Financing in an Emerging Economy: Does Financial Development or Financial Structure Matter?

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Abstract

This paper investigates the effects of the financial system on a firm's investment decisions using data from 404 Brazilian firms over the 1998-2006 period. We also use country-level data and classify firms as financially constrained and unconstrained according to the KZ and WW indexes. The results show that financial development has a significant impact on a firm's investment. Furthermore, the financial structure has an effect on the investment behavior of constrained firms even after controlling for the level of financial development. This finding points to a market-based financial system in order to reduce the constrained firms' dependence on internal resources.

Key Words: Financial Constraints; Financial Development; Financial Structure; Investment Decisions.

JEL codes: G10, G20, G30, G31, O16

1. Introduction

Finance and growth theories have shown that financial functions provided by banks and capital markets play an important role to enhance economic activity. This suggests a strong relationship between the development of financial markets and the real economy (King and Levine, 1993; Levine et al., 2000; Loayza and Rancière, 2006; Rajan and Zingales, 1998). According to these theories financial development may be characterized as the ability of financial actors to provide mechanisms that facilitate and intensify economic transactions in the economic system. This is an extremely important matter, especially to emerging economies, since it makes it possible to understand the financial constraints observed in credit and capital markets. Likewise, this topic is directly related to investment issues. Understanding the factors that influence and constrain investment decisions is a key issue because of its close relationship with macroeconomic factors, public policy and economic growth. According to economic theory, the development of financial markets provides reductions in transaction costs and information asymmetries, thus affecting the cost of financing in investment decisions.

Lately, a complementary stream of literature has been devoted to investigate whether the structure of the financial system matters for the advancement of economic activity. The debate has evolved around the merits of banks versus stock markets for boosting growth (Baum et al.,

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2011; Beck and Levine, 2002). Nevertheless, most of these studies are based on aggregate data, which can cause worries about the unobserved data heterogeneity. This encourages a microeconomic analysis of a firm's behavior to understand the channels through which the financial system affects economic growth. As pointed out by Gross (2001) economic growth as a macroeconomic phenomenon has microeconomic foundations and arises as a consequence of entrepreneurial activities. So, it is appropriate to investigate the role of financial agents at an individual level. Considering that economic growth emerges from microeconomic activities, it is important to highlight the role of private investment in growth promotion. Understanding the factors that influence and constraint these decisions is highly relevant, especially for developing economies such as Brazil, where most firms still rely on internal funds to invest. Thus, economies such as this one require a better understanding regarding the effects of the financial system on investment decisions. Our paper is based on this context.

The principal contribution of this paper is to assess the effects of the financial system on investment decisions and financial constraints of Brazilian firms. Herein the financial system is characterized both in terms of its level of development and its structure. As far as we know, no other studies have investigated the role of the Brazilian financial system on a firm's investment decisions considering the presence of financial constraint. In particular, we investigate how the financial development affects a firm's investment behavior and which kind of financial structure, i.e., market-based or bank-based, is more efficient to alleviate financial constraints. Although the understanding of how financial development is associated with a lower degree of financial constraints seems to be an important topic in the literature, there are only few international studies dealing with this subject at firm-level. By adding the role of the financial structure on investment decisions, these studies become scarcer and most report contradictory or inconclusive results. In such cases, those studies have been conducted using US or cross-country data and nothing is known about Brazil. Moreover, doubts are cast on cross-country studies, since they do not address the heterogeneity between countries, which may mask relevant cross-country differences in the relationship under analysis. This work intends to shed some light on these questions.

This study also contributes to the literature of emerging markets because Brazil has a financial system with characteristics that make it unique. These characteristics require special attention and should be taken into account. For instance, Brazil is an ideal scenario to check for the interaction of financial development, financial structure and financial constraints because it is a typical case of low credit supply in a modern financial environment able to move large amounts of resources. Although the Brazilian financial system presents a complex operational structure, the volume traded in capital markets is still low, reflecting a low level of activity[1]. Notwithstanding Brazil's banking tradition, financial intermediaries are still not able to finance long-term investment, leaving Government as the main long-term credit provider of companies. The consideration of these aspects is important as they allow a better understanding of the financing constraints observed in financial markets. Accordingly, understanding the Brazilian financial structure characteristics may help in the search for alternatives to overcome its limits and to make external resources less costly for investment purposes. Because of these reasons, to better understand the relationship between the financial system and a firm's investment in Brazil, more in-depth investigations should be carried out. This paper is the first attempt to fill this gap in the literature through a proper analysis on this issue.

This paper is also an important contribution to the existing empirical research on the link between the financial and real sides of the economy as it focuses on investment, which is a relevant aspect of economic activity and is directly related to economic growth. The analysis of a

[1] For developed countries such as German, Canada and USA the credit represents more than 100% of GDP. Even for some developing economies such as Chile this rate was about 74% in 2006. In the same year, the credit to GDP ratio for Brazil was only 34%. Regarding the value traded in the stock market it was about 24% of GDP for Brazil in that year, whereas for South Africa this indicator represented 123% of GDP in 2006. Data are from the Financial Structure Database of Beck et al. (2000), updated in November 2013.

firm's investment is a relevant approach to better understand the channels through which the financial system may generate long-run growth. Unlike cross-country studies, we explore a country case to investigate the effects of both the financial development and the financial structure on investment decisions.

This study differs from prior works in this area in some aspects. First, although Love (2003) and Islam and Mozumdar (2007) show that financial constraints decreases for higher levels of financial development, they do not take into account the role of the financial structure in a firm's investment. Second, albeit Ndikumana (2005) overcomes this stint by adding the financial structure in the analysis, the study is conducted by analyzing the effects of the financial system on the ratio of gross domestic investment to GDP and nothing is concluded at the firm-level. Third, although Baum et al. (2011) study the joint effect of the financial structure and financial development on the degree of a firm's financial frictions, the investigation analyzes the firm's cash flow sensitivity of cash and the impacts of the financial system on investment decisions are not discussed. Moreover, to split the sample into financially constrained and unconstrained firms the authors rely on criteria such as dividend payment and firm size and do not consider financial constraints as explicitly as we do.

We employ a panel data of 404 Brazilian manufacturing companies over the 1998-2006 period. This dataset is matched to country-level data, which includes financial development and financial structure indicators. An interesting aspect of the period analyzed is that it comprehends a set of great changes and implementations of rules and procedures to improve the functioning of the Brazilian financial system. We also conduct our analysis by splitting the sample into groups according to two indexes of financial constraint. The idea is to analyze how the financial system influences the investment decisions of firms more likely to face financial constraints. To achieve our goal we estimate a version of the accelerator investment model by GMM-*system* grouping firms according to the KZ and WW indexes.

The findings show that financial development plays an important role in a firm's investment. For unconstrained firms this effect is direct, improving capital allocation and increasing investment. On the other hand, for those showing financial constraint the financial development affects a firm's decisions through two different forms: via lower investment-cash flow sensitivity and by making investment more responsive to growth opportunities. Inasmuch as the first effect may be translated into lower financial constraints, the latter is called the accelerator-enhancing effect of financial development on investment. Moreover, the results in this study also indicate that the structure of the financial system do impact a firm's investment decisions. This effect remains significant for constrained firms even after controlling for the level of financial development. For these firms, a shift toward a market-based economy is translated into lower equity costs, reducing their dependence on internal funds to invest. The importance of a market-based financial system is highlighted as the stock market may also work as an alternative financing source, taking into consideration the low credit availability for investment purposes in the Brazilian economy. These findings entail direct implications for financial policies in Brazil. As financial development is important for the firms' investments and not all firms have access to the capital markets, there is ample room for policies that improve financial depth through a long-term credit expansion. This, however, also demands diligent attention to ensure the efficient use of resources. Additionally, if government is engaged in supporting some kind of industrial policy, there must be a match between the firms' financial needs and the incentives for developing a suitable type of funding to achieve the expected purpose. With respect to this study, the development through the stock market promotion could be relevant to achieve this goal.

This paper is organized in five sections, including this introduction. Section 2 presents a brief literature review about the financial system and economic activity. Section 3 shows our empirical model and describes the data. The main estimation results are analyzed in section 4. And lastly the conclusions are presented.

2. Literature Review

The literature has shown the importance of financial development to explain economic growth and several studies suggest strong evidence of the positive relationship between the financial and real sides of the economy. However, few studies have explored this relationship at firm-level. As financial development reduces transaction and information costs, it is interesting to analyze how a higher degree of financial development alleviates the barriers to access external capital and lessens financial constraints.

Although discussions about the financial development effects on the real economy are not recent, this relationship has acquired greater emphasis after the seminal study of King and Levine (1993). The authors develop a cross-country study to examine whether higher levels of financial development are positively associated with economic growth. Results show that higher levels of financial development are positively associated with faster economic growth rates, physical capital accumulation and improvements in economic efficiency. At the firm-level, the pioneering work of Demirgüç-Kunt and Maksimovic (1996) estimates the growth rate of firms that exceed the growth that could have been supported only by internal funds and shows that this rate is positively related to financial development. However, although their analysis is conducted at firm-level, the authors do not address the issue of capital allocation between constrained and unconstrained firms. At the industry-level, Rajan and Zingales (1998) examine the different effects of financial development through different industries within a country. They show that industries more dependent on external finance grow faster in countries with higher levels of financial development. The relationship between the financial and real sides of the economy is also explored by Rousseau and Wachtel (2000) through a VAR approach and by Beck and Levine (2004) through a dynamic panel data. Both studies show an important effect of financial intermediaries and stock markets on per capita output. Based on the difference between short- and long-run, Loayza and Rancière (2006) point to a co-existence of a positive long-run effect of financial intermediation on output growth with a negative short-run relationship.

Recently, the finance-growth nexus has also been evaluated in country-specific studies. Although those studies are more informative as they deal with specific characteristics of each country, they are still few in number and most of them do not explore the analysis at the firm-level. For instance, Zhang et al. (2012) analyze the relationship between China's financial development and economic growth, pointing to a positive association between finance and growth. Uddin et al. (2013) based on a Cobb-Douglas function augmented with financial development variables posit financial development as the ignition for economic growth in Kenya. In the context of Latin American, Campos et al. (2012) conduct an investigation for Argentina and show that, although the financial development effect is negative in the short-run, it is substantially larger and positive in the long-run. For Bolivia, Bojanic (2012) employs the cointegration analysis and finds a long-run equilibrium relationship between economic growth, financial development and trade openness.

Although the literature has highlighted the important role of financial development for economic growth, most of these works have been studied at a macroeconomic context or aggregate level. However, economic growth as a macroeconomic phenomenon has its underpinnings on microeconomic factors such as the firms' investments. Furthermore, it is also important to consider that financial development is directly related to finance availability. Taken together, it is reasonable to assume that the presence of financial constraints on a firm's investment decisions may vary with the level of a country's financial development.

The focus on the micro-level examination of financial constraints was initiated with the seminal work of Fazzari et al. – FHP (1988). According to the authors, firms can use internal funds when access to external resources is scarce and its cost is significantly greater than the cost of internal funds. This suggests that constrained firms would rely on retained earnings for new investments, which implies that investment would be sensitive to cash flow. While the use of such measure as a proxy for financial constraints has been criticized by some studies (Kaplan and Zingales, 1997; Cleary, 1999; Gomes, 2001; Alti, 2003; and Chen and Chen, 2012), others

have established cash flow as a significant determinant of corporate investments (Hsiao and Tahmiscioglu, 1997; Almeida and Campello, 2007; Beatty et al., 2010; Bushman et al., 2011; and Mohamed et al., 2014). The main criticism to FHP's approach is related to the fact that the cash flow may reflect the effect of potential profitability and future growth opportunities on investment decisions that are not captured by the Tobin's Q variable. In such case, the cash flow would not signalize the effects of financial constraints but could indicate a potential link between expected returns and investment decisions. To overcome such limitations one alternative has been to group firms in a manner that financial variables are able to explain the investment behavior while controlling the results for profitability or future growth opportunities. In such case, the combination of qualitative and quantitative information becomes crucial to provide a robust response in identifying evidence of financial constraints and the role of financial variables in the investment behavior.

It is in the context of financial constraints that the financial development issue becomes even more attractive. Corporate investments in economies more likely to face financial constraints tend to be more sensitive to changes in the financial factors. This suggests that the influence of financial constraints on a firm's investment decisions may vary with the level of a country's financial development. In such case, the underdevelopment of credit and capital markets may limit the expansion of the firms' productive capacity, making them more dependent on internal resources and on expansionist monetary policies through long-term funds and credit expansion. The damage effects of these restrictions are likely to be higher for financially constrained firms. Accordingly, firms that belong to economies with low levels of financial development are probably more financially constrained, which makes them more dependent on the availability of internal liquidity to undertake investments. In a related study Love (2003) shows that the firms' financing constraints decreases with higher levels of financial development. As higher levels of financial development are associated with a reduction in asymmetric information and contractual imperfections, firms could invest according to their growth opportunities due to the better funding conditions. At the same line, the study of Khurana et al. (2006) examines the influence of financial development on a firm's demand for liquidity, i.e., how the financial development affects the sensitivity of firms' cash holdings to their cash flows. The findings show that the financial development is related to financial constraints because a firm's cash flow sensitivity of cash decreases with a higher financial market development. Also relevant, the study of Islam and Mozumdar (2007) examines the impact of credit and stock markets' development on a firm's reliance on internal resources to undertake new investments. The results confirm the important role of financial development on the firms' investments by reducing their dependence on internal resources to invest. Nonetheless, although these studies present significant contributions, none of them address the question of how a country's financial structure may affect a firm's investment behavior.

Although a banking system may be effective to meet the external finance needs of firms, the development of a solid and active stock market may also fulfill such requirements. Considering this observation, the question that arises is whether the financial system's structure matters to the real economic activity. In this context, the finance-growth literature has also investigated which kind of financial system, i.e., market- or bank-based, is more efficient in boosting growth. Although this question is not new, until recently few studies have addressed this issue and the debate has revolved mainly around the comparative merits and disadvantages of banks and markets on growth promotion. Different views have emerged and they have either tried to expose the advantages of a market-based financial system over a bank-based one (and vice-versa) or have merely set the financial structure aside by judging it as irrelevant for economic growth. Levine (2002) is the first to present a comprehensive study linking financial structure and economic growth. Based on a cross-country sample he finds that there is no empirical evidence pointing to a market-based or a bank-based financial system for growth promotion. Similar results are found by Beck and Levine (2002) and Beck et al. (2001). Consistent with the financial-services and law and finance views, these studies suggest that the

financial structure has no effect on economic activity. Instead, it is the level of financial development and the efficiency of the legal system in protecting shareholders rights that matter for a long-run growth.

In a country-specific study, Gallego and Loayza (2001) conduct an extensive analysis of the Chilean financial system development both at macroeconomic level and at firm-level. They note that although the shift in the Chilean financial structure has evolved to a market-based financial system from 1970 to 1990, this change had no influence on the firms' access to capital nor on the cost of capital in Chile. On the other hand, Chiles's financial development did lower firms' financing constraints. According to them, "The shift in financial structure may be the result of an adjustment from an initial situation in which the nonbanking sector was too small for the level of the Chilean economy. In this sense, the change in the financial structure in Chile is analogous to a stock-adjustment process; the economy accumulates the financial institutions of relative scarcity. Therefore, it is likely that the increasing relative importance of nonbanking institutions tapers off in the future" (Gallego and Loayza, 2001, p.339).

However, the literature has not yet reached a consensus on the role of financial structure. An evidence of this assertion is the work of Carlin and Mayer (2003). According to the authors those studies have found no relationship between financial structure and growth because most of them are conducted using data of developed and developing countries. As there is a wide variation in the development degree of these countries' financial systems, a study driven with such economies may lead to erroneous conclusions on the role of financial structure on economic growth. Using data about only advanced OECD economies, the authors find a strong relationship between financial structure and growth. The study also indicates that a country's financial system structure may also infer on the characteristics of industries as in the growth rate of those that are dependent on external equity and skilled labour.

At firm-level, studies about financial structure have focused on the comparison between countries with predominantly bank-based financial systems and those with market-based ones. For instance, Mairesse et al. (1999) analyze the investment-cash flow sensitivity of firms in different countries. The study finds that this sensitivity is higher for American firms operating in a market-based financial system, than for Japanese and French ones, which operate in bank-based economies. Bond et al. (1999) find similar results by analyzing the investment pattern of German and British firms, which belong to countries with bank-based and market-based financial systems, respectively. The findings suggest that firms in market-oriented economies are more constrained than those in bank-based financial systems. However, these findings should not be interpreted without consideration. Although Bond et al. (2003) confirm these previous findings, the authors also point out that these results may be only reflecting transient differences in the occurrence of financial constraints. If this is the case, the higher investment-cash flow sensitivity of firms in market-based economies will not be representing the effect of different financial structures on a firm's investment. Another fact to be taken into account is that those countries are all industrialized and present similar growth rates. As a result, the difference in such investment behavior may not be assigned only to differences in financial systems. If investment is related to economic growth, it is difficult to justify resembling growth rates due to different financial system organizations. Moreover, as pointed out by Beck and Levine (2002), although American, Japanese, German and British firms experienced periods of different output growth, it is still difficult to draw any substantial inferences on the role of financial structure based only on the analysis of those countries' financial systems.

The recent study of Baum et al. (2011) develops a cross-country analysis to investigate the impact of both the financial development and the financial structure on a firm's financial constraints. This is the first work that considers the joint role of both factors on a firm's behavior. The authors argue that to deliberate on the role of financial structure on a firm's financial constraints also requires taking into account the complementary dimension of the financial system described by the level of financial development. Following the approach of Almeida et al. (2004), the inquiry is conducted by analyzing the sensitivity of cash holdings to a

firm's cash flow. The findings show that not only the level of a country's financial development but also its financial structure plays an important role to ease a firm's financial constraints. Results also suggest that economies with bank-based financial systems provide easier access to external resources than those with market-based financial systems. However, this study also raises some concerns, as it does not deliberate on the heterogeneity between countries under analysis. It is important to bear in mind that each economy exhibits different financial structures, industry patterns, governance policies, and different levels of banking and stock market development. All of these differences may imply different consequences of the financial structure on a firm's financial constraints. Furthermore, if banks and stock markets reduce transaction costs and information asymmetry problems in different ways, the different organization and development degree of these financial institutions between countries may have different impacts on overcoming such obstacles. This has consequences on the firms' various finance needs and their investment decisions.

Instead of focusing on cross-country studies, a better approach could allow analyzing an economy individually. This would allow understanding the circumstances and factors that affect a firm's decisions. This is important in the sense that a financial structure that fits a country may not be ideal for anywhere else. This requires better understanding the role of the financial system on economic activities. This fact becomes even more important when considering the possibility that the configuration a country's financial system may have an impact on real activities, which includes the firms' investments. Understanding the transmission mechanism through which finance affects the real economy is important because it is directly related to issues of growth policies. However, there is still a lack of rigorous evidence in these studies for country-specific economies and its relevance for alleviating financial constraints at firm-level are even rarer.

Although there are many works that deal with the issue of investment and financial constraints and many others that address the question of economic growth and financial system (described both in terms of financial development and/or financial structure), there are still few studies that incorporate both literatures on corporate investment analysis. Our paper is based on this context: the intersection of these two streams of literature. In addition, the few studies about financial development and financial structure at firm-level use cross-country data and do not address the heterogeneity between countries, while others employ information on countries other than Brazil. Yet, to the best of our knowledge, until now there are no studies on the role of financial development and financial structure on investment decisions considering the Brazilian case. This paper intends to fill this gap in the literature and aims to develop a proper inquiry into this issue with a country-specific analysis. Unlike conventional works that explore the relationship between financial system and economic activity through cross-country or country-level data, we go a step further and explore the relationship between the financial system and investment at firm-level for a single country. Interestingly, it is perceived that in finance-growth literature, Brazil is placed as a single case. Although it has a prominent place in the global economy, ranking as an emerging market, the Brazilian financial system still faces some obstacles to achieve growth. The low level of financial development in an operationally developed financial environment leaves the Brazilian firms in a condition of greater financial constraint. This requires understanding the factors that restrict and limit their growth. Additionally, unlike many studies that focus on either financial development or financial structure, we consider both factors as a robustness test. This allows us to rule out the possibility that financial structure works as a proxy for financial development. We also consider the mechanism through which the Brazilian economy allocates resources for investment on financial constraint conditions.

3. Empirical implementation

In this section we present the model used to examine the impact of the Brazilian financial system, characterized by the level of financial development and its financial structure, on a firm's investment and financial constraints. We also describe the data used in the estimations, which include firm-level and country-level variables.

3.1. Empirical Model and Estimation

To assess the effects of financial development on a firm's investment decisions we propose a version of the accelerator investment model augmented with financial system variables:

$$\left(\frac{I}{K_{t-1}}\right)_{it} = \alpha_i + \beta_1\left(\frac{I}{K_{t-1}}\right)_{i,t-1} + \beta_2\left(\frac{I}{K_{t-1}}\right)^2_{i,t-1} + \beta_3\left(\frac{CF}{K_{t-1}}\right)_{it} + \beta_4\left(\frac{D}{K_{t-1}}\right)_{it} + \beta_5 SG_{it} + \beta_6 Size_{it}$$

$$+ \beta_7 GDPg_t + \beta_8 Volatility_{t-1} + \beta_9 FD_t + \beta_{10}\left(\frac{CF}{K_{t-1}}\right)_{it} \times FD_t + \beta_{11} SG_{it} \times FD_{it} + \varepsilon_{it} \qquad (1)$$

where I_{it} is the firm's investment, defined as $K_{it} - K_{it-1}$; K_{it} is the capital stock (fixed assets); i is the firm; t is the year; α_i is the firm-specific effect; CF_{it} is the cash flow variable; D_{it} is the debt variable; SG_{it} indicates sales growth; $Size_{it}$ is the firm's size measured as the logarithm of the firm's total assets; $GDPg_t$ is the annual growth rate of gross domestic product; $Volatility_t$ represents the market uncertainty; FD_t is the financial development variable; and ε_{it} is the error term.

The division of firm-level variables by the capital stock allows the dependent variable to be measured as a rate and other variables, such as cash flow and debt to be represented as a ratio of a firm's capital stock[2]. The use of a lagged value of the dependent variable as an explanatory variable considers the dynamic aspect of investment behavior. The quadratic form is introduced in order to reflect the presence of a non-linear behavior in the capital stock adjustment process. The $(CF/K_{t-1})_{it}$ may indicate the effect of possible liquidity constraints on investment behavior; however it may also work as a proxy for potential future profitability. The introduction of the company's debt variable as ratio of capital stock $(D/K_{t-1})_{it}$ refers to the idea relating to debt tax benefits and the fact that a greater leverage can raise the firm's value. As shown in the literature, some authors maintain that the degree of leverage may be positively related to improvements in operational efficiency. To account for growth opportunities and future profitability in a firm's investment decisions, we include the variable sales growth SG_{it} in our analysis. The inclusion of this variable is necessary because if cash flow is correlated with future profitability, the relationship between cash flow and investment could reflect the relationship between future profitability and investment, instead of indicating the presence of financial constraints in a firm's investment behavior. Controlling for sales growth allows us to separate the effects of cash flow from the effects of future profitability in investment decisions. To account for economies of scale in investment decisions we include the variable $Size_{it}$ in our model[3].

Regarding the country-level variables, the $GDPg_t$ captures the effects of economic growth on investment. The inclusion of this variable is necessary to ensure that the financial system variables are capturing their own effects on investment decisions and not merely

[2] The only firm-level variables that are not scaled by capital stock are sales growth and firm size. The last one is in the logarithm form.

[3] According to Almeida et al. (2004) small firms are likely to suffer from financial constraints because they are typically young, less known and so more vulnerable to capital market imperfections.

reflecting the effect of economic growth on business decisions[4]. The variable $Volatility_{t-1}$ is introduced to control the results for the market volatility and to consider the effects of uncertainty on investment decisions. In an environment of high uncertainty, the firm's ability to raise external funds is reduced, so it is expected that higher market volatility might affect the investment behavior of firms[5]. We introduce this variable in the lagged form because we assume that the effects of market uncertainty are not captured by firms in the current period, but that it takes one period for firms to adjust their investments taking into account the uncertain environment. The FD_t variable intends to determine the effects of financial development on investment decisions. Furthermore, its interaction with the cash flow variable $(CF/K_{it})\times FD_t$ aims to identify if a higher level of financial development is associated with a lower dependence on internal funds and a lower level of financial constraints. The main idea is that if a firm's access to financial markets is restricted, it will rely on internal funds to support its investments. In this case, the hypothesis to be checked is whether firms in an environment of higher financial development will depend less on internal funds to promote investment, which means testing if $\beta_{10}< 0$.

To verify if financial development affects investment through a different transmission channel other than those considered until now, we also introduce an interaction term between sales growth and financial development $SG_{it}\times FD_t$. The idea behind the inclusion of this variable refers to the accelerator investment theory of Jorgenson (1971) who posits that a firm's real assets capital stock is proportional to changes in its expected level of output. It means that as demand increases so does a firm's investment. In this case, the assumption we intend to test is whether the ability of firms to attend such demand is higher in an environment where external finance is available, i.e., for higher levels of financial development. This hypothesis, still not addressed in the literature, is checked by the inclusion of the interaction term between sales growth and the financial development variable in the investment model. A significant and positive coefficient on this variable means that financial development affects the firms' investments by allowing them to invest in response to growth opportunities. Thus, we expect that $\beta_{11}>0$.

In addition, we also assess the effects of the financial structure on investment decisions. This question is examined substituting the financial development variable FD_t by the financial structure one, FS_t, in the model defined earlier. The new model is described by equation (2). The inclusion of the financial structure variable allows us to examine which kind of financial system, i.e., market-based or bank-based, is more suitable for the growth of Brazilian firms. The idea is to analyze how the different institutions of the Brazilian financial system impact a firm's investment. Specifically, we investigate how the relative importance of the stock market development compared to that of the banking system affects a firm's investment behavior. As the financial structure is a comparative measure, this variable is constructed so that its higher values point to a more market-based financial system than a bank-based one. In this case, the financial structure measures can be large (low) either because of the higher (lower) indicators of the stock market or because of the poorly (higher) indicators of the banking system. Consequently, if the parameter associated to this variable is significant, a positive signal for FS_t points to a market-based financial system for boosting the firms' investments ($\delta_9>0$). On the other hand, a negative sign signalizes that a bank-based system is more suitable for promoting firm growth ($\delta_9<0$).

[4] The inclusion of the $GDPg_t$ as an explanatory variable is necessary especially when we are analyzing the effects of financial development on investment decisions. As many studies have shown a higher level of financial development may be followed by a greater economic growth.

[5] Market volatility is constructed from a Brazilian firm's stock return index named Ibovespa. It is defined by: $Volatility = \sqrt{\frac{\Sigma_{t=1}^{n}(Ib_i - Ib_m)^2}{n\times PPA}}$, where Ib_i represent the logarithm of time variation in Ibovespa measured in an appropriate unit time; Ib_m is the mean of Ib_i; i represents the day; n is the total number of days and PPA is the period per year, which can vary depending on the volatility analysis period (daily, weekly, annual and so on).

$$\left(\frac{I}{K_{t-1}}\right)_{it} = \alpha_i + \delta_1\left(\frac{I}{K_{t-1}}\right)_{i,t-1} + \delta_2\left(\frac{I}{K_{t-1}}\right)^2_{i,t-1} + \delta_3\left(\frac{CF}{K_{t-1}}\right)_{it} + \delta_4\left(\frac{D}{K_{t-1}}\right)_{it} + \delta_5 SG_{it} + \delta_6 Size_{it}$$

$$+ \delta_7 GDPg_t + \delta_8 Volatility_{t-1} + \delta_9 FS_t + \delta_{10}\left(\frac{CF}{K_{t-1}}\right)_{it} \times FS_t + \delta_{11} SG_{it} \times FS_{it} + \varepsilon_{it} \qquad (2)$$

To consider the effects of the financial structure on financial constraints we also introduce an interaction term between $(CF/K_{t-1})_{it}$ and FS_t in equation (2). The inclusion of this variable allows assaying whether a specific financial structure is more appropriate to decrease a firm's dependence on internal resources. Accordingly, a negative and significant coefficient on this variable points to a market-based system for alleviating a firm's financial constraints by decreasing the firms' reliance on internal funds ($\delta_{10}<0$). On the other hand, a positive and significant parameter signalizes that a bank-oriented economy is more convenient for mitigating funding restrictions by providing firms with easier access to external finance ($\delta_{10}>0$). In this latter case, it means that a market-based financial system is associated to a higher firm's financial constraints.

To check the accelerator effect of the financial structure on investment, we also introduce an interaction term between sales growth and the financial structure variable $SG_{it} \times FS_t$ in equation (2). The idea is similar to what we did before for the financial development variable. In this case, we want to check whether a specific financial structure may allow firms to better enjoy growth opportunities. In other words, the hypothesis tested is whether a market-based financial system is better suited to enhance the response of a firm's investment to demand growth than a bank-based one. If results point to a market-oriented economy, we hope that $\delta_{11}>0$. Otherwise, if the investment response to growth opportunities is higher in a bank-based economy, we expect that $\delta_{11}<0$.

We use the system generalized method of moments (GMM-*system*) developed by Arellano and Bover (1995) and Blundell and Bond (1998) to estimate the models. This method allows us to consider the dynamic aspect of the investment model and control for the potential endogeneity of explanatory variables. It also has some advantages over the traditional GMM employed in the literature. Developed by Arellano and Bond (1991), the GMM estimator, also known as the GMM-*difference* estimator, suggests to first-difference the dynamic regression model to eliminate the firm-specific effect and to use lagged levels of endogenous variables as instruments. As a result, lagged levels of variables must be uncorrelated with the first-differenced errors. Under the assumption that the error term, ε_{it}, is not serially correlated or, at least, follows a moving average process of finite order, the following implication is made regarding the orthogonality condition:

$$E\left(Z_{it-s}\Delta\varepsilon_{it}\right) = 0 \quad \text{for } s \geq 2 \text{ and } t = 3, \ldots, T \qquad (3)$$

where Z_{it} represents the instruments for the endogenous variable.

Nevertheless, there are some econometric and statistical shortcomings with this estimator. First, if the original model is in level, first-differencing makes us lose the cross-section dimension of the data by reducing the variation in variables. Second, as pointed out by Blundell and Bond (1998), if the explanatory variables are persistent over time, lagged levels of these variables will perform as poor instruments for the difference equation. This leads to a rise in the asymptotic variance of coefficients and produces biased estimators in small samples. Third, according to Griliches and Hausman (1986), first-differencing may intensify the effects of measurement error by decreasing the signal-to-noise ratio.

As stated by Arellano and Bover (1995) and Blundell and Bond (1998), those shortcomings are overcome by introducing equations in levels in the estimation process and using lagged differences of corresponding explanatory variables as instruments. Consequently, it

leads to an estimation procedure that comprises a stacked system of equations in both difference and level. As the inclusion of the regression in level does not eliminate the cross-sectional variation of the data nor makes the measurement error stronger, the GMM-*system* estimator reduces the asymptotic variance of the difference estimator and decreases the potential biases in small samples. Furthermore, it also maintains a stronger correlation with their instruments than the variables in difference.

However the introduction of the equation in levels requires a further assumption in the GMM-*system* implementation. Such assumption is necessary because the use of the equation in level does not eliminate the unobservable firm-specific effect. As the firm-specific effect can be correlated with explanatory variables, it requires the assumption that this correlation is constant over time, that is:

$$E\left[X_{i,t-p} \times \alpha_i\right] = E\left[X_{i,t+q} \times \alpha_i\right] \quad \text{for all } p \text{ and } q \tag{4}$$

Under this assumption, variables in difference are uncorrelated with firm-specific effect. Consequently, the lagged difference becomes a valid instrument for the corresponding endogenous variable in the level equation. This implies the following orthogonality condition:

$$E\left[\Delta Z_{it-s}\left(\alpha_i + \varepsilon_{it}\right)\right] = 0 \quad \text{for } s = 1 \text{ and } t = 3, \ldots, T \tag{5}$$

The GMM-*system* thus consists of a stacked system of equations that includes both difference and level equations. In the first part of the procedure the equation in difference is estimated and lagged levels are used as instruments for the corresponding endogenous variables. In the second stage, the level equation is estimated and lagged differences of variables are used as instruments.

We carry out the GMM-*system* estimation using the orthogonality conditions (3) and (5) under the assumption that there is no serial correlation in the error term. Moreover, our GMM-*system* estimation is conducted in a two-step procedure. In the first step it is assumed that the error term is homoscedastic and independent. In the second step those hypotheses are abandoned and the residuals from the first step are used to build an optimal weighting matrix. In all estimations we use the Windmeijer (2005) bias-corrected robust variance-covariance matrix.

As the consistency of the GMM-*system* estimator depends on the assumptions of no serial correlation in the error term and on the legitimacy of the instruments used, we employ two tests to verify the validity of such conjectures. The first test checks the existence of no serial correlation in the error term at orders higher than one. Since we assume that idiosyncratic errors are independently and identically distributed, by construction the first differenced errors are first-order serially correlated, but the existence of serial correlation at second or higher orders invalidates the estimator that is no longer consistent. Likewise, to assess the validity of instruments we employ an over-identifying restriction test, i.e., the Sargan test[6]. Failing to reject the null hypothesis confirms the legitimacy of the instruments used and supports our model.

As some variables used in our proposed models rely on a firm's management decisions, we assume in our estimations that the cash flow and the debt variables, both scaled by capital stock, are endogenous. As unforecastable errors today might affect current and future changes in the cash flow and debt, it is possible to treat these variables as endogenous. Regarding the country-level variables all of them are treated as strictly exogenous.

In order to investigate the role of financial constraints on a firm's investment we split the sample into groups. The idea is to analyze how explanatory variables influence the investment decisions of firms more likely to face financial constraints and those with a lower degree of constraint. One advantage of our approach is that the firm classification is allowed to change in each period, so that the financial status of the firm may vary through time dimension. To achieve

[6] Under the null hypothesis that the instruments are valid this test follows a $\chi 2$ distribution with *(P – K)* degrees of freedom, where *P* is the number of columns of the instrument matrix and *K* is the number of regressors.

this goal, we employ two indexes of financial constraints: the KZ index and the WW index. These indexes are constructed in a way that a higher value for the index signalizes a higher financial constraint. For each firm we compute the value of each index. So we divide the sample into quintiles according to the values of each index and classify firms that belong to the first two quintiles as financially unconstrained and those that belong to the last two quintiles as financially constrained.

The KZ index proposed by Lamont et al. (2001) is obtained by the following equation:

$$KZ_{it} = -1.0019\frac{CF}{K_{t-1}}_{it} + (0{,}2826Q)_{it} + 3.1392\frac{D}{TotCap}_{it} - 39.3678\frac{Div}{K_{t-1}}_{it} - 1.3148\frac{Cash}{K_{t-1}}_{it} \quad (6)$$

where i is the firm; t is the year; K_{it} is the capital stock (fixed assets); CF_{it} is the cash flow variable; Q_{it} is the Tobins's Q; D_{it} is the debt variable; $TotCap_{it}$ is the total capital, defined as the sum of debt plus stockholders' equity; Div_{it} is the dividends and $Cash_{it}$ is the cash, defined as cash plus short-term investments.

The WW index suggested by Whited and Wu (2006) is:

$$WW_{it} = -0.091\left(\frac{CF}{TA}\right)_{it} - 0.062DDIV_{it} + 0.021\left(\frac{LTD}{TA}\right)_{it} - 0.044Size_{it} + 0.102ISG_{it} - 0.035SG_{it} \quad (7)$$

where i is the firm; t is the year; CF_{it} is the cash flow variable; TA_{it} is the total assets; $DDIV_{it}$ is a dividend payer dummy; LTD_{it} is the long-term debt; $Size_{it}$ is the logarithm of the firm's total assets; ISG_{it} is the industry's sales growth and SG_{it} is the firm's sales growth.

Given that the majority of our sample includes private placement firms, we do not have information about Tobin's Q and dividend payments in our database. Thus, the KZ index proposed here takes into account only three of the five variables suggested in the original index. Regarding the WW index, its computation considers only five variables since we do not have enough information to establish the variable $DDIV_{it}$. Despite the smaller number of variables used in the construction of both indexes, we believe that these indexes will work as good proxies for financial constraints.

3.2. Data

This paper comprises firm-level and country-level data to implement the proposed empirical model described in previous section. All data is deflated according to the General Price Index - Internal Availability (IGP-DI), an index that measures the prices of the Brazilian economy. A complete description of all variables is in Table A (see Appendix).

The firm-level data covers 404 manufacturing private Brazilian companies for the years 1998 to 2006. All this information is drawn from IBRE-FGV (Brazilian Institute of Economics from Getúlio Vargas Foundation).

The country-level variables used are the GDP annual growth rate, market volatility and measures of financial development and financial structure. Variables related to the Brazilian financial system are from the Financial Structure Database of Beck et al. (2000), updated in November 2013. Information about the Brazilian GDP is drawn from Brazil's Central Bank and data on market volatility is obtained from Economática database. For investment decisions not only be dependent on microeconomic factors, we also employ country-level variables in the investment models. The inclusion of such variables enable analyzing the association between investment and macroeconomic conditions.

To assess the effects of the Brazilian financial intermediaries and stock market on a firm's investment decisions we employ some indicators to characterize the Brazilian financial system. In this study we describe the financial system in terms of its level of financial development and its financial structure. Since there are no perfect measures to represent the level

of financial development and the financial structure of a country, the literature has proposed some indicators that work as a proxy for them. These indicators combine the role of financial intermediaries and stock market into a single measure[7]. Following Beck et al. (2001), we employ three measures of financial development and three measures of financial structure in this paper.

The first variable of financial development is commonly identified in the literature as *Finance-activity* (*FDa*) and it represents a measure of the overall activity or liquidity of financial sector. It is defined as the logarithm of the product of private credit and value traded. Private credit is defined as the credit allocated to the private sector divided by GDP and it includes credit of both bank and nonbank intermediaries. The value traded is defined as the ratio of the stock market trading volume to GDP and it measures the degree of liquidity that the stock market provides to economic agents.

The second measure of financial development is *Finance-size* (*FDs*) and it is defined as the logarithm of the sum of private credit and market capitalization. Market capitalization is defined as the ratio of the value of listed shares to GDP. The private credit and the market capitalization when combined into a single measure of financial development reflect the total size of an economy's financial sector development.

The third measure of financial development is named *Finance-efficiency* (*FDe*) and is defined as the logarithm of the ratio of value traded and overhead costs. We include this variable to measure the efficiency of the Brazilian financial sector, i.e., to measure the efficiency with which the financial sector channels funds in economy. Overhead costs are defined as the accounting value of banks' overhead costs as a share of banking system assets. The idea is that if overhead costs are high it will reflect inefficiencies in the banking system, leading to a low financial development indicator.

Regarding the financial structure of the Brazilian financial system, we also employ three measures. These indicators allow us to analyze how the mixture of financial institutions of the Brazilian economy affects a firm's investment. In defining financial structure we focus on the relative merits of the stock market versus the banking system, i.e., how the development of a market- or a bank-based financial system influences a firm's investment decisions in Brazil. Since there is no single definition of financial structure, we follow Beck et al. (2001) and employ three different measures in this paper. Each of these measures is constructed in a way that higher (lower) values indicate a more market-based (bank-based) financial system.

The first measure is denoted *Structure-activity* (*FSa*) and indicates the activity of the stock market relative to the activity of the banking system. It is defined as the logarithm of the ratio of value traded and private credit by deposit money banks[8].

The second variable of financial structure is denoted *Structure-size* (*FSs*) and is defined as the logarithm of the ratio of market capitalization and private credit by deposit money banks. This variable indicates the size of the stock market relative to the size of the banking system.

The third indicator of financial structure is *Structure-efficiency* (*FSe*). It is defined as the logarithm of the product of value traded and overhead costs. This financial structure variable indicates the efficiency of the stock market relative to the banking system.

4. Discussion of Results

[7] As we are interested in the ability of firms to assess not only the debt markets but also the stock market, we employ some measures of financial development that combines both markets into one indicator. According to Islam and Mozumdar (2007) a measure of financial development that is based, e.g., only on the stock market is likely to underestimate the level of financial development of economies in which financial intermediaries have an important role in productive activities financing.

[8] The definition of private credit by deposit money banks is similar to that of private credit, except that the first includes only the credit allocated to the private sector by deposit money banks and the second also considers the credit of nonbank financial institutions. Both are measured as a share of GDP.

4.1. Descriptive analysis

Regarding the issues mentioned earlier, this section presents a descriptive analysis of the variables related to the Brazilian financial system and the main financial indicators of the firms. Figure 1 shows the evolution of the main variables that represent the level of development of the Brazilian financial intermediary sector and its stock market from 1992 to 2006[9].

[Insert FIGURE 1 here]

Figure 1 indicates that the ratio of credit allocated to the private sector (as a share of GDP) is still modest for Brazil, showing a decreasing trend for most of the period considered. Although the Real Plan implementation in 1994 provided an economic stabilization process, it was not sufficient to ensure an increase in credit expansion[10]. There are several reasons that can explain the behavior of the credit market in Brazil, such as the Mexican crisis in 1994/1995, the Asian financial crisis in 1997, the Russian crisis in 1998, the Brazilian exchange crisis in 1999, and the Brazilian presidential election in 2002. As a consequence, these financial crises raised fears of a worldwide economic meltdown due to financial contagion, which reflected negatively on the Brazilian credit market. Only in 2004 is that the Brazilian economy began to show an increasing credit supply, which although it has grown in recent years, still performs worse than expected for a developing economy like Brazil.

Regarding the Brazilian capital market, particularly its stock market, Figure 1 clearly shows a growing trend when taking into account the market capitalization. It can be observed that the market share of the stock market in the Brazilian financial system has grown for the period considered when the size indicator is considered. This means that there has been an increase in the number of firms that started trading shares on the Brazilian stock exchange. This is probably due to incentive policies on local stock market, such as the creation of the New Market and the Differentiated Levels of Corporate Governance in 2000, the reshaping of the Brazilian Corporate Law in 2001, the reform of the Bankruptcy Law in 2005, among others[11]. However, the stock market's value traded in Brazil is still very modest. Although it has grown, the financing through shares performs poorly when this liquidity indicator is taken into consideration. This indicates a still incipient stock market that, although growing in size, still performs with low liquidity. This situation, associated with the low Brazilian credit supply, makes firms' financing even more critical. Understanding these aspects can provide a better comprehension of the Brazilian financial system in order to overcome its limitations.

Table 1 presents the mean of the main financial indicators for each group of firms classified by degree of financial constraint according to the KZ and WW indexes. It can be noted that firms classified as financially constrained present substantially lower values for investment rate, liquidity, debt, sales growth and profitability. The worst liquidity indicators for both groups of constrained firms may suggest a greater necessity of cash and a higher need for external resources. Although the financial indicators are worse for firms classified as financially constrained, we find important differences among constrained firms when we compare the KZ index with the WW index. The liquidity indicators of constrained firms classified by the KZ index are lower than the liquidity indicators of firms identified as constrained by the WW index. Regarding the indebtedness indicators, especially the variable debt by net equity, it is more than

[9] Although the period analyzed in this paper refers to the years 1998 to 2006, data on the Brazilian financial intermediation sector and stock market from 1992 to 2006 are used to illustrate the evolution of both economic agents over the years in Figure 1. Unfortunately, unlike the country-level data, the firm-level data are available only for the years 1998 to 2006.

[10] The Real Plan (Plano Real) was a set of measures taken to stabilize the Brazilian economy, which main purpose was to control the Brazilian inflationary process.

[11] With the institution of the New Market and the Differentiated Levels of Corporate Governance some companies have compromised to adopt better corporate governance standards voluntarily. Information about these companies is then used to start the computation of an index of corporate governance (IGC). Likewise, the essence of the Brazilian Corporate Law and the Bankruptcy Law is to allow a higher minority stockholders protection.

two times higher for the KZ constrained firms than for the WW constrained ones. Likewise, the three profitability indicators for the KZ constrained firms are negative and present worse values than those of WW constrained ones. Nonetheless, we note that the main difference between

[Insert TABLE 1 here]

constrained firms classified by both indexes is related to firm size. KZ constrained firms are more than ten times bigger, on average, than the WW constrained ones. Regarding the KZ financially constrained firms, we also note a higher leverage measured by the ratio of debt to net equity, as shown in Table 1. This may be related to the fact these firms are almost two times larger than the KZ unconstrained ones, indicating more collateral capacity. However, for the WW index, unconstrained firms are twenty times larger than the constrained counterparty. This is because in its composition the KZ index does not consider the weight of firm's size, unlike the WW index does.

4.2. Financial development effects

In order to analyze the effects of the financial system and financial constraints on investment decisions we start by estimating model (1) with financial development variables. The model is estimated by employing the GMM-*system* estimator and the firms are grouped as financially constrained and unconstrained according to the KZ and WW indexes. Table 2 presents the parameter estimates considering three specifications with financial development variables that take into account, respectively, the activity, the size and the efficiency of financial intermediaries and stock market. For brevity, intercepts are not reported in Table 2.

According to Table 2, the lagged investment rate and the lagged quadratic one are significant for all firms classified by the KZ and WW indexes, indicating that the capital stock adjustment is not linear. We also include sales growth and size to control for growth opportunities and economies of scale, respectively. To take into account the effects of economic growth and the market uncertainty we add the GDP growth rate and the market volatility to the model.

Overall, the investment is not sensitive to cash flow by itself, except for the financially constrained firms in specification (3) of Table 2, in which *Finance-efficiency* is used as a measure of financial development. However, to consider the entire role of cash flow on investment it is also necessary to take into account its interaction with the financial development variable[12]. Although for financially constrained firms the cash flow, by itself, is non-significant, it still affects the investment of those firms inasmuch as the interaction term between cash flow and financial development is significant leastwise at the 0.10 level in almost all models for these firms[13].

With respect to the effects of financial development on a firm's investment decisions we include three variables to measure the financial system development. These variables are included in different equations so that each measure intends to capture the activity, the size and the efficiency effects of financial development on a firm's investment, respectively. Regardless of the indicator used, the specifications considering *Finance-activity*, *Finance-size* and *Finance-efficiency* as measures for financial development are positive and significant only for the unconstrained firms. While financial development variables have a direct impact on the investment of financially unconstrained firms, the same does not occur for those constrained

[12] We should not look to the parameter associated to cash flow individually inasmuch as the partial effect of cash flow on investment rate also depends on the magnitude of the level of financial development. This happens due to the existence of the interaction term between both variables. In this case, the partial effect of cash flow can be obtained by deriving the investment model, described by equation (1), to cash flow. This turns to the expression: $\partial(I/K_{t-1})_{it}/\partial(CF/K_{t-1})_{it} = \beta_3 + \beta_{10} \times FD_t$. In this case, the partial effect of cash flow is jointly determined by β_3 and β_{10}.

[13] We will discuss more on the role of this interaction term when analyzing the effects of financial development on investment decisions.

ones. On the other hand, when we consider the interaction term between cash flow and financial development we find that increases in the level of financial development reduces the dependence on internal resources for investment of financially constrained firms. In other words, this result means that, for those constrained firms, a greater financial depth derived from a higher development of the credit and capital markets reduces their investment-cash flow sensitivity.

[Insert TABLE 2 here]

Accordingly, these findings signalize that the effects of financial development are different for unconstrained and constrained firms. For unconstrained firms the effect of financial development on investment comes from policies to increase credit level, market capitalization and stock market value traded, which improves financial environment and stimulate investment possibilities by reducing the cost of financing. In this case, as financially unconstrained firms are not dependent on internal resources to invest, the effects of financial system developments on investment is captured by the financial development variables directly. On the other hand, the effects of financial development on the constrained firms' investment occur by lowering the dependence of these firms on internal funds, reducing financial constraints due to the higher availability of external finance. In such case, it is plausible to consider that the more developed the financial system becomes, the greater the credit availability and the possibility of new financing, thus reducing the reliance of investment on internal cash flow for financially constrained firms.

Until here we assume that the effect of financial development on investment is direct or through its effect on a firm's internal resources. However, it may be that financial development affects the firms' investments through another transmission channel other than those considered until now. An interesting way still not addressed is to explore the role that financial development exerts on a firm's investment via growth opportunities. In other words it is equivalent to checking whether financial development increases the response of a firm's investment to an increase in a firm's demand. According to the theory, it is expected that an increase in demand is followed by an increase in investment. In this case, the hypothesis tested is whether in a more developed financial environment firms take advantage of growth opportunities due to the higher finance availability. This effect is checked by including an interaction term between sales growth and financial development variables.

The results in Table 2 suggest that a higher level of financial development allows financially constrained firms to invest in response to growth opportunities. This is especially true for the KZ constrained firms, which can also be deemed distressed due to their worst financial indicators, with negative investment ratio and negative profitability. In the three specifications presented in Table 2, the investment of KZ constrained firms is responsive to growth opportunities for higher levels of financial development. Although this interaction term is significant for the WW constrained firms only when *Finance-size* is employed as a measure of financial development, the coefficient of the remaining interaction terms have the expected sign. An environment of low financial development further restricts the resource availability for constrained firms, preventing them from investing in response to their growth opportunities. On the other hand, the implementation of policies that meet the financing needs of investors and mobilize resources for productive uses can be translated into a better financial environment, allowing those constrained firms to increase investment in response to the higher demand[14].

[14] Ndikumana (2005) finds a similar result and shows that financial development affects aggregate investment by increasing the response of investment to a potential output growth. However, his study differs from ours inasmuch as his approach is conducted at country-level and not at firm-level as we do. Although the idea concerning the interaction term for both works starts from the initial accelerator theory, the different level of data aggregation conducted by his work and ours implies in different approaches. Inasmuch as we measure a firm's growth opportunities by the firm's sales growth, he uses the growth rate of real per capita GDP to capture the enhancing-effect of financial development on aggregate investment.

Accordingly, results uncover evidence on the important role of financial development for a firm's growth, confirming and complementing the previous researches of Love (2003) and Islam and Mozumdar (2007). This study also provides evidence that suggests the existence of an additional mechanism through which the financial side impacts the real economic activity. This transmission channel occurs not only by the direct impact of financial development on the unconstrained firms' investments or by reducing the investment-cash flow sensitivity of constrained firms, but also by increasing the response of investment to growth opportunities, especially for financially constrained firms.

4.3. Financial structure effects

In this section we extend the previous analysis by investigating the effect of the financial system's structure on investment decisions. Although financial structure may be defined as the set of institutions and rules that comprises a financial system, our analysis focuses on the relative merits of the stock market versus the banking system. The inquiry consists in examining the impact of financial structure on a firm's investment considering two different types of financial system, i.e., market- or bank-based. In this approach, financial structure variables are constructed so that higher values point to a more market-based financial system than a bank-based one. Estimations of the model described by equation (2) are in Table 3.

The results reported in Table 3 consider three different specifications, depending on the financial structure variable employed. Based on the point estimates, the cash flow shows to be non-significant for unconstrained firms. On the other hand, financially constrained firms present investment-cash flow dependence in almost all specifications, except that in which *Structure-activity* is used as financial structure measure. The sensitivity of investment to cash flow for constrained firms also seems to reflect the worst financial indicators, such as negative profitability and low liquidity of these companies. The adverse conditions of such firms leads to a greater difficulty in raising external resources, keeping those firms dependent on internal funds to finance investments. Likewise, these worst indicators also allow us to justify the negative sign of the cash flow parameter for constrained firms in specification (3) of Table 3. In an environment of tightening financing constraints, constrained firms are forced to sell assets to keep cash, thus reducing investments.

The effects of the financial structure on a firm's investment are shown in Table 3 through the analysis of variables *Structure-activity*, *Structure-size* and *Structure-efficiency* in the models estimated. Interaction terms between cash flow and financial structure are also considered and we find different results for unconstrained and constrained firms. In all specifications of Table 3 the financial structure variables are positive and statistically significant leastwise at the 0.05 level in all models for financially unconstrained firms. Overall, this result points to a market-based financial system to stimulate the Brazilian unconstrained firms' investment. This finding is in line with Boyd and Smith (1998) who point out that as a country's economy develops, the inherent financial system becomes more market oriented. In this case, it is expected that those unconstrained firms take advantage of a higher market development due to the possibility of a new financing source. However, in the case of constrained firms, the financial structure, by itself, does not seem to be important in explaining the firms' investment. The exception is the specification (2) of Table 3 for WW constrained firms when *Structure-size* is employed as a proxy for financial structure[15]. It is also possible to note that the *Structure-size* variable has a larger effect on the unconstrained firms' investment than other financial structure variables. We conjecture that this higher effect is associated to the relative higher stock market capitalization

[15] Levine (2002) highlights that inasmuch as *Structure-size* is a simple measure of financial structure it also has some drawbacks as it does not take into account the liquidity of markets. Accordingly, if is the markets' liquidity that matters for the capital markets functioning the use of a variable that takes into account only the market size may lead to an erroneous conclusion about its effects. This happens because a market that is large in size may not attend the financing needs of firms if it has a low liquidity.

compared to the low credit supply in Brazil. In contrast, when the relative liquidity and efficiency of markets are taken into account, both represented by the *Structure-activity* and *Structure-efficiency* variables respectively, the effect of the financial structure is lower, though it is still significant. Although the market capitalization is high in Brazil, the stock market value traded is still small. This is reflected in a lower impact of the *Structure-activity* and *Structure-efficiency* variables on the unconstrained firms' investment when compared to the result from a measure that takes into account only the size of financial agents.

[Insert TABLE 3 here]

Turning to the effects of the interaction term between cash flow and financial structure on investment, we find a contrasting result than that when financial structure is analyzed alone. We note that although the coefficients on this interaction term are insignificant for unconstrained firms, they are negative and statistically significant only for those constrained ones[16]. This finding signalizes that the investment dependence of constrained firms on internal funds lowers as the economy becomes more market-oriented. This means that, for constrained firms, financial restrictions are higher in a bank-based financial system. Although the question about the role of financial structure on firm behavior is controversial, Ndikumana (2005) points that this issue is particularly important for less-developed countries due to the existence of limited financing resources, which applies to Brazil. Evidence from other studies also supports the findings of this paper. For instance, our results are also in line with Beck et al. (2013), who show that the presence of banks in most financial systems across the developing world is associated to a limited access to financial services by firms. In the case of Brazilian firms, we go further and show that, in general, financial structure impacts both unconstrained and constrained firms, but in different ways. For unconstrained firms the impact of financial structure on investment is direct, by fostering investment through the development of a market-oriented economy. However, for constrained firms the impact is via a lower investment-cash flow dependence. In this case, the development of a market-based economy may mitigate the constraint level of firms by easing the financial frictions that could not be supported by the scarce bank credit of the Brazilian financial system. As the stock market develops, it gives constrained firms the opportunity of a new finance source, reducing their self-financing need. At the same time, it creates an environment that facilitates risk sharing and reduces equity costs, fostering the unconstrained firms' investment and lowering the investment-cash flow sensitivity of constrained firms.

In order to test the existence of another transmission channel through which financial structure may affect investment, we also add an interaction term between sales growth and financial structure in the model described by equation (2). The purpose of the inclusion of this variable is to test whether the financial structure may allow firms to better enjoy growth opportunities and, if so, which kind of financial structure, i.e., market- or bank-based, is more suitable for that purpose. As shown in Table 3, the interaction term is positive in all specifications regardless of the measure used to represent the financial structure. We also note that the estimates on this variable are significant for the KZ constrained firms and WW unconstrained ones in most specifications. When *Structure-size* is employed as a financial structure variable, the interaction term is also significant for both groups of constrained firms. These results suggest that the financial structure may have an incremental effect on investment via growth opportunities. Specifically, the development of a market-oriented financial system may create a new financing possibility, while reducing the cost in equity markets. As a consequence, firms may be encouraged to increase investment in response to growth

[16] The significant effects of the interaction term between cash flow and financial structure variables for constrained firms are higher when financial structure is represented by *Structure-size*. As pointed before, this is due to the higher stock market capitalization compared to the low credit supply in Brazil.

opportunities due to the better financing environment created by the development of the stock market.

4.4. Robustness tests and Final remarks

The previous sections point to an important role of financial development and financial structure for a firm's investment. However, as pointed out by Baum et al. (2011), the level of financial development and the financial structure of a country are complementary dimensions of the whole financial system. It is also expected that the relative importance of capital markets increases for higher levels of financial development. In this case, a potential concern regarding the results for the role of financial structure is that the variables used to describe the structure of the financial system may reflect the information included in the financial development measures. This implies that there are chances that financial structure is working as a proxy for financial development. To rule out this possibility we re-estimate the model with financial structure variables controlling the results for the level of financial development.

Table 4 reports the results of estimating equation (2) augmented with financial development variables. For brevity and space purposes we only report the coefficients that are of main interest now[17]. When we control the results for the level of financial development, we note some interesting findings. Although financial structure, by itself, no longer explain the investment behavior of unconstrained firms, the interaction term between cash flow and financial structure remains significant for the constrained ones[18]. Moreover, while the magnitude of coefficients changes for the different measures of financial structure, the direction of the results are nearly identical whatever the measure used. This finding supports the previous results that suggest that a market-oriented financial system is more suitable for constrained firms' growth.

Turning to the effects of the interaction term between sales growth and financial structure on investment, the results remain the same as before. As shown in Table 4, this interaction term keeps positive and significant for the KZ constrained firms and the WW unconstrained ones when we use measures related to the activity and efficiency of markets, even after adding the financial development variable to the model estimation. When we employ measures related to the financial system size, the interaction term is also significant for both groups of constrained firms. In this case, our results suggest that financial structure does have an additional effect on a firm's investment through the accelerator effect. More specifically, the development toward a market-based financial system allows those firms to better respond to growth opportunities by investing more than in a bank-oriented financial system.

Overall, our results show that the financial development and the structure of the Brazilian financial system have a relevant role for investment in Brazil. In contrast to Demirgüç-Kunt and Maksimovic (2002) and Beck and Levine (2002), we find that both financial development and financial structure play an important role on a firm's investment, whether by boosting the firm's growth or by alleviating restrictions to external financing. Although there is still no consensus whether the financial structure of a country impacts its growth rates, in the case of Brazil our results tilts to the market-based view. Considering that the decisions regarding an efficient allocation of capital by firms is directly related to their investment decisions, the effects of a market-oriented financial system on corporate investment are also reflected through an improvement in capital allocation by allowing firms to invest according to their growth opportunities.

The positive effect of a market-based financial system may also be related to a reduction in the intrinsic inefficiencies associated with banks (Levine, 2002) and to a better growth promotion by easing forms of fundraising. These effects are even more relevant for an economy

[17] All coefficient estimates are available upon request.

[18] The exception occurs for the KZ constrained firms when *Structure-efficiency* is employed as a financial structure indicator. Only in this case the investment-cash flow sensitivity of constrained firms is not affected by the financial system's structure.

like Brazil, in which most firms still rely on internal funds to invest. Furthermore, one cannot ignore that when a firm goes public this is a way to mitigate the information asymmetry problem existing in the bank-firm relation[19]. As the firm decides to raise capital via equity, it also commits with information disclosure and its terms of trade improve, raising the firm's value to creditors.

The issue regarding the role of the stock market development becomes even more important when we verify that the possibilities for long-term financing are reduced in the Brazilian economy and are driven merely by government institutions such as the BNDES (National Bank for Economic and Social Development). In this situation, the stock market

[Insert TABLE 4 here]

development introduces a new source of funding, opening up new possibilities for the firms' financing. In this case, the stock market development also becomes an alternative for long-term financing[20]. Likewise, as mentioned in Ndikumana (2005), the higher development of the stock market relative to the credit market may affect investment through its effects on the cost of capital. We understand that this is another reason that explains the impact of the financial structure on a firm's investment. As the stock market develops it becomes more liquid, increasing the risk sharing and resulting in a lower cost of external financing by that market. In this case, unconstrained firms increase investments and the constrained ones reduce their dependence on internal funds due to the possibility of obtaining external resources at a lower cost in equity markets.

While Baum et al. (2011) show a significant impact of the banking system on a firm's liquidity constraints, we find evidence that a market-based economy fits better for easing the constrained firms' access to finance. Inasmuch as their study is based on a cross-country data, ours is applied to a single economy. According to Luintel et al. (2008) and Arestis et al. (2010), the lack of a consensus at a theoretical level regarding the role of financial structure on economic activity may be the result from the absence of studies that account for cross-country heterogeneity. Whereas our work is conducted for only one country, the studies that point to the irrelevance of financial structure or evidence the importance of some particular kind of financial structure are conducted for a set of different economies. This fact might relativize the role of a specific country's financial organization on financial constraints since financial structure is a relative measure. Additionally, another shortcoming of cross-country studies is that the resulting estimates are applied to the whole sample analyzed as well as to each country individually. This leads to the assumption that the effects of financial structure are unchanged across countries and that the cross-country estimates are the same as the country-specific estimates. Consequently, this may result in doubtful inferences when the parameters estimated for a cross-country data are used in a country-specific analysis[21]. Lastly, it is also relevant to consider that the different development stages among economies may have different consequences on the relationship between the financial system and investment.

Moreover, Brazil's financial system has some characteristics that may help explain our results. Though the results presented here point to the relative importance of the stock market for a firm's investment, the role of the credit market cannot be neglected and the results must be interpreted cautiously. Although the credit level in the Brazilian economy has increased in recent years, the amount of credit that is destined to firms is still low. Consequently, the effect of private credit on investment is reduced, as most firms do not enjoy the benefits of policies

[19] Rajan (1992) points out that, by monitoring the firms, banks can hinder the firms' incentives by extracting them informational rents. He also points out that close bank-firm ties may put firms apart competition.

[20] According to Demirgüç-Kunt and Maksimovic (2002) inasmuch as the banking sector development is related to short-term financing, the development of a market-based economy is more related to long-term financing.

[21] The study of Luintel et al. (2008) demonstrates that the parameters estimated for a panel of countries do not correspond to the country-specific estimates.

designed to increase the credit level. This fact, associated with the recent developments in the Brazilian capital markets, add more relevance to the role of the stock market on a firm's investment in Brazil[22]. Though the Brazilian banking system has evolved operationally and has developed improvements, which made the system resilient to the turbulent financial environment it faced between 1994-2006, some inefficiencies and imperfections still persist and harm its functioning. Among such limitations, the great shortcoming of the Brazilian banking system is the inexistence of a private long-term financing provider. Actually, the Brazilian government, through the BNDES, is the only source of long-term financing of the economy. In such situation, international experience has shown that countries that grant the state the role of main long-term credit provider have financial institutions that are less engaged in overcoming market frictions, but more concerned in reaching political objectives. A related study by Carvalho (2014) shows that the Brazilian government's control of banks affects the allocation of resources in the financial market and is associated with political interests, which affect the decisions of firms. Likewise, as pointed out by Goldfajn et al. (2003), the Brazilian banking sector does not fully exert the role of financial intermediary, making firms having to rely on internal resources for financing. This is especially true for those firms that have no access to the stock markets.

This study also points to the significant role of financial development for a firm's investment decisions. Although in this paper the measures used to represent the degree of financial development are widely used in the literature, to effectively measure the effects of financial development on investment, one should preferably employ indicators that discriminate between credit purposes. This implies distinguishing between credit for investment and credit for consumption. Although the ratio of total private credit designed for investment is high in developed economies, that amount is very small for Brazil. In 2006, the ratio of credit for investment purposes was about 6% of GDP and only 19% of total private credit in Brazil. These indicators are translated into lower indicators of financial development and a poorer source of funds for a firm's financing. The situation is even more critical when one considers that the Brazilian supply of long-term finance is relegated only to official agencies. In this case, the use of this directed credit as a measure of the Brazilian banking system development can also be translated into higher values for the financial structure variables, giving more emphasis to the stock market in the relative indicator of financial structure in this study.

Given the results presented here, this paper provides some important policy messages. Though there is room for long-term credit expansion policies in Brazil, the extent to which credit can be amplified demands diligent attention. This fact leads to an important policy implication, as a mere increase in the credit for investment, by itself, does not always translate into increase growth. A firm's investment decisions depend on numerous factors that should also be considered. Although we control our results for the economic growth and the market uncertainty, it is also necessary to understand that some conditions, such as economic stabilization, inflation control, tax and interest rates issues, and other factors should be satisfied in order to create an environment that is conducive to investment. The high interest rates that the Brazilian economy still maintains do not encourage Brazilian companies to increase their indebtedness. Improvements in the legal system should also be considered in order to guarantee creditor rights. Furthermore, there is also the need to develop a monitoring mechanism for the long-term credit to ensure that this credit is used for productive purposes and to guarantee an efficient use of resources. Only under these circumstances increasing credit policies can stimulate investment.

Despite the fact that the findings presented here point to the market-based view, it is also important to correctly interpret this result. It does not mean that the Brazilian stock market is developed, as it still requires progress to increase its capillarity, activity and trading volume. Improvement needs are even more evident when the Brazilian stock market indicators are

[22] As pointed out in the section 4.1, the Brazilian capital market has fostered some changes that have added some transparency to the financial system and have increased the investors' reliance. Among such changes are the Corporate Law in 2001, the Bankruptcy Law in 2005, and the institution of the New Market and the Differentiated Levels of Corporate Governance in 2000.

compared with those from developed countries. Additionally, the fact that the stock market development stimulates the firms' growth does not disqualify the important role of credit for investment. This statement is especially reinforced when we consider that many firms still do not have access to capital markets, especially those considered as new and small companies. It is important to understand that in Brazil only the best companies are able to do an IPO, which gives them the possibility of a new financing market that other firms do not have access to. This is especially true for the private placement firms, which comprises most of our sample. These are the firms that may better enjoy moving toward a market-based economy in relation to other firms. Lastly, a final important message emerges from this perspective if government intends to provide an industrial policy to encourage the development of some specific types of firms. In this situation there should be a link between a firm's financial needs and the promotion of a proper type of funding designated for the expected purpose.

5. Conclusions

In this paper our goal is to analyze the effects of the financial system on a firm's investment decisions for Brazil. As far as we know, the literature has no studies addressing this issue for a specific emerging country, such as the Brazilian economy. Most of the recent empirical works analyze the financial system issue using cross-country data and do not address the heterogeneity between countries, which may mask relevant cross-country differences in the relationship under analysis. Furthermore, the relationship between financial system and investment may be different for countries at different stages of development, which implies different inferences depending on the economy under concern. Considered a developing country, the economy under analysis still faces some barriers that limit its growth, such as the firms' dependence on internal financing. This requires a better understanding of the Brazilian financial system in order to comprehend its shortcomings and overcome its limitations. This paper is the first attempt to fill this gap in the literature by means of a proper inquiry into this issue for Brazil. Herein the financial system is characterized by its level of financial development as well as by its financial structure (market-based versus bank-based).

The results in this study provide some interesting findings. In agreement with Love (2003) and Ndikumana (2005) the evidence shows that the level of financial development matters for growth and it is related to a firm's investment. However, this effect seems to be different for unconstrained and constrained firms. For the former ones the impact is direct, and for constrained firms the financial development affects investment through a lower dependence on internal resources. In this last case, a higher level of financial development is translated into a lower degree of financial constraints. We also test the existence of another transmission channel through which financial development may affect a firm's investment behavior. Thus, we analyze whether financial development raises the investment response to an increase in a firm's demand. The findings suggest that a higher financially developed environment enables constrained firms to increase investment in response to growth opportunities due to a higher finance availability. Despite the low credit supply and the incipient stock market in Brazil, these results reinforce the important role of financial development at microeconomic level and the prominence of policies that take into consideration a higher financial system development.

Our results are also informative about the role of financial structure on investment decisions. We find that the organization of the financial system impacts a firm's investment behavior. After controlling for the level of financial development, the financial structure seems to affect constrained firms through lower investment-cash flow sensitivity, but leaves unconstrained firms unaffected. . This evidence points to the development of a market-based economy for mitigating the constrained firms' financial constraints. As the stock market develops, it reduces intrinsic inefficiencies associated with banks and promotes growth by easing forms of fundraising. This aspect may reduce the self-financing needs of constrained firms. Although not all firms have access to capital markets, a higher stock market development would

open up the possibility of a new financing source in light of the limited credit availability of the Brazilian financial system. Similar to the financial development variables, the financial structure also appears to have an incremental effect on investment through growth opportunities. As the Brazilian financial system develops toward a market-based financial structure the cost of capital is reduced in equity markets. If growth opportunities are available, firms will increase investment due to the better financing environment created by the capital markets development. This finding should motivate future studies to explore additional transmission channels that could reflect the relationship between financial development, financial structure and investment.

The results in this paper also highlight some important points with regard to policies aimed at boosting investment and easing restrictions in corporate financing. First, although Brazil may be classified as a market-based economy, this is not due to the existence of a large, active and efficient capital market. Rather, this is because the Brazilian banking system is still underdeveloped if we consider the low amount of credit available for investment. Second, although this study points to a market-based system for enhancing investment and easing financial constraints, the importance of the private credit for a firm's growth cannot be neglected inasmuch as the overall financial development level is also important for a firm's investment. We should also consider that equity markets are unable to attend the financing needs of some Brazilian firms, whose investments are funded either through internal resources or directly through banks and other financial intermediaries. This requires a better credit policy to encourage a financial sector reform, which associated to a stable macro-financial environment and to monitoring mechanisms, will stimulate long-term financing. Third, although financing through shares in Brazil has shown a growing trend over the last years, the value traded in capital markets is still too low in the Brazilian economy. Although some measures have been implemented to improve the functioning of the Brazilian capital market, this situation calls for reforms and incentives to increase the liquidity of this market and its trading volume. This type of policy could create an environment that facilitates the development of the stock market as well as stimulate investments and economic growth. Although this paper is the first attempt to draw a specific analysis for Brazil, its findings should encourage further exploration on the impact of such policies on the development of the financial system and its consequences on a firm's investment behavior.

Lastly, the possibility that the results presented here may also reflect the adaptive relation of firms with the current Brazilian financial system organization should also be taken into consideration. If this is the case, the growth rate analysis of these firms does not allow concluding whether a specific financial system could lead to higher firm growth or if a different financial system could encourage the development of certain types of firms. We leave this as an open question for future studies.

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Appendix

[Insert TABLE A here]

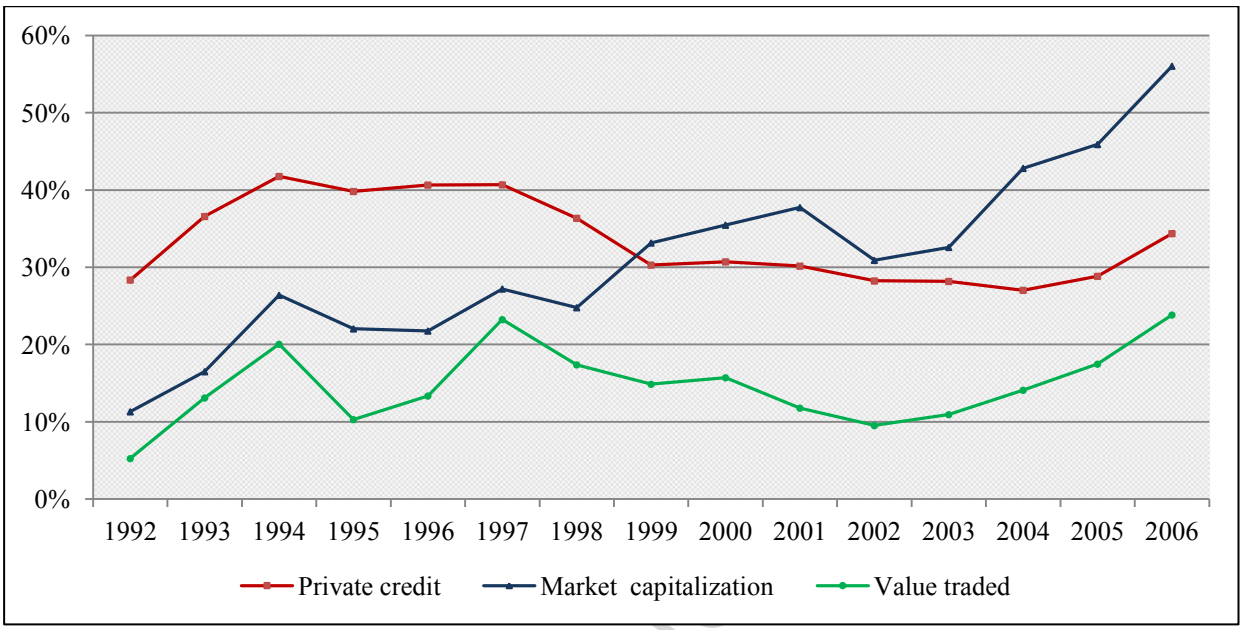

Figure 1: Evolution of private credit, stock market capitalization and stock market value traded for Brazil from 1992 to 2006. All variables are as share of GDP.

Table 1: Descriptive statistics - Mean values of financial variables

Financial indicators	KZ Index				WW Index			
	Unconstrained		Constrained		Unconstrained		Constrained	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
I/K_{t-1}	0.0498	0.4322	-0.0111	0.3224	0.0378	0.3943	0.0003	0.3599
CF/K_{t-1}	0.8502	1.3302	0.0842	0.3793	0.5505	1.1954	0.2983	0.6473
S/K_{t-1}	7.1932	9.6630	3.0524	3.7259	4.2556	7.8627	5.0937	5.8363
D/K_{t-1}	1.3644	4.0501	1.0791	1.3457	1.2445	3.1002	0.8848	1.9152
Total assets	7.9e+08	2.5e+09	1.4e+09	3.2e+09	2.4e+09	5.0e+09	1.2e+08	6.2e+07
Sales growth	0.0868	0.3765	0.0613	0.3016	0.1353	0.4121	0.0077	0.2098
D/Total assets	0.1081	0.1071	0.3437	0.1405	0.2277	0.1648	0.2067	0.1507
D/Net equity	0.2391	0.3857	1.7242	4.5426	0.7444	1.3320	0.8447	2.7386
NI/K_{t-1}	0.7242	1.3266	-0.0344	0.3753	0.4260	1.1912	0.1782	0.6418
NI/Total assets	0.0972	0.0807	-0.0048	0.0897	0.0630	0.0918	0.0269	0.0983
NI/Net equity	0.1543	0.7148	-0.1296	1.0224	0.1018	0.4044	-0.0468	1.0519
Cash holding	0.1962	1.2385	0.0526	0.0859	0.1637	1.2277	0.0681	0.1537
WC/K_{t-1}	2.4078	6.2735	0.1976	1.1433	1.2036	5.7174	0.9825	2.5325
KZ index	-1.7992	4.5481	1.3483	0.6215	-0.2948	3.3575	0.2011	2.2914
WW index	-0.8706	0.0551	-0.8687	0.0676	-0.9289	0.0441	-0.8118	0.0235
Observations	1,293		1,293		1,293		1,293	

Table 1 reports the mean and the standard deviation of financial variables for financially unconstrained and financially constrained firms classified according to the KZ and WW indexes. The subscript t indicates time. Variable definitions are in Table A.

Table 2: GMM-system estimates of the investment model with financial development variables

Variable	KZ Index						WW Index					
	Unconstrained			Constrained			Unconstrained			Constrained		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
$(I/K_{t-1})_{it-1}$	0.171**	0.167**	0.184**	0.245***	0.238***	0.243***	0.231**	0.232**	0.250***	0.161**	0.160**	0.155**
	(0.077)	(0.078)	(0.079)	(0.064)	(0.063)	(0.064)	(0.095)	(0.097)	(0.097)	(0.073)	(0.073)	(0.072)
$(I/K_{t-1})^2_{it-1}$	-0.122**	-0.119**	-0.126***	-0.105***	-0.098***	-0.106***	-0.105**	-0.104**	-0.113***	-0.095***	-0.098***	-0.094***
	(0.048)	(0.048)	(0.048)	(0.030)	(0.030)	(0.030)	(0.043)	(0.043)	(0.043)	(0.029)	(0.030)	(0.029)
$(CF/K_{t-1})_{it}$	-0.051	-0.008	-0.012	-0.629	-0.150	0.342***	0.033	0.021	-0.000	-0.202	0.004	0.170**
	(0.114)	(0.026)	(0.048)	(0.405)	(0.143)	(0.100)	(0.174)	(0.045)	(0.062)	(0.154)	(0.041)	(0.078)
$(D/K_{t-1})_{it}$	-0.003	-0.003	-0.004	0.045*	0.043*	0.045*	0.014	0.014	0.014	-0.011	-0.011	-0.012
	(0.006)	(0.006)	(0.006)	(0.024)	(0.025)	(0.025)	(0.009)	(0.010)	(0.010)	(0.019)	(0.020)	(0.019)
SG_{it}	0.237	0.098	0.025	1.325**	0.525**	-0.179	0.814	0.199	-0.053	0.494	0.352*	-0.096
	(0.586)	(0.186)	(0.136)	(0.609)	(0.252)	(0.117)	(0.625)	(0.221)	(0.167)	(0.499)	(0.181)	(0.148)
$Size_{it}$	0.210***	0.201***	0.215***	-0.004	-0.004	0.000	0.178***	0.169**	0.183***	0.402***	0.396***	0.405***
	(0.072)	(0.070)	(0.069)	(0.027)	(0.027)	(0.027)	(0.064)	(0.070)	(0.064)	(0.086)	(0.086)	(0.086)
$GDPg_t$	0.190	0.008	0.274	1.336***	1.304***	1.259***	0.425	0.348	0.638*	0.701*	0.600	0.649**
	(0.412)	(0.401)	(0.373)	(0.319)	(0.332)	(0.301)	(0.389)	(0.423)	(0.345)	(0.359)	(0.374)	(0.322)
$Volatility_{t-1}$	-0.009***	-0.007***	-0.009***	0.007***	0.007***	0.007***	-0.003	0.000	-0.002	-0.004*	-0.004**	-0.004*
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$(FDa)_t$	0.119***			-0.014			0.111**			0.019		
	(0.044)			(0.040)			(0.047)			(0.052)		
$(CF/K_{t-1})_{it}.(FDa)_t$	-0.014			-0.228*			0.006			-0.094*		
	(0.039)			(0.126)			(0.058)			(0.055)		
$(SG)_{it}.(FDa)_t$	0.052			0.364**			0.211			0.149		
	(0.180)			(0.181)			(0.195)			(0.156)		
$(FDs)_t$		0.375***			-0.001			0.388***			0.125	
		(0.132)			(0.119)			(0.140)			(0.154)	
$(CF/K_{t-1})_{it}.(FDs)_t$		-0.001			-0.706**			0.026			-0.274*	
		(0.097)			(0.342)			(0.139)			(0.163)	
$(SG)_{it}.(FDs)_t$		0.056			0.991*			0.121			0.864**	
		(0.477)			(0.538)			(0.563)			(0.434)	
$(FDe)_t$			0.123**			0.011			0.116**			0.037
			(0.050)			(0.048)			(0.057)			(0.057)
$(CF/K_{t-1})_{it}.(FDe)_t$			0.006			-0.398**			0.023			-0.122
			(0.057)			(0.166)			(0.078)			(0.077)
$(SG)_{it}.(FDe)_t$			0.056			0.547**			0.293			0.188
			(0.217)			(0.213)			(0.246)			(0.215)
Observations	1,148	1,148	1,148	1,121	1,121	1,121	1,126	1,126	1,126	1,125	1,125	1,125
Number of firms	288	288	288	270	270	270	225	225	225	225	225	225
Tests (p-values)												
Sargan test	0.0896	0.1235	0.0930	0.1086	0.1564	0.1305	0.3034	0.2747	0.3052	0.1263	0.1478	0.1379
Serial correlation												
First-order	0.0000	0.0001	0.0000	0.0003	0.0003	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Second-order	0.8495	0.8204	0.7841	0.1688	0.1505	0.1508	0.2433	0.2317	0.2151	0.4684	0.4376	0.4306

Estimation by GMM-*system*. The dependent variable is $(I/K_{t-1})_{it}$. Variable definitions are in Table A. Standard errors are reported in parentheses below their respective estimated parameters. Symbols (***), (**) and (*) indicate statistical significance at 1%, 5% and 10% respectively.

Table 3: GMM-system estimates of the investment model with financial structure variables

Variable	KZ Index						WW Index					
	Unconstrained			Constrained			Unconstrained			Constrained		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
$(I/K_{t-1})_{it-1}$	0.174**	0.173**	0.158**	0.235***	0.223***	0.239***	0.251**	0.256**	0.236**	0.162**	0.167**	0.163**
	(0.078)	(0.084)	(0.075)	(0.066)	(0.062)	(0.067)	(0.099)	(0.104)	(0.098)	(0.072)	(0.071)	(0.074)
$(I/K_{t-1})^2_{it-1}$	-0.125**	-0.123**	-0.118**	-0.101***	-0.089***	-0.101***	-0.112**	-0.111**	-0.105**	-0.094***	-0.098***	-0.094***
	(0.050)	(0.052)	(0.048)	(0.031)	(0.030)	(0.031)	(0.046)	(0.045)	(0.046)	(0.029)	(0.029)	(0.029)
$(CF/K_{t-1})_{it}$	-0.036	0.006	-0.210	-0.149	0.378***	-0.962*	-0.013	0.035	-0.112	-0.024	0.243**	-0.539*
	(0.031)	(0.047)	(0.187)	(0.124)	(0.110)	(0.585)	(0.042)	(0.050)	(0.254)	(0.049)	(0.104)	(0.304)
$(D/K_{t-1})_{it}$	-0.003	-0.003	-0.003	0.041*	0.040	0.043*	0.016*	0.016	0.015*	-0.011	-0.013	-0.010
	(0.007)	(0.007)	(0.007)	(0.024)	(0.027)	(0.025)	(0.009)	(0.010)	(0.009)	(0.018)	(0.017)	(0.019)
SG_{it}	0.157	0.024	0.585	0.575**	-0.166	1.851*	0.438**	0.053	1.534**	0.139	-0.190*	0.702
	(0.165)	(0.115)	(0.775)	(0.234)	(0.118)	(1.011)	(0.178)	(0.124)	(0.764)	(0.138)	(0.111)	(0.640)
$Size_{it}$	0.217***	0.214***	0.212***	-0.010	-0.012	-0.010	0.197***	0.194***	0.189***	0.398***	0.400***	0.397***
	(0.073)	(0.075)	(0.073)	(0.028)	(0.028)	(0.029)	(0.061)	(0.067)	(0.062)	(0.086)	(0.088)	(0.085)
$GDPg_t$	0.355	0.190	0.344	1.342***	1.258***	1.378***	0.546	0.559	0.396	0.588	0.274	0.612
	(0.465)	(0.503)	(0.500)	(0.315)	(0.341)	(0.340)	(0.401)	(0.443)	(0.450)	(0.383)	(0.440)	(0.413)
$Volatility_{t-1}$	-0.008***	-0.004	-0.008***	0.007***	0.008***	0.007***	-0.002	0.005**	-0.002	-0.004*	-0.003	-0.004*
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
$(FSa)_t$	0.160**			0.000			0.163***			0.080		
	(0.063)			(0.056)			(0.058)			(0.072)		
$(CF/K_{t-1})_{it}.(FSa)_t$	-0.045			-0.396**			-0.035			-0.187*		
	(0.061)			(0.172)			(0.074)			(0.097)		
$(SG)_{it}.(FSa)_t$	0.133			0.591**			0.418**			0.185		
	(0.203)			(0.267)			(0.208)			(0.188)		
$(FSs)_t$		0.326**			0.080			0.413***			0.299*	
		(0.127)			(0.115)			(0.114)			(0.162)	
$(CF/K_{t-1})_{it}.(FSs)_t$		-0.036			-0.633**			-0.061			-0.357*	
		(0.080)			(0.289)			(0.084)			(0.186)	
$(SG)_{it}.(FSs)_t$		0.123			0.889*			0.286			0.614**	
		(0.311)			(0.463)			(0.394)			(0.305)	
$(FSe)_t$			0.143***			-0.016			0.140***			0.056
			(0.054)			(0.049)			(0.048)			(0.062)
$(CF/K_{t-1})_{it}.(FSe)_t$			-0.045			-0.238*			-0.027			-0.142*
			(0.044)			(0.129)			(0.059)			(0.072)
$(SG)_{it}.(FSe)_t$			0.113			0.372*			0.302*			0.152
			(0.166)			(0.213)			(0.163)			(0.140)
Observations	1,148	1,148	1,148	1,121	1,121	1,121	1,126	1,126	1,126	1,125	1,125	1,125
Number of firms	288	288	288	270	270	270	225	225	225	225	225	225
Tests (p-values)												
Sargan test	0.0766	0.1019	0.0625	0.1476	0.1988	0.1209	0.3194	0.3508	0.3015	0.1415	0.1666	0.1480
Serial correlation												

First-order	0.0001	0.0001	0.0001	0.0002	0.0004	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Second-order	0.8884	0.8783	0.9409	0.1551	0.1504	0.1741	0.2406	0.2442	0.2596	0.4292	0.3778	0.4622

Estimation by GMM-*system*. The dependent variable is $(I/K_{t-1})_{it}$. Variable definitions are in Table A. Standard errors are reported in parentheses below their respective estimated parameters. Symbols (***), (**) and (*) indicate statistical significance at 1%, 5% and 10% respectively.

Table 4: GMM-system estimates of the investment model with financial structure variables augmented by financial development measures

Variable	KZ Index		WW Index	
	Unconstrained	Constrained	Unconstrained	Constrained
(A) Finance-activity and Structure-activity measures				
$(CF/K_{t-1})_{it}$	-0.039	-0.190	-0.009	-0.017
	(0.028)	(0.120)	(0.043)	(0.049)
$(FDa)_t$	0.181	-0.080	0.085	-0.105
	(0.133)	(0.114)	(0.125)	(0.106)
$(FSa)_t$	-0.056	0.116	0.066	0.204
	(0.167)	(0.156)	(0.157)	(0.156)
$(CF/K_{t-1})_{it}.(FSa)_t$	-0.052	-0.463***	-0.031	-0.175*
	(0.055)	(0.171)	(0.073)	(0.094)
$(SG)_{it}.(FSa)_t$	0.119	0.660**	0.404*	0.181
	(0.193)	(0.278)	(0.210)	(0.191)
Tests (p-values)				
Sargan test	0.1111	0.1575	0.3357	0.1331
Serial correlation				
First-order	0.0001	0.0003	0.0000	0.0000
Second-order	0.8997	0.1577	0.2644	0.4593
(B) Finance-size and Structure-size measures				
$(CF/K_{t-1})_{it}$	0.010	0.414***	0.033	0.239**
	(0.044)	(0.109)	(0.050)	(0.100)
$(FDs)_t$	0.378	-0.229	0.245	-0.256
	(0.283)	(0.231)	(0.261)	(0.214)
$(FSs)_t$	0.054	0.281	0.230	0.482**
	(0.233)	(0.227)	(0.230)	(0.227)
$(CF/K_{t-1})_{it}.(FSs)_t$	-0.042	-0.722***	-0.053	-0.343*
	(0.075)	(0.278)	(0.085)	(0.180)
$(SG)_{it}.(FSs)_t$	0.083	0.981**	0.251	0.620**
	(0.291)	(0.487)	(0.381)	(0.312)
Tests (p-values)				
Sargan test	0.1251	0.1582	0.3269	0.1875
Serial correlation				
First-order	0.0001	0.0004	0.0000	0.0000
Second-order	0.8671	0.1661	0.2644	0.4213
(C) Finance-efficiency and Structure-efficiency measures				
$(CF/K_{t-1})_{it}$	-0.271	-0.861	-0.130	-0.543*
	(0.182)	(0.603)	(0.252)	(0.313)
$(FDe)_t$	0.116	0.068	0.052	-0.007
	(0.105)	(0.083)	(0.095)	(0.119)
$(FSe)_t$	0.069	-0.076	0.106	0.062
	(0.095)	(0.088)	(0.087)	(0.121)
$(CF/K_{t-1})_{it}.(FSe)_t$	-0.060	-0.215	-0.031	-0.143*
	(0.043)	(0.133)	(0.058)	(0.075)
$(SG)_{it}.(FSe)_t$	0.121	0.362*	0.310*	0.139
	(0.149)	(0.210)	(0.166)	(0.144)
Tests (p-values)				
Sargan test	0.0809	0.1062	0.3102	0.1196
Serial correlation				
First-order	0.0001	0.0003	0.0000	0.0000
Second-order	0.9189	0.1754	0.2617	0.4136
Observations	1,148	1,121	1,126	1,125
Number of firms	288	270	225	225

Estimation by GMM-*system*. The dependent variable is $(I/K_{t-1})_{it}$. Variable definitions are in Table A. Standard errors are reported in parentheses below their respective estimated parameters. Symbols (***), (**) and (*) indicate statistical significance at 1%, 5% and 10% respectively.

Table A: Variable definitions

Abbreviation	Variable description
Firm-level variables	
Cash	Cash + short-term investments
Cash holding	Cash holding = (Cash / S)
CF	Cash flow = NI + DA
D	Debt = STD + LTD
DA	Depreciation + amortization expense
DDIV	Dummy variable that takes the value one if the firm pays cash dividends
Div	Dividends payment
I	Firm's investment = $(K_{it} - K_{it-1})$
ISG	Industry's sales growth
K	Capital stock, measured by property plant and equipment
LTD	Long-term debt
NI	Net income
Q	Tobin's Q
S	Sales
SG	Firm's sales growth
Size	Firm size = log(firm's total assets)
STD	Short-term debt, it is the debt in current liabilities
TA	Firm's total assets
TotCap	Total capital = D + stockholders' equity
WC	Working capital = Current assets – Current Liabilities
Country-level variables	
FDa	Finance-activity = log(PC x VT). It is a measure of financial development
FDs	Finance-size = log(PC + MC). It is a measure of financial development
FDe	Finance-efficiency = log (VT/OC). It is a measure of financial development
FSa	Structure-activity = log(VT/PB). It is a measure of financial structure
FSs	Structure-size = log(MC/PB). It is a measure of financial structure
FSe	Structure-efficiency = log(VT x OC). It is a measure of financial structure
GDPg	Annual growth rate of gross domestic product, measured as $\log(GDP_t) - \log(GDP_{t-1})$
MC	Stock market capitalization. Equals to the ratio of the value of listed shares to GDP. It is a measure of the stock market development
OC	Overhead costs of the banking system. It is the accounting value of banks' overhead costs as a share of banks' total assets
PB	Private credit by deposit money banks. It is the credit allocated to the private sector by deposit money banks as a share of GDP.
PC	Private credit. It is the credit allocated to the private sector divided by GDP. It includes private credit by deposit money banks and other financial institutions. It is a measure of financial intermediaries development
Volatility	Market volatility
VT	Value traded. It is defined as the ratio of the stock market trading volume to GDP. It is a measure of the stock market development

Highlights:

- Financial development affects the unconstrained and constrained firms' investments
- The financial structure has effects on the investment of constrained firms
- A market-oriented economy reduces the constrained firms' financial constraints