shareholder rights. Since the firm's age tends to be inversely related to its degree of information asymmetry, it may also affect the firm's leverage. We thus add the firm's age measured by the number of years since it was founded (AGE). Given that the above variables contain missing data, we fill the blanks with null values and create corresponding dummy variables. This ensures that the sample remains unchanged and avoids creating possible sample biases.

The results in table 5 indicate that all the additional control variables have significant effects on corporate leverage. More specifically, insider ownership is associated with higher leverage, consistent with the incentives for the firm's owners to avoid dilution. In contrast, institutional ownership is associated with lower leverage as institutional investors require greater transparency which facilitates equity issues. Better firm-level governance appears to have a similar negative effect on leverage since it also decreases information asymmetry. Finally, firm age is associated with lower leverage as transparency tends to increase as the firm matures, thereby allowing it to raise equity more easily. Yet, despite the significant influence of these additional variables, the coefficients of the standard determinants of leverage, including their interaction terms with RQ, remain virtually unchanged, thus adding to the sense that their effects are statistically robust.

ECONOMIC SIGNIFICANCE

To get a better sense of the significance of RQ, we split the sample around the median of RQ and use two dummy variables (High RQ and Low RQ) to generate separate coefficients for each firm-level determinant of leverage. To facilitate the comparison of these coefficients, the interaction terms are displayed in adjacent columns (columns 1 and 5 for High RQ and columns 2 and 6 for Low RQ). Columns 3 and 7 indicate the difference between Low RQ and High RQ countries whereas columns 4 and 8 report their percentage difference. For instance, the effect of firm size on leverage (using the debt-to-asset ratio) is 15.97% higher in Low RQ countries compared to High RQ countries, consistent with the more significant role played by firm size in low RQ environments.

More generally, in both High RQ and Low RQ countries, all the coefficients have the expected signs: positive for firm size and asset tangibility, and negative for the remaining variables. They are also highly significant. However, the coefficients for Low RQ countries are substantially larger – either more positive or more negative – compared to High RQ countries. A particularly visible difference is in regard to profitability for which the coefficient is about 3 times larger in Low RQ countries (a nearly 200% difference) in comparison to High RQ countries, for both measures of leverage. Hence, it appears that poor regulatory quality can have a truly material impact on the way firm characteristics affect corporate leverage.

Another way to appreciate the moderating influence that RQ can have on the determinants of leverage is to compare two similar countries with different levels of RQ. For that purpose, we chose the United Kingdom (UK) and Italy. Both countries are members of the G7 group of advanced economies. They have a similar population size (the UK being about 10% larger) and comparable outputs and living standards (especially at purchasing power parity). However, the UK is characterized by one of the most robust RQ frameworks in the world while Italy has one of the weakest RQ frameworks in Europe (just above Greece and Bulgaria). Figure 1 highlights the consistent gap in RQ that exists between these two countries.

Table 7 presents the regression results of the two leverage measures on their firm-level determinants. Observations for the UK and Italy are combined, and the regression coefficients are distinguished by using two country dummies. As in the previous table, the percentage difference between the low RQ country (Italy) and the high RQ country (UK) are reported in columns 4 and 8. It then clearly appears that firm size contributes much more to corporate leverage in Italy (a low RQ country) with a coefficient on firm size about three-quarters higher than the one for the UK (a high RQ country). In addition, intangible assets, represented by high R&D expenditures and extensive growth opportunities, act much more negatively against the use of debt in the low RQ country (Italy) with coefficient estimates between three-quarters and two times larger than the ones for the high RQ country (UK). The role of internal cash flows in explaining corporate leverage is also significantly larger in Italy compared to the UK, which is likely to reflect the greater information asymmetry that is associated with poor RQ. On the other hand, the large difference in RQ between Italy and the UK does not seem to affect the importance of asset tangibility in helping firms to raise debt.

ADDITIONAL RESULTS

We perform additional tests with the aim of confirming our results or uncovering possible discrepancies. These results are not tabulated to save space but are available from the authors. First, we analyze the moderating effect of RQ for small firms and large firms separately to check that the results are not dependent on firm size. To do so, size is defined relative to the firm's country and industry in any given year. The sample is then split around the median of the country, industry, and year-adjusted firm size. Overall, the results established above are validated irrespective of firm size with only a few minor differences.

We next examine how RQ affects leverage depending on the firm's profitability. As above, profitability is adjusted relative to the country, industry, and year average. The sample is then split around the median of adjusted profitability. The results show that the hypotheses are supported in both subsamples. However, an interesting point is that RQ helps low profit firms to a greater extent in reducing the influence of firm characteristics on leverage. As a result, low profit firms can expect to face less difficulty in raising debt in a high RQ environment when they have few tangible assets, high R&D expenditures or more growth opportunities.

We also compare the effect of RQ on leverage in developed and developing countries using OECD membership as indicator of economic development. The results confirm that higher RQ attenuates the positive influence of asset tangibility and the negative influence of profitability on leverage in both OECD and non-OECD countries. Nonetheless, the moderating effect of RQ appears to be significantly stronger in OECD countries, especially in regard to the role played by firm size and R&D intensity whose role in determining a firm's capital structure is much less prominent when RQ is high.

In the same vein, we split the sample by industry affiliation and examine manufacturing and non-manufacturing firms separately. The results that are again consistent with the main findings with only minor yet interesting differences. As a matter of fact, all the predicted moderating effects are verified for manufacturing firms, except the one regarding R&D intensity which appears to be insignificant. For non-manufacturing firms, the only moderating effect that is unsupported is the one involving the proportion of tangible assets which is negative, but statistically insignificant.

Finally, we run the regressions on a subsample excluding the years before 1996 when the RQ index was not available. Again, we find that the results are qualitatively similar.

Discussion and conclusion

In this paper, we study the effect of country-level regulatory quality (RQ) on corporate leverage. We do so by examining the extent to which RQ moderates the effect of firm characteristics on leverage using a large international sample of firms from 70 countries over a 32-year period. This approach allows us to uncover that RQ has a material impact on leverage. More precisely, we find that as RQ increases, firm size and asset tangibility play a less significant positive role on leverage, while growth opportunities, R&D intensity and profitability become less significant in decreasing leverage. These findings suggest that RQ helps companies by facilitating their access to debt financing.

As a matter of fact, smaller firms with fewer tangible assets appear to be less restricted in their use of debt when they are in a high RQ country relative to similar firms located in a low RQ country. Similarly, firms with higher growth opportunities, R&D intensity, and profitability, are able to use more debt in high RQ countries. It thus appears that RQ plays a critical role in the sense that it benefits, first and foremost, firms most likely to experience financial constraints. Indeed, firms facing the toughest challenges in securing external financing are small innovative firms with plenty of growth opportunities that tend to hold intangible assets that are hard to value and easy to expropriate. Moreover, these assets are most likely to depreciate and become worthless in case of bankruptcy.

By facilitating their access to debt financing, higher RQ helps to accelerate firm investment and development. It can thus be inferred that high RQ spurs economic growth. Supporting this outcome is the argument that RQ decreases the cost of bankruptcy resolution that a higher leverage makes more likely. More explicitly, RQ mitigates the agency costs of debt by making opportunistic managerial behavior more difficult to conceal as well as increasing the likelihood of being exposed and penalized, thus providing better protection to creditors.

Our findings survive a series of robustness checks. They are confirmed using firm fixed effects, which rules out the possibility that unobservable time-invariant firm characteristics might have driven the results, and weighted regressions intended to put more weight on large firms without dropping smaller firms that form a large proportion of our sample. The inclusion of variables reflecting the potential for agency conflicts does not alter either our results. The latter hold equally well for small and large firms, and for high profit and low profit firms, although RQ appears to have a stronger moderating effect in the less profitable group of firms. The analysis

by country economic development, using OECD membership, and industry affiliation, also reveals minor differences such as the fact that RQ attenuates the positive influence of tangible assets in the manufacturing sector, but not among non-manufacturing firms.

Besides, we show that the role played by RQ in moderating the effect of firm characteristics is not only statistically significant, but also economically sizable. Most of the firm-level variables have an effect several dozens of percentage points greater in low RQ countries. This is notably the case of profitability whose effect is about 3 times larger. The comparison of Italy and the UK, two advanced economies with a relatively similar size but quite different RQ standards, illustrates the detrimental effect that poor RQ can have by requiring, for instance, that firms hold more tangible assets to borrow funds.

Overall, our results offer a distinct perspective on what may drive leverage decisions around the world. They show that country-level RQ needs to be taken into account to provide a more complete picture regarding the determinants of corporate financing. Another key result is that countries benefit from enhancing their regulatory environments. By doing so, smaller R&D intensive firms, and firms with more growth opportunities and fewer tangible assets, would be less disadvantaged by their size, growth and innovation profile, or type of assets, as investors, and more specifically debt providers, would have greater confidence in small innovative firms. Countries would then benefit since these firms would have improved access to debt financing and would thus be able to achieve higher growth (Jalilian et al. 2007; Haidar, 2012).

References

- Alves, P. F. P., & Ferreira, M. A. (2011). Capital structure and law around the world. *Journal of Multinational Financial Management*, 21, 119-150.
- Baghai, R. P., Silva, R. C., Thell, V., & Vig, V. (2021). Talent in distressed firms: Investigating the labor costs of financial distress. *Journal of Finance*, 76, 2907-2961.
- Bharath, S. T., Pasquariello, P., & Wu, G. (2009). Does asymmetric information drive capital structure decisions? *Review of Financial Studies*, 22, 3211-3243.
- Bhaumik, S. K., Dimova, R., Kumbhakar, S. C., & Sun, K. (2018). Is tinkering with institutional quality a panacea for firm performance? Insights from a semiparametric approach to modeling firm performance. *Review of Development Economics*, 22, 1-22.
- Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2005). Financial and legal constraints to growth: does firm size matter? *Journal of Finance*, 60, 137-177.
- Belkhir, M., Maghyereh, A., & Awartani, B. (2016). Institutions and corporate capital structure in the MENA region. *Emerging Markets Review*, 26, 99-129.
- Bessler, W., Drobetz, W., & Grüninger, M. C. (2011). Information asymmetry and financing decisions. *International Review of Finance*, 11, 123-154.
- Bielen, S., Marneffe, W., & Vereeck, L. (2015). A cross-country analysis of the impact of regulatory quality on commercial case disposition time. *European Journal of Law and Economics*, 39, 455-474.
- Black, J. (2002). Regulatory conversations. *Journal of Law & Society*, 29, 163-196.
- Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V., 2001. Capital structure in developing countries. *Journal of Finance*, 56, 87-130.
- Bradley, M., Jarrell, G. A., & Kim, E. H. (1984). On the existence of an optimal capital structure: Theory and evidence. *Journal of Finance*, 39, 857-878.
- Chen, Z., Harford, J., & Kamara, A. (2019). Operating leverage, profitability, and capital structure. *Journal of Financial and Quantitative Analysis*, 54, 369-392.
- Cho, S. S., El Ghouli, S., Guedhami, O., & Suh, J. (2014). Creditor rights and capital structure: Evidence from international data. *Journal of Corporate Finance*, 25, 40-60.
- Commander, S., & Svejnar, J. (2011). Business environment, exports, ownership, and firm performance. *Review of Economics and Statistics*, 93, 309-337.
- 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 & Finance*, 32, 1954-1969.
- Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *Review of Financial Studies*, 15, 1-33.
- Fan, J. P., Titman, S., & Twite, G. (2012). An international comparison of capital structure and debt maturity choices. *Journal of Financial and Quantitative Analysis*, 47, 23-56.

- Frank, M. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics*, 67, 217-248.
- Frank, M. Z., & Goyal, V. K. (2009). Capital structure decisions: which factors are reliably important? *Financial Management*, 38, 1-37.
- Gao, W., & Zhu, F. (2015). Information asymmetry and capital structure around the world. *Pacific-Basin Finance Journal*, 32, 131-159.
- Haidar, J. I. (2012). The impact of business regulatory reforms on economic growth. *Journal of the Japanese and International Economies*, 26, 285-307.
- Jalilian, H., Kirkpatrick, C., & Parker, D. (2007). The impact of regulation on economic growth in developing countries: A cross-country analysis. *World Development*, 35, 87-103.
- Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review*, 76, 323-329.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). Governance matters VIII: aggregate and individual governance indicators, 1996-2008. World Bank Policy Research Working Paper #4978.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal determinants of external finance. *Journal of Finance*, 52, 1131-1150.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and finance. *Journal of Political Economy*, 106, 1113-1155.
- Lopez-Iturriaga, F. J., & Rodriguez-Sanz, J. A. (2008). Capital structure and institutional setting: a decompositional and international analysis. *Applied Economics*, 40, 1851-1864.
- Luo, Y., & Junkunc, M. (2008). How private enterprises respond to government bureaucracy in emerging economies: the effects of entrepreneurial type and governance. *Strategic Entrepreneurship Journal*, 2, 133-153.
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5, 147-175.
- Myers, S. C. (1984). The capital structure puzzle. *Journal of Finance*, 39, 574-592.
- 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.
- Oztekin, O. (2015). Capital structure decisions around the world: which factors are reliably important? *Journal of Financial and Quantitative Analysis*, 50, 301-323.
- Park, S. H., Suh, J., & Yeung, B. (2013). Do multinational and domestic corporations differ in their leverage policies? *Journal of Corporate Finance*, 20, 115-139.
- Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *Journal of Finance*, 50, 1421-1460.

Shah, A., Shah, H. A., Smith, J. M., & Labianca, G. J. (2017). Judicial efficiency and capital structure: An international study. *Journal of Corporate Finance*, 44, 255-274.

Shyam-Sunder, L., & Myers, S. C. (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics*, 51, 219-244.

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *Journal of Finance*, 43, 1-19.

Wald, J. K. (1999). How firm characteristics affect capital structure: an international comparison. *Journal of Financial Research*, 22, 161-187.

Table 1: Sample statistics

| | Mean | Std Dev | Q1 | Median | Q3 | Min | Max |
|-------------|--------|---------|---------|--------|--------|---------|--------|
| TDMA | 0.1981 | 0.1901 | 0.0312 | 0.1499 | 0.3134 | 0 | 0.9978 |
| TDME | 0.3565 | 0.5096 | 0.0322 | 0.1763 | 0.4564 | 0 | 2.9308 |
| LNTA | 5.3984 | 1.7839 | 4.0669 | 5.1997 | 6.4840 | 2.3026 | 15.042 |
| PPE | 0.3067 | 0.2365 | 0.1090 | 0.2645 | 0.4558 | 0.0000 | 0.9407 |
| MBA | 0.2939 | 0.5698 | -0.0706 | 0.1779 | 0.5685 | -0.9188 | 7.0283 |
| RD | 0.4391 | 0.8252 | 0 | 0 | 0.5436 | 0 | 5.3423 |
| PROFIT | 0.0795 | 0.1544 | 0.0355 | 0.0920 | 0.1545 | -0.6248 | 0.4542 |
| RQ | 1.0285 | 0.7271 | 0.6791 | 1.1761 | 1.6039 | -2.1112 | 2.1987 |
| AGE | 39,180 | 26,974 | 21 | 30 | 49 | 1 | 202 |
| INSIDER OWN | 7,430 | 13,864 | 0,123 | 1,371 | 7,5765 | 0 | 69,82 |
| INST OWN | 44,939 | 31,982 | 16,904 | 39,16 | 72,205 | 0 | 100 |
| GOV SCORE | 47,915 | 7,900 | 42,857 | 48,214 | 51,786 | 3,5714 | 85,714 |

TDMA is total debt over market value of assets. TDME is total debt over market value of equity. LNTA is the natural log of total assets (in USD millions). PPE is net property, plant, and equipment over total assets. MBA is the natural log of the market to book value of assets. RD is the natural log of R&D to total assets incremented by one unit. PROFIT is earnings before interest, taxes, depreciation, and amortization over total assets. RQ is the World Bank's index of regulatory quality. AGE is the number of years since the firm was founded. INSIDER OWN is the percentage of shares owned by all board members. INST OWN is the percentage of shares owned by institutional investors. GOV SCORE is the firm's internal governance score calculated by Refinitiv.

Table 2: Correlation between the variables

| | | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] | [12] |
|-------------|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|------|
| TDMA | [1] | 1 | | | | | | | | | | | |
| TDME | [2] | 0.9271* | 1 | | | | | | | | | | |
| LNTA | [3] | 0.1458* | 0.0928* | 1 | | | | | | | | | |
| PPE | [4] | 0.2877* | 0.2478* | 0.0779* | 1 | | | | | | | | |
| MBA | [5] | -0.3848* | -0.3069* | -0.0254* | -0.1563* | 1 | | | | | | | |
| RD | [6] | -0.2249* | -0.1853* | -0.0393* | -0.2329* | 0.2665* | 1 | | | | | | |
| PROFIT | [7] | -0.0852* | -0.0927* | 0.1966* | 0.0840* | 0.0792* | -0.2059* | 1 | | | | | |
| RQ | [8] | -0.1146* | -0.1089* | -0.0041* | -0.0841* | 0.0224* | 0.1729* | -0.1022* | 1 | | | | |
| AGE | [9] | 0,0284* | -0.0087* | 0,2264* | 0,1059* | -0,0866* | -0.0413* | 0,1451* | 0,0438* | 1 | | | |
| INSIDER OWN | [10] | -0,0263* | -0.0172* | -0,2680* | -0,0436* | 0,0698* | -0.0335* | 0,0515* | -0,0917* | -0,0988* | 1 | | |
| INST OWN | [11] | -0,0567* | -0.0608* | 0,2992* | -0,0698* | 0,1627* | 0.1048* | 0,0382* | 0,3025* | -0,0321* | -0,2739* | 1 | |
| GOV SCORE | [12] | -0,0028 | -0.0334* | 0,3639* | 0,0217* | 0,0521* | 0.0565* | 0,0447* | 0,2592* | 0,1725* | -0,1316* | 0,3209* | 1 |

TDMA is total debt over market value of assets. TDME is total debt over market value of equity. LNTA is the natural log of total assets (in USD millions). PPE is net property, plant, and equipment over total assets. MBA is the natural log of the market to book value of assets. RD is the natural log of R&D to total assets incremented by one unit. PROFIT is earnings before interest, taxes, depreciation, and amortization over total assets. RQ is the World Bank's index of regulatory quality. AGE is the number of years since the firm was founded. INSIDER OWN is the percentage of shares owned by all board members. INST OWN is the percentage of shares owned by institutional investors. GOV SCORE is the firm's internal governance score calculated by Refinitiv. * indicates significance at the 1% level.

Table 3: Effect of regulatory quality on the determinants of leverage

| | | TDMA | TDME | VIF | TDMA | TDME | VIF | TDMA | TDME | VIF |
|-------------------------------------------|-----|-----------------------|-----------------------|------|-----------------------|-----------------------|-------|-----------------------|-----------------------|-------|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Constant | | 0.1819*** (0.000) | 0.3547*** (0.000) | | 0.1819*** (0.000) | 0.3547*** (0.000) | | 0.1884*** (0.000) | 0.3368*** (0.000) | |
| LNTA | (+) | 0.0155*** (0.000) | 0.0297*** (0.000) | 1,22 | 0.0155*** (0.000) | 0.0297*** (0.000) | 1.23 | 0.0166*** (0.000) | 0.0378*** (0.000) | 4,24 |
| PPE | (+) | 0.1880*** (0.000) | 0.4428*** (0.000) | 1,28 | 0.1880*** (0.000) | 0.4428*** (0.000) | 1.28 | 0.2121*** (0.000) | 0.5261*** (0.000) | 3,64 |
| MBA | (-) | -0.0964*** (0.000) | -0.1988*** (0.000) | 1,29 | -0.0964*** (0.000) | -0.1988*** (0.000) | 1.29 | -0.1067*** (0.000) | -0.2255*** (0.000) | 3,53 |
| RD | (-) | -0.0305*** (0.000) | -0.0682*** (0.000) | 1,46 | -0.0305*** (0.000) | -0.0682*** (0.000) | 1.46 | -0.0395*** (0.000) | -0.0906*** (0.000) | 11,84 |
| PROFIT | (-) | -0.1936*** (0.000) | -0.4938*** (0.000) | 1,18 | -0.1936*** (0.000) | -0.4938*** (0.000) | 1.18 | -0.3717*** (0.000) | -0.9671*** (0.000) | 5,84 |
| RQ | (?) | | | | -0.0535*** (0.000) | -0.1428*** (0.000) | 32.06 | -0.0563*** (0.000) | -0.1193*** (0.000) | 46,13 |
| LNTA × RQ | (-) | | | | | | | -0.0013** (0.013) | -0.0079*** (0.000) | 15,24 |
| PPE × RQ | (-) | | | | | | | -0.0226*** (0.000) | -0.0773*** (0.000) | 5,41 |
| MBA × RQ | (+) | | | | | | | 0.0121*** (0.000) | 0.0316*** (0.000) | 3,79 |
| RD × RQ | (+) | | | | | | | 0.0068*** (0.000) | 0.0166*** (0.000) | 12,5 |
| PROFIT × RQ | (+) | | | | | | | 0.1418*** (0.000) | 0.3797*** (0.000) | 6,14 |
| Industry, year, and country fixed effects | | Yes | Yes | | Yes | Yes | | Yes | Yes | |
| F value | | 964,22*** | 524,99*** | | 945.80*** | 513.63*** | | 889.57*** | 479.35*** | |
| Adjusted R ² | | 0,2909 | 0,2101 | | 0.2923 | 0.2114 | | 0.2994 | 0.2189 | |
| N observations | | 547,864 | 547,864 | | 547,864 | 547,864 | | 547,864 | 547,864 | |

TDMA is total debt over market value of assets. TDME is total debt over market value of equity. LNTA is the natural log of total assets (in USD millions). PPE is net property, plant, and equipment over total assets. MBA is the natural log of the market to book value of assets. RD is the natural log of R&D to total assets incremented by one unit. PROFIT is earnings before interest, taxes, depreciation, and amortization over total assets. RQ is the World Bank's index of regulatory quality. Standard errors are adjusted for clustering at the firm level. p-values are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Table 4: Fixed effect and weighted regressions

| | | Firm fixed effects | | Weighted regressions | |
|-------------------------|-----|-----------------------|-----------------------|-----------------------|-----------------------|
| | | TDMA | TDME | TDMA | TDME |
| | | (1) | (2) | (3) | (4) |
| Constant | | 0,0869*** (0,000) | 0,0785*** (0,000) | 0,2120*** (0,000) | 0,4030*** (0,000) |
| LNTA | (+) | 0,0383*** (0,000) | 0,0900*** (0,000) | 0,0144*** (0,000) | 0,0310*** (0,000) |
| PPE | (+) | 0,1620*** (0,000) | 0,4134*** (0,000) | 0,2070*** (0,000) | 0,5119*** (0,000) |
| MBA | (-) | -0,1090*** (0,000) | -0,2313*** (0,000) | -0,1154*** (0,000) | -0,2411*** (0,000) |
| RD | (-) | -0,0151*** (0,000) | -0,0382*** (0,000) | -0,0372*** (0,000) | -0,0853*** (0,000) |
| PROFIT | (-) | -0,2664*** (0,000) | -0,7237*** (0,000) | -0,3769*** (0,000) | -0,9797*** (0,000) |
| RQ | (?) | -0,0474*** (0,000) | -0,0886*** (0,000) | -0,0682*** (0,000) | -0,1534*** (0,000) |
| LNTA × RQ | (-) | -0,0014* (0,056) | -0,0085*** (0,000) | -0,0009* (0,098) | -0,0062*** (0,000) |
| PPE × RQ | (-) | -0,0110** (0,016) | -0,0588*** (0,000) | -0,0191*** (0,000) | -0,0658*** (0,000) |
| MBA × RQ | (+) | 0,0175*** (0,000) | 0,0456*** (0,000) | 0,0112*** (0,000) | 0,0283*** (0,000) |
| RD × RQ | (+) | 0,0060*** (0,000) | 0,0165*** (0,000) | 0,0057*** (0,000) | 0,0145*** (0,000) |
| PROFIT × RQ | (+) | 0,0702*** (0,000) | 0,2211*** (0,000) | 0,1330*** (0,000) | 0,3562*** (0,000) |
| Year effect | | Yes | Yes | Yes | Yes |
| Industry + country | | No | No | Yes | Yes |
| F value | | 713.56*** | 408.71*** | 917.96*** | 468.57*** |
| Adjusted R ² | | 0.7309 | 0.6519 | 0.3258 | 0.2338 |
| N observations | | 547,864 | 547,864 | 547,864 | 547,864 |

TDMA is total debt over market value of assets. TDME is total debt over market value of equity. LNTA is the natural log of total assets (in USD millions). PPE is net property, plant, and equipment over total assets. MBA is the natural log of the market to book value of assets. RD is the natural log of R&D to total assets incremented by one unit. PROFIT is earnings before interest, taxes, depreciation, and amortization over total assets. RQ is the World Bank's index of regulatory quality. Firm market values are used in weighted regressions. Standard errors are adjusted for clustering at the firm level. p-values are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Table 5: Regressions with additional controls

| | | TDMA | TDME |
|----------------------------------------------|-----|-----------------------|-----------------------|
| | | (3) | (4) |
| Constant | | 0,1838*** (0,000) | 0,3664*** (0,000) |
| LNTA | (+) | 0,0190*** (0,000) | 0,0445*** (0,000) |
| PPE | (+) | 0,2123*** (0,000) | 0,5269*** (0,000) |
| MBA | (-) | -0,1052*** (0,000) | -0,2216*** (0,000) |
| RD | (-) | -0,0391*** (0,000) | -0,0897*** (0,000) |
| PROFIT | (-) | -0,3697*** (0,000) | -0,9612*** (0,000) |
| RQ | (?) | -0,0564*** (0,000) | -0,1245*** (0,000) |
| LNTA × RQ | (-) | -0,0013** (0,011) | -0,0077*** (0,000) |
| PPE × RQ | (-) | -0,0219*** (0,000) | -0,0756*** (0,000) |
| MBA × RQ | (+) | 0,0116*** (0,000) | 0,0305*** (0,000) |
| RD × RQ | (+) | 0,0069*** (0,000) | 0,0169*** (0,000) |
| PROFIT × RQ | (+) | 0,1417*** (0,000) | 0,3792*** (0,000) |
| AGE | (-) | -0,0004*** (0,000) | -0,0011*** (0,000) |
| AGE_MISS (N= 370,800) | (?) | -0,0010 (0,641) | -0,0046 (0,427) |
| INSIDER OWN | (+) | 0,0343*** (0,001) | 0,1014*** (0,000) |
| INST OWN | (-) | 0,0063 (0,197) | -0,0288*** (0,003) |
| INSIDER_MISS (N= 475,820) | (?) | -0,0114 (0,134) | -0,5311 (0,117) |
| INST_MISS (N= 475,827) | (?) | 0,0246*** (0,001) | 0,5556 (0,102) |
| GOV SCORE | (-) | -0,0006*** (0,000) | -0,0024*** (0,000) |
| GOV SCORE_MISS (N= 477,051) | (?) | -0,0176** (0,014) | -0,0740*** (0,000) |
| Industry, year, and country fixed effects | | Yes | Yes |
| F value | | 761,19*** | 409,07*** |
| Adjusted R ² | | 0,3021 | 0,222 |
| N observations | | 547,864 | 547,864 |

Table 6: Economic significance of regulatory quality

| | | TDMA | | | | TDME | | | |
|----------------------------------------------|-----|-----------------------|-----------------------|-----------------------|---------|-----------------------|-----------------------|-----------------------|---------|
| | | High RQ | Low RQ | Low - High | | High RQ | Low RQ | Low - High | |
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| LNTA | (+) | 0,0144*** (0,000) | 0,0167*** (0,000) | +0,0023*** (0,001) | 15,97% | 0,0235*** (0,000) | 0,0373*** (0,000) | +0,0137*** (0,000) | 58,30% |
| TANG | (+) | 0,1631*** (0,000) | 0,2168*** (0,000) | +0,0537*** (0,000) | 32,92% | 0,3771*** (0,000) | 0,5202*** (0,000) | +0,1431*** (0,000) | 37,95% |
| LNQ | (-) | -0,0900*** (0,000) | -0,0979*** (0,000) | -0,0080*** (0,000) | 8,89% | -0,1824*** (0,000) | -0,2028*** (0,000) | -0,0205*** (0,000) | 11,24% |
| RD | (-) | -0,0268*** (0,000) | -0,0374*** (0,000) | -0,0106*** (0,000) | 39,55% | -0,0584*** (0,000) | -0,0899*** (0,000) | -0,0316*** (0,000) | 54,11% |
| PROFIT | (-) | -0,1214*** (0,000) | -0,3632*** (0,000) | -0,2418*** (0,000) | 199,18% | -0,3057*** (0,000) | -0,9137*** (0,000) | -0,6079*** (0,000) | 198,86% |
| Industry, year, and country fixed effects | | | Yes | | | | Yes | | |
| F value | | | 898.87*** | | | | 482.35*** | | |
| Adjusted R ² | | | 0.2998 | | | | 0.2183 | | |
| N observations | | | 547,864 | | | | 547,864 | | |

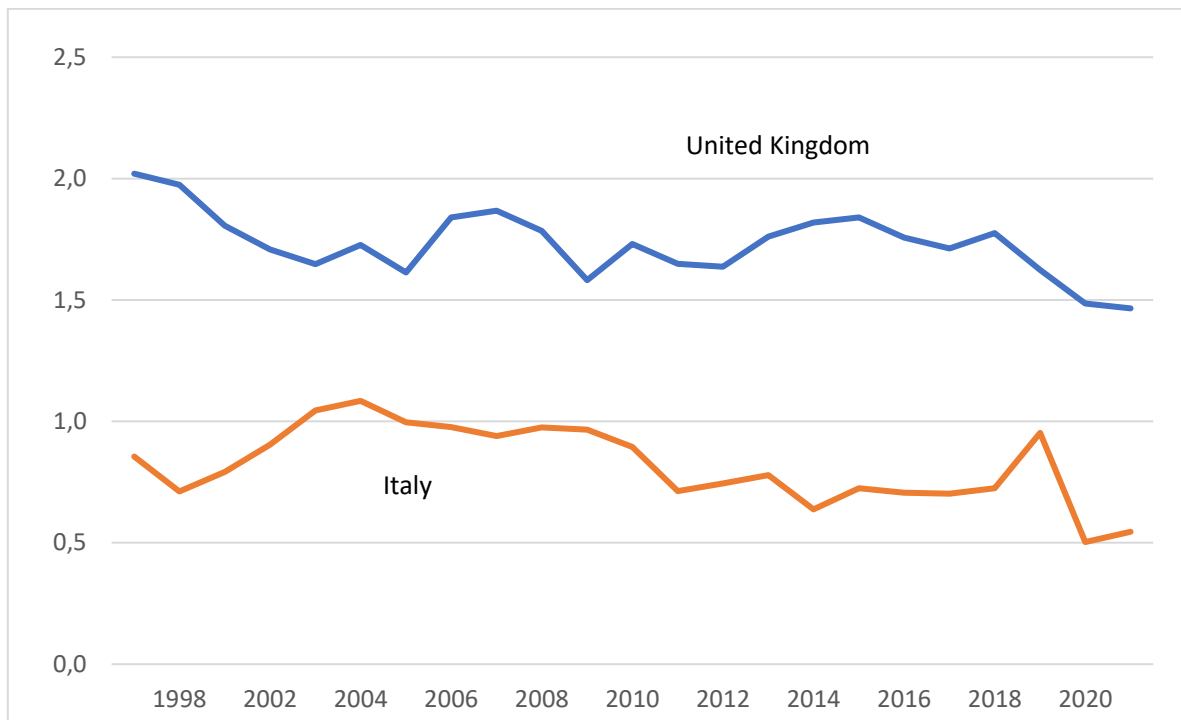
Observations for High RQ and Low RQ countries are pooled together. The coefficients in columns 1 and 5 are those for High RQ countries. The coefficients in columns 2 and 6 are those for Low RQ countries. TDMA is total debt over market value of assets. TDME is total debt over market value of equity. LNTA is the natural log of total assets (in USD millions). PPE is net property, plant, and equipment over total assets. MBA is the natural log of the market to book value of assets. RD is the natural log of R&D to total assets incremented by one unit. PROFIT is earnings before interest, taxes, depreciation, and amortization over total assets. RQ is the World Bank's index of regulatory quality. Standard errors are adjusted for clustering at the firm level. p-values are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Table 7: Comparison of two similar countries with different levels of regulatory quality

| | | TDMA | | | | TDME | | | |
|-------------------------------------|-----|-----------------------|-----------------------|-----------------------|--------|-----------------------|-----------------------|-----------------------|--------|
| | | UK | Italy | Italy - UK | | UK | Italy | Italy - UK | |
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| LNTA | (+) | 0,0119*** (0,000) | 0,0207*** (0,000) | 0,0088*** (0,002) | 73,9% | 0,0193*** (0,000) | 0,0340*** (0,000) | 0,0147** (0,039) | 76,2% |
| TANG | (+) | 0,1878*** (0,000) | 0,1811*** (0,000) | -0,0067 (0,879) | -3,6% | 0,4005*** (0,000) | 0,4911*** (0,000) | 0,0906 (0,518) | 22,6% |
| LNQ | (-) | -0,0736*** (0,000) | -0,1279*** (0,000) | -0,0543*** (0,000) | 73,8% | -0,1331*** (0,000) | -0,2533*** (0,000) | -0,1202*** (0,000) | 90,3% |
| RD | (-) | -0,0179*** (0,000) | -0,0333*** (0,000) | -0,0154** (0,044) | 86,0% | -0,0303*** (0,000) | -0,0664*** (0,000) | -0,0361** (0,016) | 119,1% |
| PROFIT | (-) | -0,1084*** (0,000) | -0,3024*** (0,000) | -0,1940*** (0,000) | 179,0% | -0,2565*** (0,000) | -0,6596*** (0,000) | -0,4031*** (0,001) | 157,2% |
| Industry and year, fixed effects | | | Yes | | | | Yes | | |
| F value | | | 138.89*** | | | | 76.45*** | | |
| Adjusted R ² | | | 0.2811 | | | | 0.1907 | | |
| N observations | | | 38,642 | | | | 38,642 | | |

Observations for the UK and Italy are pooled together. The coefficients in columns 1 and 5 are those for the UK. The coefficients in columns 2 and 6 are those for Italy. TDMA is total debt over market value of assets. TDME is total debt over market value of equity. LNTA is the natural log of total assets (in USD millions). PPE is net property, plant, and equipment over total assets. MBA is the natural log of the market to book value of assets. RD is the natural log of R&D to total assets incremented by one unit. PROFIT is earnings before interest, taxes, depreciation, and amortization over total assets. Standard errors are adjusted for clustering at the firm level. p-values are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Figure 1: Comparison of RQ for the UK and Italy



Source: www.theglobaleconomy.com/rankings/wb_regulatory_quality/