IFRS Adoption, financial development and efficient capital allocation: Evidence from a structural investment model

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Abstract

This research investigates how different levels of International Financial Reporting Standards (IFRS) adoption affects firms' investment efficiency along with countries' financial development. I estimate an investment Euler equation model in which financial development and IFRS enter as factors to relief firms' financing constraints to decrease the cost of external capital and, hence, improve the efficiency of capital allocation. Here, IFRS is measured as a composite index built according to the information in the jurisdiction profiles published by the IFRS Foundation. The results show firms can decrease their financing constraints by half adopting IFRS even at relatively low levels. Firms in countries with low financial development and adopting IFRS have similar levels of financing constraints as firms in countries with high financial development but no IFRS. The results are important mainly from a policy perspective because it provides evidence that the financial reporting systems is important for economic development, which is to be useful to policymakers and international organizations supporting IFRS adoption.

Keywords: IFRS, Financial Development, Financial Constraints, Investment Efficiency.

1 Introduction

This research aims to investigate the role of accounting information for firms' investments allocation efficiency. Specifically, I assess how different levels of the adoption of IFRS contributes to ease financing constraints, improving firms' information environment to decrease the cost of external capital and, consequently, improving firms' intertemporal decision to allocate investment.

The literature about the effects of IFRS in capital markets around the world is vast but not rarely controversial. Several studies document financial markets improvements

around IFRS adoption (Barth et al., 2008; Byard et al., 2011; Horton et al., 2013), but the literature also documents results moderated by countries' characteristics (Christensen et al., 2013; Daske et al., 2008; Gordon et al., 2012; Kim & Shi, 2012; Li, 2010), so that the interactions between IFRS and other institutions in the functioning of financial markets is still a hazy issue. But, mostly important, the literature misses to evaluate the ultimate goal of accounting harmonization, as stated by the Conceptual Framework for Financial Reporting (IASB, 2018, p. A17) which says the objective of financial reporting is "to provide financial information about the reporting entity that is useful to existing and potential investors, lenders and other creditors in making decisions relating to providing resources to the entity".

Barberis and Thaler (2003) argue that our ultimate concern is that capital is allocated to the most promising investments opportunities, that is, we should invest more in activities with potential to generate income. If market's prices reflect the underlying fundamentals they are able to appoint these activities and, thus, contribute to the efficient allocation of capital in the economy. Therefore, IFRS adoption is effective if providing high quality and comparable accounting information helps users to make more confident investment and lending decisions which result in a more efficient allocation of resources in the economy.

The controversies in the literature on IFRS adoption can be roughly accommodated as a causality problem. If different problems give different answers about the relationship between IFRS adoption and other institutional features, it is difficult to be sure about the effects of IFRS on investment allocation efficiency. Therefore, establishing causal models for this issue is crucial. Bushman and Smith (2001) develop some theoretical paths of causality between financial accounting information and economic activity, but highlight their relationship is expected to vary with other factors, such as the financial system structure and the legal environment. With a similar thought, but skeptical about the causal effect of IFRS, Holthausen (2009) says a common set of accounting standards across countries is unlikely to lead to similar financial reporting outcomes across countries if the other forces that govern the quality of financial statements are not also converged. The author even argues that "it is not at all obvious that similar financial reporting outcomes would lead to greater economic efficiency given cross countries in other institutional features" (Holthausen, 2009, p. 448).

This research uses a structural model approach to investigate the causal effect of IFRS adoption on the efficiency of capital allocation, aiming to fill the gap in the literature about the ultimate purpose of financial reporting as stated in the Conceptual Framework. Considering the interactions of IFRS with other forces that govern financial reporting quality, as put by Holthausen (2009), I use a model in which IFRS interacts with financial markets and financial institutions development to ease financing constraints and improve capital allocation. This choice of a model comes also from the literature

in Economics which evaluates the causal effects of financial development on economic growth, which forms a large bulk of research, as once can see in Section 2. Despite all its controversies, this literature indicates greater financial development leads to better allocation of resources and, consequently, economic growth. If IFRS can improve the functioning of financial markets, then it can improve capital allocation efficiency.

Besides difficulties in assessing the causal relationships between IFRS adoption and economic performance, the empirical accounting literature is missing another point: how different countries adopt IFRS in different levels. A brief search through the details of the profiles covering the adoption across the World published by the IFRS Foundation shows the manifold ways countries incorporate the international standards into their market. In this research, I evaluate these differences specifying which types of firms are allowed, required of prohibited to use which standards and how they are made available in the domestic setting to measure IFRS adoption.

The IFRS adoption differences across countries were somehow bespoken by the literature, as in Ball (2006), who lists his concerns that there would be inevitable substantial differences in IFRS implementation among countries. This concern, is not only due to the differences in the adoption process as in Nobes and Zeff (2008, 2016) and Zeff and Nobes (2010), but also due to market and legal features leading to differences in the enforcement of the international standards, as discussed by Holthausen (2009). Nonetheless, most empirical studies did not incorporate this question in their analysis. An exception is Christensen et al. (2013), who explicitly evaluated other changes in enforcement along IFRS adoption in the European Union, arguing that other mechanisms besides the formal set of accounting standards should effectively change the quality of accounting information in a given country.

Albeit such changes in enforcement that relate to the quality of accounting and auditing are certainly important to evaluate the state of IFRS adoption and application, this kind of information is not always observable. Christensen et al. (2013), for instance gathered the enforcement information through surveys sent to PricewaterhouseCoopers and to all national regulators in the countries of their sample, explicitly focusing on regulatory and policy changes in the period of 2001 to 2009. Notwithstanding, some information can be publicly accessed, as the Reports on the Observance of Standards and Codes (ROSC) published by the International Monetary Fund (IMF) and the World Bank, which assess different areas of countries financial architecture from fiscal and monetary policy transparency to financial markets infrastructures, including accounting and auditing. This latter is managed by the World Bank which covers both IFRS and the International Standards on Auditing[1]. The reports are published by country and address the development of the accountancy profession, including policy recommendations, and reporting practices, including compliance with IFRS (when adopted) and auditing standards.

[1] http://www.worldbank.org/en/programs/rosc#2

Although comprehensive, on the downside the ROSC are very slowly updated. The ROSC have information from the International Federation of Accountants (IFAC), which encompasses the International Auditing and Assurance Standards Board (IAASB), the International Accounting Education Standards Board (IAESB), the International Ethics Standards Board for Accountants (IESBA) and the International Public Sector Accounting Standards Board (IPSASB). The IFAC also publishes reports on the extent of countries adoption of the standards issued by these boards, report's[2] information are disclosed only aggregated.

Therefore, both comprehensive and up to date information on countries' levels of enforcement are not available. Nevertheless, the details of the adoption are declared by the countries themselves in the IFRS Foundation profiles, which are fairly regularly updated. In the website I collect information about the extent of IFRS adoption for different types of firms (public, non-public and foreign) and financial statements (consolidated and separate) as well as about the endorsement process of the adoption, including details on whether it is forced by law and if there were any accounting policies eliminations of changes in the standards. With this information I build an IFRS variable that varies from zero (no adoption is allowed for any type of firm) to one (full adoption fully endorsed for all firms), achieving different levels and nuances of IFRS adoption among countries.

Therefore, to investigate how IFRS affects capital allocation efficiency, I first describe the different types and levels of IFRS adoption across the World. Second, I turn to the economic model of investment to analyze how financial development minimizes financing constraints by reducing the cost of external capital. Finally, I assess whether financial reporting reforms, as measured by the different levels of IFRS adoption, have their own role on investment efficiency along with the other features of financial markets development. Considering the literature on IFRS, I hypothesize that, first, the adoption may merely reinforce the effect, being effective only under already developed financial markets, or, second, it may have an active role substituting weaker features in financial markets, being effective for less financially and economically developed countries. Further, a third hypothesis states IFRS adoption may be effective regardless of the given level of financial development.

To test these hypotheses, I estimate an investment Euler equation model in which financial development and IFRS enter as possible factors to relief firms' constraints in an intertemporal optimization problem, as modeled by Love (2003). The results show that IFRS adoption is capable of improving firms' financing possibilities decreasing their need to rely on internal funds to invest in their activity. The results show that, in general, firms can decrease their financing constraints by half with the international standards. The results are only seen when analyzing countries with different levels of economic development, although the marginal effect of IFRS is roughly the same for countries with

[2]https://www.ifac.org/publications-resources/international-standards-2017-global-status-report

different levels of economic and financial development. Firms in countries with low economic and financial development, and adopting IFRS, have similar levels of financing constraints as firms in low economic but high financial development (or with low financial but high economic development) countries who do not adopt IFRS. The results are consistent with the hypothesis that higher quality accounting information can improve the efficiency of firms' capital allocation decisions for countries with different levels of development.

These results are are important for two main reasons. First, since I use a non-binary measure of IFRS adoption the results are able to show that a country can benefit of IFRS even at relatively low level of adoption. For instance, firms with low economic and financial development with no IFRS can drop their investment to cash sensitivity from 0.367 to around 0.100 if the country allows all public domestic firms to use IFRS in their financial statements. Second, the results are critical from a policy perspective because they show that the positive effects of IFRS adoption documented in the literature are not limited to the financial economy, but it also seems to benefit real investment, which can boost economic development. Thus, the results provide evidence that the financial reporting system relates to economic development, which is to be useful for policymakers and international organizations who have been supporting IFRS adoption throughout the world, such as the World Bank and the IMF (IFRS Foundation, 2018).

2 Background

The discussion on whether and how finance affects economic growth is an old issue, according to King and Levine (1993), coming from Schumpeter (1911), who argued financial intermediaries are essential for technological innovation and economic development. However, the authors point that this issue is also controversial, as when one reads Lucas (1988, p. 6), who, when treating economic development, decided to abstract from monetary matters, affirming that the importance of finance have been "badly over-stressed". Despite such controversies, the relationship between several aspects of financial development and real economic activity have been extensively studied. The works of Shaw (1973) and McKinnon (1973) are usually referred as the first ones who boosted this literature, and analytical foundations of growth theory that explores how finance can influence growth can be seen in Pagano (1993). The author presents a endogenous growth model, showing financial intermediation can influence not only the levels of capital stocks, but also growth, through affecting the proportion of savings funneled to investment, the social marginal productivity and the savings rate.

Further researches have explored several aspects of this relationship, such as the issue of causality. Levine (1997) make an extensive review on the evidence regarding the association and influence of finance on economic development. The author shows the

concern about the direction of causality in this literature is old, citing the early work of Goldsmith (1969), and then lists several more recent papers with different econometric techniques, examining their claim on causality, such as Calderón and Liu (2003), King and Levine (1993), and Levine and Zervos (1998) and Levine et al. (2000).

Notwithstanding, the recent literature has been presenting evidences consistent with the hypothesis that finance does matter for growth. Levine (2005) concludes with his review that finance matters for growth and that this relationship is not being driven by reverse causality. For example, Levine et al. (2000) explore the issue of causality with methods trying to expand the temporal precedence evidence, dealing with bias induced by simultaneity and omitted variables, using Generalized Method of Moments (GMM) dynamic panel estimators and cross-sectional instrumental variables estimators. The authors found the exogenous component of financial development is positively and robustly related to economic growth. As an example of the implication of their results, the authors assess if Argentina had presented the average level of financial development of emerging countries in the period of 1960 to 1995, it would have experienced one percentage point faster real Gross Domestic Product (GDP) per capita growth per year.

In the literature on finance and growth the role of information is always emphasized (e.g., Levine, 2005; Levine et al., 2000). Considering that the information flow in financial markets is the central issue in the mainstream financial accounting research, it is surprising accounting appears so timidly in this literature. As an example of the few papers regarding financial development who consider the role of accounting is the work of Levine et al. (2000), who show countries where firms present relatively comprehensive and accurate financial statements have financial intermediation better developed than countries where firms are less transparent. The authors show that cross-country differences in accounting standards, along with creditors' rights and enforcement quality, help to explain cross-country differences in the level of development in financial intermediation, concluding that countries where accounting standards produce high quality and comparable financial statements tend to be more financially developed, and that reforms that strengthen creditors' rights, enforcement and accounting practices can accelerate economic growth.

Rajan and Zingales (1998), based on the theoretical argument that financial markets and institutions help firms to overcome problems of moral hazard and adverse selection, argue financial development should have a more prominent effect on firms who depend more on external finance, and then, show firms from industries that rely more on outside capital grow relatively faster in countries that are more financially developed. It is interesting to highlight the authors use two proxies for financial development, the first one is the traditional ratio of domestic credit plus market capitalization to GDP and the second one is simply the accounting standards of each country, reflecting, in their argument, the potential for obtaining finance.

While Levine et al. (2000) argue the accounting systems affect financial intermediation and then growth, and Rajan and Zingales (1998) argue accounting standards improve firms' ability to raise capital, both arguments are essentially the same, highlighting the role of high-quality information for economic activity. In their survey regarding financial systems and industry growth, Rajan and Zingales (2001, p. 480) argue that, from a policy perspective, a country aiming economic development should "fix its financial plumbing", that is, its legal codes and accounting systems.

Bushman and Smith (2001) develop theoretical links between accounting information and economic performance. According to the authors, the effects of financial information occurs through three channels: (i) helping managers identify and distinguish between good and bad investment opportunities, (ii) disciplining managers and (iii) reducing adverse selection and liquidity risk. There are some researches who specifically analyze the first channel, that is, how information collaborates with a more efficient capital allocation. Wurgler (2000), for instance, shows countries with more developed financial markets present more efficient capital allocation, that is, they invest more in growing industries and decrease investment more in their declining industries. Importantly, although financially developed countries do not necessarily present higher levels of investments they seem to allocate their investment more efficiently. According to Wurgler (2000), better capital allocation is associated with strong minority investors, lower state ownership and higher stock prices' informativeness. The author shows countries with stock markets where more firm-specific information is incorporated into stock prices, measured as stock price synchronicity, exhibit a better allocation of capital.

Habib (2008) explores the mechanism of stock price informativeness for capital allocation efficiency, specifically assessing the role of the financial reporting system. According to the author, financial reporting provides the primary source of information about firms' performance, thus, financial accounting information is expected to facilitate capital allocation decisions, as theorized by Bushman and Smith (2001). Using the same measures of capital allocation as Wurgler (2000) and using a measure that captures the intensity and timeliness of financial disclosure and their interpretation and dissemination by analysts and the media, and a measure that captures the intensity of governance disclosure, Habib (2008) finds corporate transparency is positively associated with more efficient allocation of capital.

Both works of Habib (2008) and Rajan and Zingales (1998) are concerned about how the quality of accounting systems varies across countries. Rajan and Zingales (1998) point that more developed countries tend to have better accounting standards, but exceptions call their attention. They highlight Malaysia presented accounting standards with high levels as Australia and Canada, and Belgium and Germany were at the same level as Korea, the Philippines and Mexico, and Portugal were listed among the worst accounting measures. However, a few years later, almost all of the countries studied by Rajan and

Zingales (1998) had their accounting practices converged to the same set of standards, the IFRS.

Comparative international accounting research has shown the origins of accounting systems in different countries are strictly related to environmental factors such as the legal and political systems, social climate and cultural aspects (Gray, 1988), which led to differences in accounting practices over countries. Nobes and Parker (2010) point the awareness of these differences has led to impressive attempts to reduce them, most prominently by the International Accounting Standards Board, through the issuance of the IFRS.

These attempts seems to have been working. According to the IFRS Foundation (Pacter, 2015), the IFRS is the financial reporting system used in several jurisdictions from Europe, the Americas, Africa, Middle-East and Asia-Oceania. For the first time in History, there is a substantial number of firms domiciled in different countries using the same accounting standards (Tarca, 2012). According to Nobes and Parker (2010), this movement towards global accounting harmonization is a result of several factors, including the emergence of global financial markets and political issues. Tarca (2012), in a review over the studies evaluating the global IFRS convergence, points the benefits of global accounting standards are compelling. She explains the use of one set of high quality financial standards has the potential to improve investments' transparency and comparability, allowing firms to achieve lower costs of capital and markets to allocate funds more efficiently. Hence, the arguments around IFRS adoption lie in the reasoning that IFRS provides higher quality financial information and, in line with the arguments of Bushman and Smith (2001), Habib (2008) and Wurgler (2000), improves market prices informativeness and, consequently, capital allocation.

3 Model of Investment

In this research I estimate a structural model of investment in the form of Euler equations. Traditionally, financing constraints are estimated using the Q-theory of investment (Hubbard, 1998). Nevertheless, Love (2003) explains that although both the Q-theory and Euler equation models come from the same firm value optimization problem, the Euler equation model requires less strong assumptions to be estimated. Namely, the Q-theory requires a proxy for the unobservable marginal q. According to the author, the commonly used proxy of the market-to-book ratio carries bias correlated to the level of financial development of a given country in the denominator. Similarly, the book value will also carry bias correlated to the level of accounting quality, invalidating its use for cross-country studies.

Rajan and Zingales (1998) study the relationship between finance and growth using industry-level data arguing they are improving on the previous literature (e.g., King &

Levine, 1993) who focused on country-level data. Rajan and Zingales (1998) say they are able to correct for country and industry characteristics rendering their model less vulnerable to omitted variable bias and mispecification. Wurgler (2000), studying the role of financial development on the efficiency of capital allocation also rely on industry data. The author argues he does not estimate a structural investment model due to lack of data, so he assumes that optimal investment implies increasing investment in growing industries and decreasing investment in declining ones.

Wurgler (2000) estimates the efficiency of capital allocation as the elasticity coefficient between investment and value-added. According to author, the coefficient can be interpreted as an adjustment cost from the Q-theory of investment in Hubbard (1998) and its correlation with financial development is what indicates capital markets frictions. The author says value added growth is what proxies for growth opportunities; however, Love (2003) argues this proxy is questionable. She says value-added growth is likely to capture not industries' productivity growth but growth in size. Further, Love (2003) adds a concern on reverse causality in Wurgler (2000)'s approach, since the author assumes in his model that investment growth promote value-added growth, but the reverse case will indicate firms are growing in size but not necessarily in productivity.

With this considerations, I follow the approach of Love (2003) and estimate a structural investment model with financing constraints in the form of Euler equationsusing firm-level data. Love (2003) explains that through the Euler equations is possible to control for future growth opportunities (including the marginal productivity of investment) and to identify the information set available at each decision-making point, allowing the specification of valid instruments and an appropriate estimation technique. Finally, the estimated parameters can be interpreted as structural parameters.

Using firm-level data rather than industry or country aggregates allows for firm heterogeneity in the productivity of capital. Even inside a same industry, some firms might be more productive than others. Therefore, allocating capital to industries is not as efficient as allocating capital to the most productive firms. Furthermore, one feels more comfortable treating financial development and IFRS adoption as exogenous to firms instead of to industries or countries. In the next steps I present the theoretical model and its empirical form, as developed by Love (2003), which follows closely the specification from Gilchrist and Himmelberg (1998).

In the model, shareholders, or managers, are maximizing the present value of the firm which equals to the expected discounted value of dividends subject to capital

accumulation and external financing constraints:

$$V_t\left(K_t, \xi_t\right) = \max_{\{I_{t+s}\}_{s=0}^{\infty}} D_t + \mathrm{E}_t\left[\sum_{s=1}^{\infty} \beta_{t+s-1} D_{t+s}\right], \tag{1}$$

$$\text{subject to} \quad D_t = \Pi\left(K_t, \xi_t\right) - C\left(I_t, K_t\right) - I_t \tag{2}$$

$$K_{t+1} = \left(1-\delta\right) K_t + I_t \tag{3}$$

$$D_t \geq 0, \tag{4}$$

where D_t are dividends paid to shareholders, given by the constraint (2) which defines that sources equal uses; β_{t+s-1} is a discount factor from $t+s$ to t. In the capital accumulation constraint (3), K_t is the beginning of period capital stock, I_t is the investment expenditure and δ is the depreciation rate. The profit function $\Pi\left(K_t, \xi_t\right)$ includes a productivity shock ξ_t. The investment adjustment cost is given by $C\left(I_t, K_t\right)$, which assumes to result in a loss of part of the investment. The financing constraints are introduced via the non-negativity of dividends constraints (4), whose multiplier is denoted by λ_t. This multiplier is what denotes the cost associated with raising new equity. This implies equity financing is costly and this extra cost is due to information or contracting costs (see, e.g. Jensen & Meckling, 1976; Myers & Majluf, 1984). In the model, this constraints are considered exogenous to the firm and represent the shadow cost of finance.

The first order conditions of the previous optimization problem result in the following Euler equation:

$$1 + \left(\frac{\partial C}{\partial I}\right)_t = \beta_t \mathrm{E}_t\left[\Theta_t\left\{\left(\frac{\partial \Pi}{\partial K}\right)_{t+1} + \left(1-\delta\right)\left(1 + \left(\frac{\partial C}{\partial I}\right)_{t+1}\right)\right\}\right], \tag{5}$$

where $\partial C/\partial I$ is the marginal adjustment cost of investment, $\partial \Pi/\partial K$ is the Marginal Profit of Capital (MPK) and

$$\Theta_t = \frac{1+\lambda_{t+1}}{1+\lambda_t}. \tag{6}$$

is the cost of external finance between t and $t+1$.

As Love (2003) explains, the intuition behind the Euler Equation (5) is that the marginal cost of investing today, given by the adjustment cost and the price of investment goods (normalized to one), is equal to the discounted marginal cost of postponing the investment until tomorrow, given by the foregone MPK plus the future adjustment cost and price of investment.

If a firm is financially constrained, i.e., it cannot raise capital, the cost of external capital today rises relative to tomorrow. Thus, $\lambda_t > \lambda_{t+1}$, so that Θ_t falls and the firm postpone its investments. In perfect capital markets $\lambda_t = \lambda_{t+1}$ and $\Theta = 1$ for all t and

the firm is never constrained. In imperfect capital markets, Θ_t depends on state-variables that can be identified by observable firms' characteristics, via an *ad hoc* parametrization (Myers & Majluf, 1984; Whited, 1992) where it depends on the amount of cash firms have available to invest:

$$\Theta_t = a_{0i} + aCash_{i,t-1}. \tag{7}$$

Studying the effect of financial development, Love (2003) expands the parametrization to include the effect of financial development on how important the cash stock is for investment:

$$\Theta_{it} = a_{0i} + (a_1 + a_2 FD_c)\, Cash_{i,t-1}, \tag{8}$$

so that if $a_2 < 0$, then financial development reduces the sensitivity of investment to internal funds.

To evaluate the role of IFRS minimizing financing constraints I add an IFRS variable in the parametrization allowing the effects of both cash and financial development to vary according to IFRS adoption:

$$\begin{aligned}\Theta_{it} = {} & a_{0i} + a_1 FD_{c,t-1} + a_2 IFRS_{c,t-1} + a_3 FD \times IFRS_{c,t-1} + a_4 Cash_{i,t-1} + \\ & + a_5 Cash \times FD_{ci,t-1} + a_6 Cash \times IFRS_{ci,t-1} + a_7 Cash \times FD \times IFRS_{ci,t-1},\end{aligned} \tag{9}$$

where *Cash* varies over firms and over time and *FD* and *IFRS* vary over countries and over time. Love (2003) uses a time-constant measure for financial development measured at the beginning of her sample period. It is also important to note that the stock of cash and the level of financial development and IFRS adoption are lagged in one period. This is so because I assume firms make their investment decision at the beginning of each period (or in the end of the previous period) so the information set influencing that decision should be at this period.

Since a_{0i} is constant over time and firm-specific and *FD* and *IFRS* (and their interaction) are country-time specific they are excluded from the estimation model because I remove firm and country-time fixed effects. Thence, the cost of external capital is written as:

$$\begin{aligned}\Theta_{it} = {} & a_1 Cash_{i,t-1} + a_2 Cash \times FD_{ci,t-1} + a_3 Cash \times IFRS_{ci,t-1} + \\ & + a_4 Cash \times FD \times IFRS_{ci,t-1},\end{aligned} \tag{10}$$

The MPK function comes from a Cobb-Douglas production function in the form $F(K, L) = AK^{\alpha_K} L^{\alpha_L} X^{\alpha_X}$, in which L is labor, A is a technology parameter and X are quasi-fixed factors such as intangible assets, research and development capital or

managerial output. From its first order condition, one can arrive in a sales-based definition for MPK:

$$\frac{\partial \Pi}{\partial K} = MPK_{it} = \theta \frac{S}{K} \approx \theta_i + \bar{\theta} \frac{S}{K_{it}}, \tag{11}$$

where $\theta = \alpha_K / \mu$, in which α_K is the capital share in the production function and μ is the markup. In the estimation model, α_K is considered industry-specific and μ is considered either industry or firm-specific and they are captured by fixed effects in the estimation model.

The adjustment cost function is given by $C(I_t, K_t) = \frac{\alpha}{2} \left(\frac{I}{K_t} - g \frac{I}{K_{t-1}} - v_i \right)^2 K_t$, in which the g parameter captures investment persistence, since it may be easier for firms to continue investment at some fraction g so that the marginal adjustment cost is of investment is

$$\frac{\partial C}{\partial I_{it}} = \alpha \left(\frac{I}{K_{it}} - g \frac{I}{K_{it-1}} - \nu_i \right), \tag{12}$$

where $\alpha \nu_i$ is captured by firm fixed effects. Finally, the adjustment cost function may also include technology shocks that are captured by time fixed effects.

Furthermore, I rely on rational expectations to replace the expectation by realized values plus an error term e_{it}. This error term is orthogonal to any information available at the time when the investment decision is made. Therefore, I am assuming that e_{it} is not correlated with the variables at $t-1$, so that the orthogonality condition (sequential exogeneity) for this model is that $\mathrm{E}\left[e_t | \mathbf{X}_{t-s}\right] = 0$ for $s \geq 1$.

Finally, the model is linearized using a first-order Taylor approximation around the means. This allows to separate the discount factor β_t in a linear term to allow it to be captured by country-time fixed effects, as well as the several firm-specific terms to be captured by firm fixed effects. Then, the right side term in Equation (5) is written as:

$$\beta_t \Theta_{it} \{\cdot\}_{it} = \bar{\beta} \gamma \Theta + \bar{\beta} \{\cdot\}_{it} + \gamma \beta_t, \tag{13}$$

where $\bar{\beta}$ is the mean of β_t, γ is the mean of $\{\cdot\}_{it}$ and the mean of Θ_{it} is considered to be one, since its value should be around one.

Substituting Equations (11), (12) and (13) into (5), replacing the expectation with an error term, and grouping the firm and country-time specific parameters into fixed effects I arrive at the following estimation model:

$$\begin{aligned} \frac{I}{K_{it}} = {} & \beta_1 \frac{I}{K_{i,t+1}} + \beta_2 \frac{I}{K_{i,t-1}} + \beta_3 \frac{S}{K_{i,t+1}} + \beta_4 Cash_{i,t-1} + \beta_5 Cash \times FD_{ci,t-1} + \\ & + \beta_6 Cash \times IFRS_{ci,t-1} + \beta_7 Cash \times FD \times IFRS_{ci,t-1} + f_i + d_{ct} + e_{it}, \end{aligned} \tag{14}$$

where the estimation parameters relate to the structural parameters in the following ways:

$$\beta_1 = \frac{\bar{\beta}(1-\delta)}{1+\bar{\beta}(1-\delta)g}; \qquad \beta_2 = \frac{g}{1+\bar{\beta}(1-\delta)g}; \qquad \beta_3 = \frac{\bar{\beta}\bar{\theta}}{\alpha(1+\bar{\beta}(1-\delta)g)};$$
$$\beta_4 = \frac{\bar{\beta}\gamma a_1}{\alpha(1+\bar{\beta}(1-\delta)g)}; \qquad \beta_5 = \frac{\bar{\beta}\gamma a_2}{\alpha(1+\bar{\beta}(1-\delta)g)}; \qquad \beta_6 = \frac{\bar{\beta}\gamma a_3}{\alpha(1+\bar{\beta}(1-\delta)g)};$$
$$\beta_7 = \frac{\bar{\beta}\gamma a_4}{\alpha(1+\bar{\beta}(1-\delta)g)}. \tag{15}$$

The estimation of Equation (14) is as follows. To exclude the firms fixed effects f_i I take the first differences of the variables. The country-time fixed effects d_{ct} are excluded from the model subtracting the mean for each country at each time period. Both regressors and instruments are country-year differenced prior to estimation. To tackle the sequential exogeneity assumption I estimate the model via GMM including as instruments all lags of the regressors plus all the lags of the cost of goods sold (Cogs), cash flow and their interaction with cash, sales and investment, as well as interactions of financial development and IFRS with GDP per capita (to instrumentalize financial development and IFRS adoption by economic development) investment, sales and cash, and interactions of IFRS with trade (to instrumentalize IFRS adoption by countries' economic openness), investment, sales and cash.

4 Data and Sample

4.1 IFRS Adoption

In this section, I describe how I collect and measure the IFRS adoption data. By August 2018, the IFRS Foundation (IFRS Foundation, 2018) kept profiles of 161 plus five other jurisdictions: Anguilla (British overseas territory in the Caribbean), Chinese Taipei (Taiwan), Montserrat (British overseas territory in the Caribbean), Palestine and the European Union. These profiles detail the extent to which countries adopt IFRS, that is, which firms are required / permitted to adopt which standards, as well as the processes of each country to endorse and converge them to the domestic setting.

The profiles present a set of answers provided by each jurisdiction's relevant authority (usually the stock exchange regulator, or a board for the accounting profession or the Ministry of Finance) on its state of IFRS adoption. In the questionnaire countries answer several questions, including whether the IFRS are required or permitted for which kinds of firms, as well as whether and how the IFRS are incorporated into laws and regulations, if there is a formal endorsement process for new or amended standards issued by the International Accounting Standards Board (IASB), and if the jurisdiction eliminated accounting policy options permitted by IFRS and/or made modifications to

any standards (explaining which ones).

To measure the adoption of IFRS, I aggregate these information into two categories: (i) type and extent of adoption, and (ii) endorsement. Each category has a number of classifications. Each category receives a weight and each classification receives a grade following to a level of importance *ad hoc* attributed to it according to the objective of this research. These two categories have subcategories which, then, have their own classification. At each level, categories sum to one and the classifications of each category are graded from zero (no adoption) to one (full adoption).

It is important to highlight that these weights and grades carry a great level of arbitrariness. I defined them aiming to obtain a grade for the level of each country that reflects both higher dissemination of IFRS and higher efforts of the country to converge to the international standards. For instance, the objective of this research is to examine how greater quality of accounting information helps investments decisions. This is, of course, more important for firms who rely of external finance, so the application of IFRS in the consolidated financial statements of public domestic firms is of higher importance. However, the application in separated/individual financial statements of public firms as well as for non-public firms imply in greater efforts of business people to understand and incorporate IFRS. Other studies, with different objectives, might arrive at different schemes. The categories and classifications are defined and weighted as follows.

I define that the type and extent of adoption is the most important category, so I attribute a weight of 0.70 to it, and 0.30 to the endorsement category. There are four adoption types, or classifications, with the following grades: (i) not adopted (0.00), (ii) formal commitment (0.10), (iii) early/voluntary/partial adoption (0.20), and (iv) mandatory/full adoption (1.00). The last one is then divided into other four categories with the following weights: (i) public domestic consolidated financial statements (0.50), (ii) public domestic separate/individual financial statements (0.30), (iii) public foreign firms (0.10) and (iv) non public domestic firms (0.10). Each of these four categories receives a different weight if the adoption of IFRS for them is (i) not permitted to all firms (0.00), (ii) permitted to some firms (0.15), (iii) permitted to all but some firms (0.30), (iv) required to some firms (0.30), (v) permitted to all firms, (vi) required to all but some firms, or (vii) required to all firms.

For the endorsement category, I define four subcategories with different classifications. The first subcategory is which IFRS, with a weight of 0.40, that has four different classifications with the following grades: (i) designated IFRS (0.20), (ii) as issued by the IASB once (0.50), (iii) as issued by the IASB (0.70), and (iv) as issued by the IASB and locally endorsed (1,00). The second subcategory is whether IFRS has force of law, with a weight of 0.30, that has three different classifications with the following grades: (i) no / not yet (0.00), (ii) initially / partially / indirectly (0.50), and (iii) yes (1.00). The third subcategory is whether there were accounting policy eliminations or changes to the

original standards, which has a weight of 0.20 and three classifications with the following grades: (i) yes (0.50), (ii) for some firms (0.80), and (iii) no (1.00). The last subcategory of the endorsement process asks whether the standards are translated, with a weight of 0.10 and two different classifications: (i) no (0.00), and (ii) not applicable / yes (1.00).

To yield the IFRS adoption level of each country I multiply the classifications' grades by the weight of their category and the categories at each level. For instance, suppose a country that requires IFRS for all the public domestic consolidated and separate or individual financial statements, permits for all the public foreign firms but do not permit it for the non-public domestic firms. Therefore, its type and extent category is calculated as: $1.00 \times 0.50 + 1.00 \times 0.30 + 0.50 \times 0.10 + 0.50 \times 0.10 + 0.00 \times 0.10 = 0.85$. Suppose this country uses the IFRS as issued by the IASB and locally endorsed by law, has eliminated accounting policies and translates the standards to the local language. Therefore, its endorsement category is calculated as: $0.40 \times 1.00 + 0.30 \times 1.00 + 0.20 \times 0.50 + 0.10 \times 1.00 = 0.90$. Thus, its level of IFRS adoption is $0.85 \times 0.70 + 0.90 \times 0.30 = 0.865$. Most countries have different levels over different periods. As an example, Colombia assumed the formal commitment do adopt IFRS in 2009, had an early adoption from 2013 and the mandatory / full adoption is from 2015.

Figure 1 shows the state of IFRS adoption for all the countries with available profiles in 2018. It shows the different nuances of IFRS adoption across the World, both for the IFRS variable, as well as disaggregated between the type and level of adoption and the endorsement process. Such nuances have been ignored by previous researches. For instance, the United States and Japan are usually presented as important cases of non-adoption. However, in this method, although they have not mandatorily adopted IFRS for domestic listed firms, the IFRS have some place for them. Specifically, from the total of 165 completed profiles, only 21 of them have not yet mandatorily adopted IFRS, but most of them have some level of adoption. Seven countries (Barbados, Bermuda, Cayman Islands, Guatemala, Paraguay, Suriname and Switzerland) permit the adoption for all public domestic firms. Bolivia, Japan and Yemen permit the adoption for certain types of firms, Japan explains that their eligible criteria cover virtually all listed firms. Macao, Madagascar, Timor-Leste and Uzbekistan do not have an active stock exchange, but they either permit or require IFRS for some types of firms. China, Egypt, India, Indonesia, Thailand, United States and Vietnam do not permit IFRS in the consolidated financial statements of their listed domestic firms. However, the United States, together with Thailand and Egypt, permit the international standards for foreign listed firms, while China and India, along with Thailand, argue their national standards are significantly converged to IFRS.

Nevertheless, is still important to highlight the differences between this non-null but low level of adoption from higher levels, and this is accomplished by the weights and grades criteria I chose, attributing higher valuations for mandatory adoption for

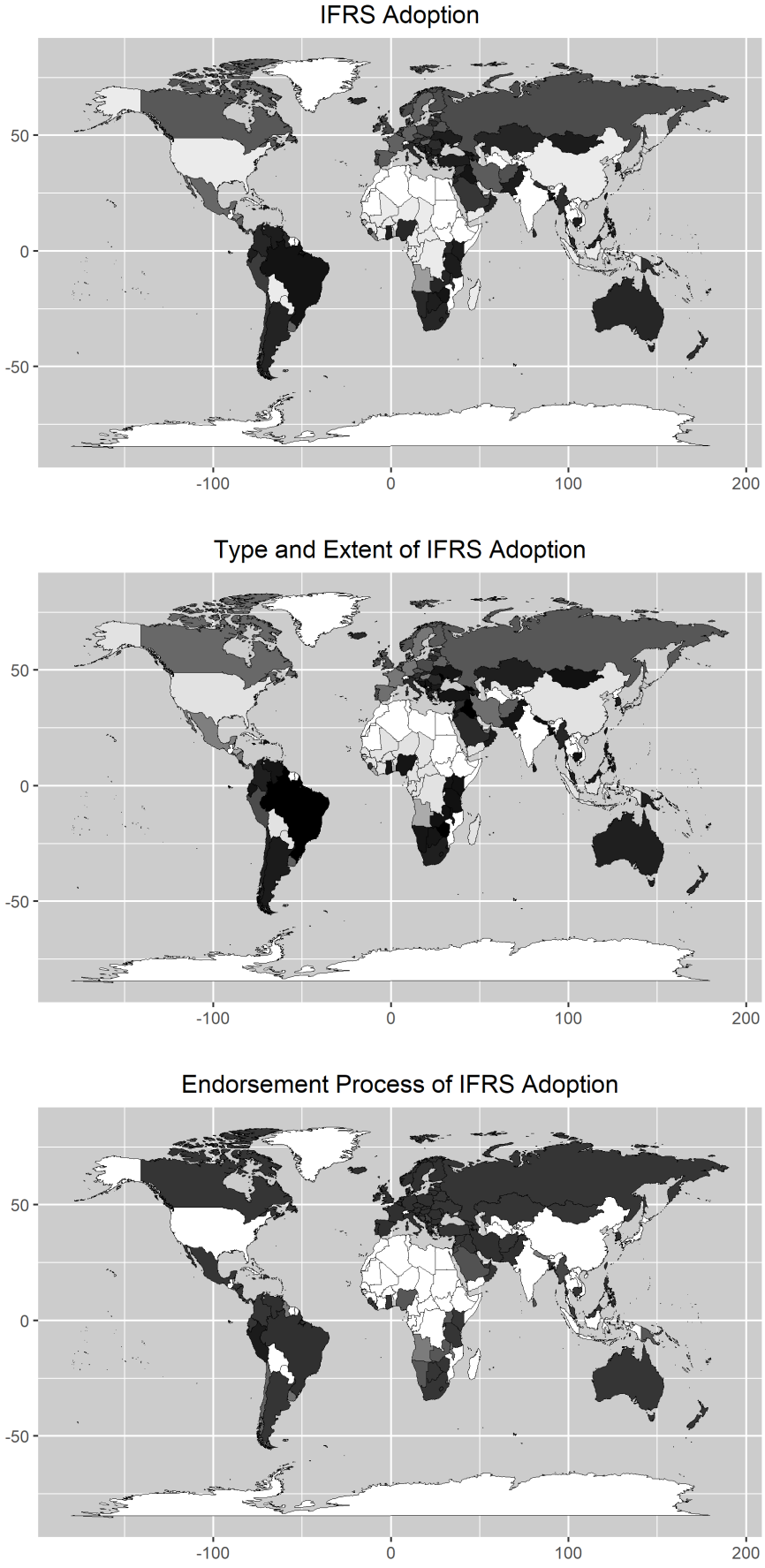

Figure 1: Levels of IFRS Adoption. The plot shows the state for the year of 2018. Higher levels are represented in darker tones.

public domestic firms consolidated financial statements and for formal local endorsement processes.

4.2 Financial Development

Beck et al. (2010) built a series of financial development variables which are available at the Global Financial Development (GFD) database of the World Bank[3]. Beck et al. (2010) developed several measures for four different aspects of both financial markets and financial institutions: depth, access, efficiency and stability .

The depth, or size, of financial institutions is measured as the amount of private credit by deposit money banks as a percentage to GDP, and the depth, or size, of the financial markets is measured as the sum of outstanding domestic private debt securities and stock market capitalization as a percentage to GDP. Access is measured as the number of depositors with commercial banks per 1,000 adults for financial institutions and the market capitalization excluding top 10 companies as a percentage to total market capitalization. The efficiency of financial institutions is measured as the accounting value of bank's net interest revenue as a share of its average interest-bearing assets (higher values indicates higher profitability for banks and, therefore, lower efficiency), and the efficiency of financial markets is measured as the stock market turnover ratio. Finally, the stability is measured as banks' z-score for the financial institutions and as the volatility of stock prices for the financial markets (higher volatility indicates lower stability).

To measure financial development in this research, I built a compound index capturing the depth, stability and efficiency of both credit (financial institutions) and capital markets (financial markets). I exclude the measures of access due to its limited availability. I use the inverse of banks' profitability and stock prices volatility. I standardize the variables, because they are in different scales, and calculate their mean for each country at each year to gauge the financial development index (FD) I use in the regressions. I also considered using Principal Components Analysis (PCA) to extract a common financial development factor. However, PCA do not allow for missing data so I would lose groups of country-year observations if one indicator is missing for a certain country in a certain period. There are several alternative PCA with different methods to infer the missing variables. Nevertheless, I preferred to adhere with the simplest aggregation method which is taking means.

4.3 Sample and Statistics

Firm-level data comes from the Worldscope database. The sample selection proceeded as follows. I searched for all firms in all countries for a 15 years period, from 2002 to 2016. I excluded firms from the financial and services industries (one-digit SIC codes of 6, 7,

[3]http://databank.worldbank.org/data/source/global-financial-development

and above). I excluded missing observations, as well as observations with investment to capital ratio greater than two, sales and cogs to capital ratios greater than 20 and cash to total assets ratio greater than 0.6, following Love (2003). Furthermore, since the United States has much more firms than any other country, I selected a random one third of United States (US) firms. I also excluded firms with less than 10 years of coverage and countries with less than 25 firms as well as country-years with less than 10 firms. I do so because since the model evaluates intertemporal firms decision, I need the sample to be minimally consistent over time.

Table 1 summarizes the descriptions of the variables and instruments used in the model, as developed in section 3, including their definitions and sources. It is important to note that IFRS adoption is likely to change the definition of cash, as well as of the other accounting variables in the model, used in the financial statements of firms from a certain country. This would induce bias in my estimations. However, Worldscope analysts harmonize accounting figures presentation and disclosure using standard data definitions in the coding of financial accounts, so that the concern that IFRS adoption would lead to systematic differences in the measured value of cash stocks and other variables is minimized.

Table 1: Variables' Description

Variable	Name	Description	Source
I/K	Investment to Capital Ratio	Investment is defined as capital expenditures (Capex), and capital is defined as property, plant and equipment minus Capex.	Worldscope.
S/K	Sales to Capital Ratio	Sales is net sales, and capital is defined as property, plant and equipment minus Capex.	Worldscope.
Cash	Cash stock	Cash plus short term investments scaled by total assets.	Worldscope.
Cogs	Cogs	Cost of goods sold scaled by capital.	Worldscope.
CashFlow	Cash flow	Variation in cash stock scaled by capital.	Worldscope.
FD	Financial Development	Mean of financial institutions' depth (private credit by deposit money banks as a percentage of GDP), efficiency (inverse of bank net interest margin) and stability (bank z-score) and financial markets' depth (outstanding domestic private debt securities plus stock market capitalization as a percentage of GDP), efficiency (stock market turnover ratio) and stability (inverse of stock price volatility).	Calculated from data from the GFD, World Bank.
IFRS	IFRS adoption	Composite index including details on the type and extent of adoption and endorsement. Yearly.	Data compiled from the IFRS Foundation (2018).
GDP	GDP	Log of GDP.	WDI, World Bank.
Trade	Trade	Imports plus Exports as a percentage of GDP.	WDI, World Bank.

Table 2 shows the distribution of the sample (number of observations and number of firms) by country. The total sample has 52,118 observations for 4,324 firms of 32 countries. 26% of total observations (firms) are from the United States, followed by the United Kingdom with 10%. The country with lower representation in the sample is Saudi Arabia with less than 0.60% (0.65%) of total observations (firms). Ten countries have less than 1% of observations (firms) and the ten largest countries in the sample account for almost 75% of total observations (firms).

Table 2: Sample Distribution by Country

Country	Number of Obs.	Percentual (%)	Number of Firms	Percentual (%)
Australia	2,498	4.79	212	4.90
Austria	620	1.19	46	1.06
Belgium	595	1.14	45	1.04
Brazil	795	1.53	65	1.50
Canada	2,316	4.44	195	4.51
China	1,029	1.97	86	1.99
Denmark	365	0.70	30	0.69
Finland	946	1.82	75	1.73
France	3,039	5.83	232	5.37
Germany	3,305	6.34	258	5.97
Greece	533	1.02	45	1.04
Hong Kong	1,066	2.05	93	2.15
Ireland	477	0.92	35	0.81
Israel	341	0.65	31	0.72
Italy	1,331	2.55	107	2.47
Japan	627	1.20	44	1.02
Malaysia	2,996	5.75	268	6.20
Mexico	408	0.78	38	0.88
Netherlands	989	1.90	84	1.94
New Zealand	315	0.60	27	0.62
Peru	320	0.61	26	0.60
Poland	736	1.41	62	1.43
Portugal	440	0.84	35	0.81
Saudi Arabia	305	0.59	28	0.65
Singapore	2,684	5.15	230	5.32
South Africa	351	0.67	27	0.62
Spain	642	1.23	60	1.39
Sweden	515	0.99	43	0.99
Switzerland	1,773	3.40	135	3.12
Turkey	740	1.42	65	1.50
United Kingdom	5,381	10.32	448	10.36
United States	13,640	26.17	1,149	26.57
Total	52,118	100	4,324	100

Figure 2 shows the levels of IFRS adoption for the sample countries over the years as well as the variation of Financial Development. Most countries in the sample have mandatorily adopted IFRS in 2005 mostly following the European Union (EU) directives. The exceptions are Brazil who adopted in 2010, Canada in 2011, Israel in 2009, and Malaysia, Mexico, New Zealand and Peru in 2012. The country with the highest level of

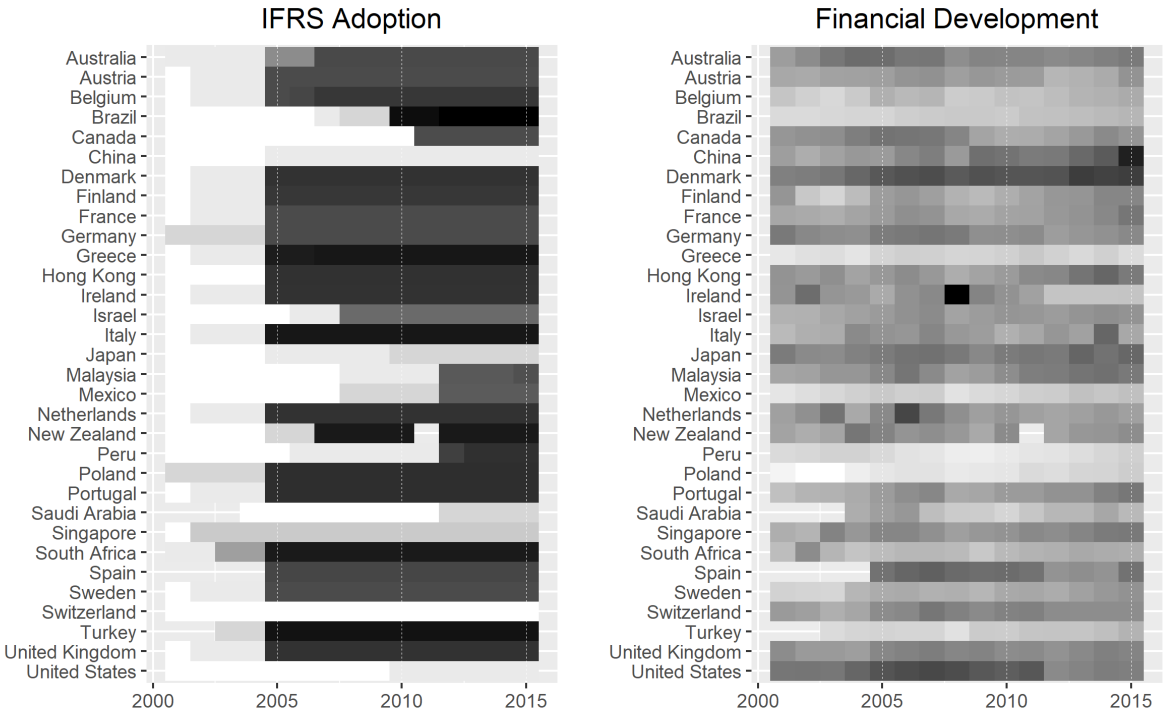

Figure 2: IFRS and Financial Development of the Sample Countries

adoption is Brazil from 2012 on, when all firms, both domestic and foreign are required to use IFRS for both separate and consolidated financial statements. Considering the mean over the sample, Turkey, Greece and South Africa have the higher mean level of IFRS adoption. The only country with no level of adoption is Switzerland. The second country with the lowest level of adoption is the United States, followed by Saudi Arabia, China, Japan, and Singapore, which are the countries with no mandatory adoption. The country with the highest level of financial development is Denmark, followed by the United States, Spain, Japan, and China. Poland, Peru, Greece, Mexico, Turkey, and Brazil have the lower levels of financial development.

Table 3 shows the mean values for variables used as regressors and instruments. Australia, South Africa, Singapore, Saudi Arabia, and Brazil are the countries with higher levels of investment and Malaysia, Switzerland, Portugal, Peru, and Mexico are the countries with the lowest levels. China, Israel, Sweden, and Singapore have the highest levels of Cash (around 20% of total assets), and New Zealand and Portugal have the lowest levels (6%). Cash Flows scaled by capital are on average close to zero and are negative for New Zealand, China, and Denmark. Switzerland, Denmark, Ireland, and Sweden have the highest GDP per capita and China, Peru, and South Africa are on the opposite side. Finally, Singapore, Hong Kong and Malaysia have the highest levels of trade and Brazil, United States, and Japan the lowest.

Table 4 shows the correlation between the variables. Investment is positive and

Table 3: Mean Variables by Country

Country	I/K	S/K	Cash	Cogs	Cash Flow	FD	IFRS	GDP	Trade
Australia	0.15	2.48	0.11	1.79	0.03	0.73	0.46	10.59	0.42
Austria	0.10	1.65	0.08	1.17	0.02	0.39	0.50	10.63	0.97
Belgium	0.10	2.36	0.10	1.71	0.02	0.08	0.59	10.60	1.50
Brazil	0.13	1.56	0.18	1.01	0.03	−0.02	0.42	8.89	0.26
Canada	0.12	2.11	0.11	1.50	0.02	0.57	0.20	10.60	0.66
China	0.12	1.28	0.21	0.88	−0.01	0.73	0.05	8.05	0.52
Denmark	0.10	2.61	0.16	1.80	−0.01	1.16	0.59	10.86	0.95
Finland	0.10	3.18	0.09	2.27	0.02	0.31	0.55	10.63	0.76
France	0.12	3.13	0.10	2.41	0.03	0.43	0.49	10.50	0.56
Germany	0.10	2.85	0.09	1.93	0.02	0.65	0.52	10.54	0.75
Greece	0.11	1.83	0.08	1.31	0.03	−0.13	0.75	10.07	0.56
Hong Kong	0.10	1.63	0.17	1.15	0.09	0.54	0.52	10.31	3.52
Ireland	0.11	3.41	0.11	2.20	0.03	0.53	0.58	10.80	1.73
Israel	0.09	2.25	0.21	1.51	0.03	0.45	0.31	10.19	0.72
Italy	0.09	2.02	0.09	1.02	0.03	0.45	0.70	10.40	0.52
Japan	0.09	1.59	0.13	1.00	0.01	0.80	0.08	10.55	0.29
Malaysia	0.07	1.53	0.19	1.18	0.01	0.59	0.12	8.82	1.81
Mexico	0.08	1.91	0.13	1.30	0.02	−0.12	0.12	9.04	0.57
Netherlands	0.10	3.31	0.08	2.38	0.02	0.58	0.54	10.67	1.31
New Zealand	0.10	2.13	0.06	1.50	−0.00	0.50	0.57	10.31	0.58
Peru	0.08	1.37	0.14	0.99	0.01	−0.23	0.20	8.23	0.48
Poland	0.12	2.32	0.15	1.70	0.01	−0.26	0.70	9.29	0.81
Portugal	0.08	1.60	0.06	1.38	0.03	0.43	0.61	9.89	0.69
Saudi Arabia	0.13	1.59	0.17	1.16	0.01	0.14	0.05	9.87	0.85
Singapore	0.12	2.57	0.20	1.91	0.06	0.54	0.17	10.49	3.87
South Africa	0.15	2.07	0.13	1.44	0.01	0.18	0.70	8.58	0.59
Spain	0.09	2.03	0.08	1.48	0.01	0.84	0.68	10.31	0.57
Sweden	0.10	3.25	0.21	2.28	0.02	0.22	0.50	10.76	0.85
Switzerland	0.08	2.46	0.17	1.53	0.02	0.58	0.00	11.06	1.08
Turkey	0.10	1.95	0.14	1.51	0.03	−0.06	0.83	9.16	0.49
United Kingdom	0.11	2.93	0.08	1.85	0.03	0.61	0.55	10.59	0.55
United States	0.11	3.06	0.13	1.91	0.03	1.01	0.02	10.73	0.27

Variables' descriptions are in Table 1.

Table 4: Correlation Matrix

	I/K	S/K	*Cash*	*Cogs*	*CshFlow*	*FD*	*IFRS*	*GDP*	*Trade*
I/K	1	0.25	0.12	0.20	0.02	0.02	0.003	0.02	−0.01
S/K		1	0.08	0.93	0.05	0.10	−0.005	0.16	−0.06
Cash			1	0.03	−0.05	−0.01	−0.12	−0.14	0.17
Cogs				1	0.03	0.06	0.01	0.12	−0.02
CshFlow					1	0.004	−0.005	0.01	0.01
FD						1	−0.33	0.42	−0.20
IFRS							1	0.10	0.04
GDP								1	−0.12
Trade									1

Variables' descriptions are in Table 1.

highly correlated with sales, cash and cost of goods sold but it is poorly correlated with cash flow, financial development and IFRS. IFRS correlates negatively with cash and with financial development. GDP is highly correlated with financial development and also with IFRS, but negatively correlated with cash.

5 Estimation Results

Table 5 shows the GMM estimation results for three versions of Equation (14). The first column shows the estimation of the financing constraints, where investment depends on the firms' cash stocks. The results show the coefficient of cash is positive and statistically significant, implying firms do not have full access to financial markets to finance their economic activities so they need to rely on internally generated funds to invest. In other words, firms are financially constrained.

In the second column I estimate the effect of financial development. The coefficients imply that the partial effect of the cash stock on investment in a country with a low level of financial development of 0.135 (first quartile of the sample), such as Saudi Arabia and South Africa, is 0.134, and for a country with a high level of financial development of 0.656 (third quartile of the sample), such as the United Kingdom, Germany or Australia, is 0.058. That is, firms in a country five times more financially developed are 40% less constrained. Further, for countries with the highest levels of financial development, such as Denmark and the United States (Financial Development (FD) index is around one), firms are not financially constrained, since the partial effect of cash is around zero.

Finally, the third column of Table 5 presents the results for the full model including the interactions with IFRS. The results indicates that, once controlling the effect of cash for financial development and IFRS adoption no significant financing constraints remains.

Table 2 highlights how much the sample is unbalanced by country. Since my variables of interest are country-level the results might be biased towards the effect in these largest countries. To tackle this concern I re-estimate the models for a more balanced

Table 5: Estimation Results: All Firms

	Dependent variable:		
	Investment (I/K)		
	(1)	(2)	(3)
I/K_{t-1}	0.136^{***}	-0.049^{*}	-0.071^{***}
	(0.022)	(0.030)	(0.024)
I/K_{t+1}	0.779^{***}	1.731^{***}	1.712^{***}
	(0.116)	(0.143)	(0.101)
S/K_{t+1}	0.032^{***}	0.020^{**}	0.026^{***}
	(0.005)	(0.008)	(0.007)
$Cash_{t-1}$	0.067^{***}	0.154^{**}	0.160
	(0.022)	(0.065)	(0.101)
$Cash \times FD_{t-1}$		-0.147^{**}	-0.144
		(0.075)	(0.107)
$Cash \times IFRS_{t-1}$			-0.111
			(0.166)
$Cash \times FD \times IFRS_{t-1}$			0.087
			(0.209)
Observations	52,118	52,118	52,118
Wald Statistics	766.365^{***}	363.634^{***}	641.603^{***}
Sargan Chi-Squared Stat	149.533	225.485	361.988
Sargan Chi-Squared P-value	0.999	0.998	0.999
AR(1) test p-value	0.000	0.000	0.000
AR(2) test p-value	0.000	0.057	0.183

Note: *p<0.1; **p<0.05; ***p<0.01

Variables' descriptions are in Table 1. The model is estimated via GMM excluding country-time and firm fixed effects including as instruments all lags of the regressors plus all the lags of Cogs, cash flow and their interaction with cash, sales and investment, as well as interactions of financial development and IFRS with GDP per capita, investment, sales and cash, and interactions of IFRS with trade, investment, sales and cash.

sample, in which I randomly select 100 firms for each country with more than 100 firms in the sample. Table 6 presents the results for this analysis. The results for the first two specifications are similar to the ones considering the whole sample, but the last column shows significant estimates for cash and financial development. Considering this more balanced sample, the partial effect of cash on investment for a country with a low level of financial development (first quartile) is 0.173, and for a country with a high level of financial development (third quartile) the partial effect is only 0.022. Still, IFRS do not appear to significantly affect financing constraints.

Table 6: Estimation Results: Country-balanced firms

	Dependent variable:		
	Investment (I/K)		
	(1)	(2)	(3)
I/K_{t-1}	0.188***	−0.002	−0.031
	(0.033)	(0.033)	(0.029)
I/K_{t+1}	0.580**	1.567***	1.572***
	(0.230)	(0.169)	(0.151)
S/K_{t+1}	0.043***	0.034***	0.034***
	(0.011)	(0.013)	(0.011)
$Cash_{t-1}$	0.079***	0.140**	0.213*
	(0.027)	(0.056)	(0.113)
$Cash \times FD_{t-1}$		−0.212***	−0.291**
		(0.080)	(0.147)
$Cash \times IFRS_{t-1}$			−0.176
			(0.185)
$Cash \times FD \times IFRS_{t-1}$			0.295
			(0.235)
Observations	25,400	25,400	25,400
Wald Statistics	396.117***	288.708***	359.681***
Sargan Chi-Squared Stat	127.466	188.698	323.961
Sargan Chi-Squared P-value	0.999	0.999	0.999
AR(1) test p-value	0.000	0.000	0.000
AR(2) test p-value	0.005	0.463	0.784

Note: *p<0.1; **p<0.05; ***p<0.01

Variables' descriptions are in Table 1. The model is estimated via GMM excluding country-time and firm fixed effects including as instruments all lags of the regressors plus all the lags of Cogs, cash flow and their interaction with cash, sales and investment, as well as interactions of financial development and IFRS with GDP per capita, investment, sales and cash, and interactions of IFRS with trade, investment, sales and cash.

Nevertheless, the literature suggests, as seen in Section 2, that IFRS adoption has different effects in different countries. Besides being unbalanced in the number of firms and observations, the sample is also high unbalanced in the level of economic development, as Figure 3 shows. I split the sample into a low development (with observations for which the GDP per capita is under the median) and high development sample (with observations for which the GDP per capita is above the median) and re-estimate the models. Table 7 shows the summary statistics for financial development and IFRS adoption for the four

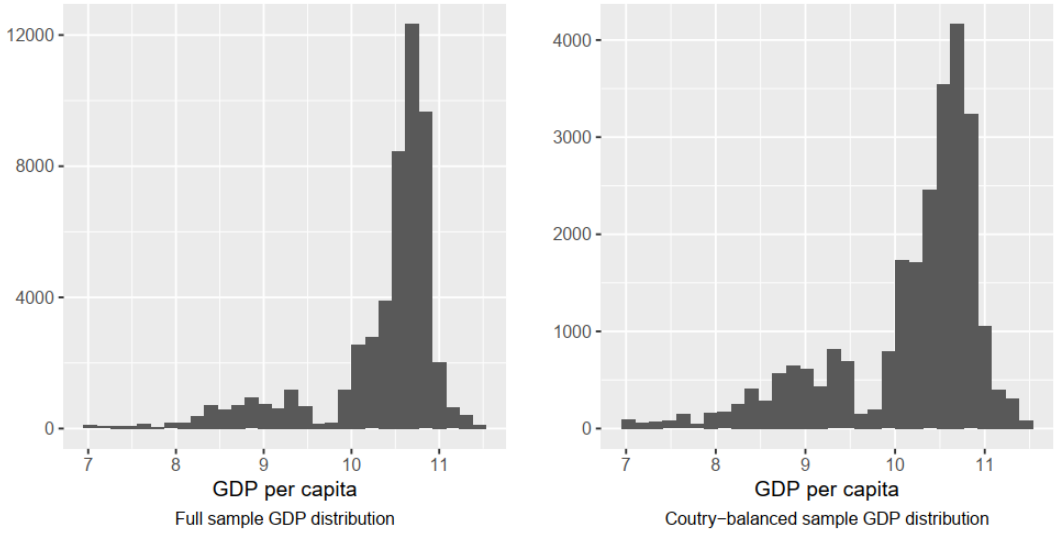

Figure 3: GDP distribution

different samples.

Table 7: Summary Statistics of FD and IFRS for Different Samples

Variable	Stat	All	Country-balanced	Low GDP	High GDP
FD	Min.	−0.536	−0.536	−0.536	0.838
	1st Qu.	0.135	0.135	−0.106	0.879
	Median	0.445	0.445	0.165	1.004
	Mean	0.413	0.413	0.203	1.084
	3rd Qu.	0.656	0.656	0.479	1.207
	Max.	2.184	2.184	1.847	2.184
IFRS	Min.	0.000	0.000	0.000	0.000
	1st Qu.	0.070	0.070	0.000	0.070
	Median	0.593	0.593	0.070	0.404
	Mean	0.424	0.424	0.337	0.391
	3rd Qu.	0.767	0.767	0.788	0.767
	Max.	0.970	0.970	0.970	0.893

Variables' descriptions are in Table 1.

Table 8 shows the results for the low GDP sample and Table 9 shows the results for the high GDP sample. First, comparing the first column of each table one can see that firms in high developed countries are not financially constrained, since the coefficient of cash is only statistically significant for the low GDP sample. Second, analyzing the role of financial development, the results in the second column of each table says that firms under low economic development face financing constraints, but the levels of financial development are not enough to relief such constraints. As Table 7 shows, the mean financial development for the the low GDP sample is only 0.203 and the mean for the high GDP sample is 1.084, more than five times higher. Table 4 shows the correlation between FD and GDP per capita is 0.420.

However, when analyzing the role of IFRS adoption some interesting results appear.

Table 8: Estimation Results: Firms in Low GDP

	Dependent variable:		
	Investment (I/K)		
	(1)	(2)	(3)
I/K_{t-1}	−0.033	−0.054	−0.086*
	(0.062)	(0.055)	(0.050)
I/K_{t+1}	0.938***	0.938***	0.550***
	(0.240)	(0.242)	(0.170)
S/K_{t+1}	0.038***	0.037***	0.026***
	(0.009)	(0.009)	(0.007)
$Cash_{t-1}$	0.079*	0.075*	0.324***
	(0.045)	(0.043)	(0.080)
$Cash \times FD_{t-1}$		−0.048	−0.405***
		(0.059)	(0.106)
$Cash \times IFRS_{t-1}$			−0.570***
			(0.132)
$Cash \times FD \times IFRS_{t-1}$			0.676***
			(0.225)
Observations	13,119	13,119	13,119
Wald Statistics	48.324***	50.736***	93.267***
Sargan Chi-Squared Stat	134.663	163.761	268.03
Sargan Chi-Squared P-value	0.999	0.999	0.999
AR(1) test p-value	0.000	0.000	0.000
AR(2) test p-value	0.774	0.924	0.445

Note: *p<0.1; **p<0.05; ***p<0.01

Variables' descriptions are in Table 1. The model is estimated via GMM excluding country-time and firm fixed effects including as instruments all lags of the regressors plus all the lags of the Cogs, cash flow and their interaction with cash, sales and investment, as well as interactions of financial development and IFRS with GDP per capita, investment, sales and cash, and interactions of IFRS with trade, investment, sales and cash.

Table 9: Estimation Results: Firms in High GDP

	Dependent variable:		
	Investment (I/K)		
	(1)	(2)	(3)
I/K_{t-1}	-0.029	-0.071^{**}	-0.084^{***}
	(0.028)	(0.032)	(0.026)
I/K_{t+1}	1.406^{***}	1.593^{***}	1.159^{***}
	(0.162)	(0.152)	(0.089)
S/K_{t+1}	0.037^{***}	0.040^{***}	0.050^{***}
	(0.010)	(0.010)	(0.008)
$Cash_{t-1}$	0.004	0.115	0.272^{***}
	(0.046)	(0.095)	(0.100)
$Cash \times FD_{t-1}$		-0.057	-0.182^{**}
		(0.091)	(0.076)
$Cash \times IFRS_{t-1}$			-0.514^{***}
			(0.172)
$Cash \times FD \times IFRS_{t-1}$			0.354^{**}
			(0.150)
Observations	38,999	38,999	38,999
Wald Statistics	282.231^{***}	315.381^{***}	549.480^{***}
Sargan Chi-Squared Stat	155.006	216.457	413.341
Sargan Chi-Squared P-value	0.999	0.999	0.999
AR(1) test p-value	0.000	0.000	0.000
AR(2) test p-value	0.012	0.208	0.662

Note: *p<0.1; **p<0.05; ***p<0.01

Variables' descriptions are in Table 1. The model is estimated via GMM excluding country-time and firm fixed effects including as instruments all lags of the regressors plus all the lags of the Cogs, cash flow and their interaction with cash, sales and investment, as well as interactions of financial development and IFRS with GDP per capita, investment, sales and cash, and interactions of IFRS with trade, investment, sales and cash.

Let us first consider the low GDP sample. For a country with a low FD level of -0.106, such as Greece and Mexico, and with no IFRS adoption, the estimated partial effect of cash on investment is 0.367. For the mean adoption level (0.337), the partial effect falls to 0.150 and for higher levels of adoption the constraints are nullified. For a country with a high FD level in the low GDP sample of 0.479, as is the case of Israel or Italy, the partial effect of cash with no IFRS adoption is 0.130, which falls to 0.047 with the mean adoption level.

Now I consider the high GDP sample. For a country with a low FD level of 0.879, as is close to Japan and China, and with no IFRS adoption, the estimated partial effect of cash is 0.112. For the mean adoption level of this sample (0.391) the partial effect of cash falls to 0.032. For a country with a high FD level of 1.207, as Denmark and the United States, the partial effect of cash on investment is only 0.052 and falls to 0.018 with a mean level of IFRS adoption. Table 10 summarizes these results.

Suppose a country in the low GDP sample in which IFRS is required only to foreign firms, as issued by the IASB, with force of law, no changes and no translation.

Table 10: Estimation Results: Marginal Effects

	Low GDP	
	No IFRS	Mean Level of IFRS (0.337)
Low FD: −0.106 (e.g., Greece and Mexico)	0.367	0.150
High FD: 0.479 (e.g., Israel and Italy)	0.130	0.047
	High GDP	
	No IFRS	Mean Level of IFRS (0.391)
Low FD: 0.879 (e.g., Japan and China)	0.112	0.032
High FD: 1.207 (e.g., Denmark and U.S.)	0.052	0.018

This country would have a IFRS adoption level of 0.304. If this country has a mean level of financial development, the partial effect of the cash stock on investment for its firms is, according to the estimation results, 0.110. If this same country maintain its financial development levels but then requires IFRS to the consolidated financial statements of public domestic firms and starts translating the international standards, its adoption level goes to 0.684 and, consequently, the partial effect of cash on investments falls crossing the negative threshold. If the same situation happens to a country in the high GDP sample, the investment to cash sensitivity falls from 0.035 also to a negative value.

These nuances cannot be seen if I consider the binary state of IFRS adoption indicating only the mandatory adoption / non-adoption status, whose estimations results are in Table 11. Except for the first column (full sample) in which the coefficient of cash appears statistically significant, the parameters' estimations are very similar, but one can only infer the variations of moving from the non-adoption to the mandatory adoption status.

In sum, the results indicate that countries with low economic and financial development can drop their financing constraints by half adopting IFRS even if the adoption is in a considerably restricted extent. These countries under IFRS have similar levels of financing constraints as countries with low GDP and high FD (or low FD and high GDP) and without IFRS. Furthermore, the effect of the adoption is similar in different countries, although their levels of financing constraints vary considerably. At first glance, these results suggest IFRS could act as a substitute for financial development to improve capital allocation efficiency. Although I do not test this directly, I consider the accounting system as part of the financial system as a whole, so that adopting IFRS is a way to improve the functioning of the financial system, in other words, to increase financial development.

Therefore, the evidence point to IFRS having significant ability to reduce firms' financing constraints by around half, decreasing their cost of external capital and, thus, improving investment efficiency. Most important, although the levels of financing constraints vary widely among countries with different levels of economic development, IFRS, even at relatively low levels of adoption, has roughly the same effect for both low and

Table 11: Estimation Results: IFRS Dummy Variable

	Dependent variable:			
	Investment (I/K)			
	All Firms	Country-balanced	Low GDP	High GDP
	(1)	(2)	(3)	(4)
I/K_{t-1}	-0.071^{***}	-0.032	-0.071	-0.088^{***}
	(0.024)	(0.029)	(0.050)	(0.027)
I/K_{t+1}	1.691^{***}	1.570^{***}	0.613^{***}	1.165^{***}
	(0.105)	(0.155)	(0.164)	(0.090)
S/K_{t+1}	0.027^{***}	0.033^{***}	0.027^{***}	0.049^{***}
	(0.007)	(0.011)	(0.007)	(0.008)
$Cash_{t-1}$	0.174^{*}	0.219^{**}	0.244^{***}	0.213^{**}
	(0.091)	(0.099)	(0.070)	(0.094)
$Cash \times FD_{t-1}$	-0.152	-0.350^{**}	-0.360^{***}	-0.133^{*}
	(0.099)	(0.136)	(0.094)	(0.073)
$Cash \times IFRS_{t-1}$	-0.088	-0.103	-0.320^{***}	-0.377^{***}
	(0.115)	(0.125)	(0.089)	(0.117)
$Cash \times FD \times IFRS_{t-1}$	0.042	0.294	0.444^{***}	0.222^{**}
	(0.148)	(0.179)	(0.138)	(0.110)
Observations	52,118	25,400	13,119	38,999
Wald Statistics	571.716^{***}	369.674^{***}	87.455^{***}	555.143^{***}
Sargan Chi-Squared Stat	335.818	319.833	251.359	402.570
Sargan Chi-Squared P-value	0.999	0.999	0.990	0.999
AR(1) test p-value	0.000	0.000	0.000	0.000
AR(2) test p-value	0.166	0.781	0.666	0.675

Note: *p<0.1; **p<0.05; ***p<0.01

Variables' descriptions are in Table 1, except for IFRS which here is a dummy variable indicating the mandatory adoption. The model is estimated via GMM excluding country-time and firm fixed effects including as instruments all lags of the regressors plus all the lags of the Cogs, cash flow and their interaction with cash, sales and investment, as well as interactions of financial development and IFRS with GDP per capita, investment, sales and cash, and interactions of IFRS with trade, investment, sales and cash.

high developed groups.

6 Concluding Remarks

This research aimed to investigate the role of IFRS adoption for firms' efficiency of capital allocation. To do so, I estimated a structural investment model with financing constraints in which financial development (Love, 2003) and IFRS enter as factors to minimize firms' need for internal funds to make capital investments.

The results indicate that IFRS adoption is capable of decreasing firms' financing constraints along with financial development, making them less dependent on internally generated funds to finance their activities. The results show that, generally, IFRS reduces the partial effect of cash stocks on investment by half. Firms in countries less economically and financially developed have the highest levels of financing constraints but they drop to similar levels of firms in countries with either low financial and high economic development or high financial and low economic development when adopting IFRS at an average level.

Since I use an IFRS variable which allows for different levels of adoption and endorsement, the results indicate that not only full mandatory adoption can generate effects. The average adoption level of the sample (0.350), which would be consistent, for instance, with an adoption where all public domestic firms are permitted to use IFRS in their consolidated financial statements without force of law, is estimated to reduce financing constraints by half.

These results are consonant with the hypothesis that the higher quality accounting information brought with IFRS adoption can improve firms decision to allocate investment over time by decreasing their cost of external capital. Therefore, IFRS facilitates not only financial investments, as the literature has been providing evidence, but also improves real investment efficiency.

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