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CREDIT SCARCITY IN DEVELOPING COUNTRIES: AN EMPIRICAL INVESTIGATION USING BRAZILIAN FIRM-LEVEL DATA

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Abstract

Credit constraint is one market failure existent in many developing countries, as evidenced by Banerjee and Duflo (2005). Its relevance to innovation and growth is crucial, since it hampers entrepreneur efforts for making investments. Terra (2003) and Aldrighi and Bisinha (2010) provided evidence that Brazilian firms are indeed credit constrained using microdata, yet some differences between them emerge. While Terra (2003) outcomes suggest that credit constraints are softer for large firms, Aldrighi and Bisinha (2010) found the opposite. We shed some light to this debate exploiting a rich database that contains both listed and non listed firms in the stock market. Instead, both cited papers focused on firms in the former group. Since non listed firms comprehend the major part of Brazilian firms, our results are grounded in a more representative sample. Also, we exploit the availability of non-traded firms to investigate whether this type of firms are more credit restricted than those listed in the stock market. Finally, we discuss if exporting firms are less credit constrained. Our results show that all dimensions considered, greater size, listed in the stock market, and export capacity, are associated with less credit restriction. Besides, the influence of the last two is beyond any possible correlation with size: even small firms are not restricted either listed in the stock market or with high export revenue.

JEL Classification Code: D92, E22

Keywords: Credit Constraint, Firm's Investment.

1 INTRODUCTION

Credit constraint is a widespread market failure, especially in developing countries, as evidenced by Banerjee and Duflo (2005). Its adverse consequences, inhibiting entrepreneur capacity to make investments, are particularly important to these countries, which needs to accumulate capital and implement innovations to accelerate growth.

This paper investigates whether Brazilian companies are credit constrained considering the investment-cash flow model proposed by Fazzari, Hubbard and Petersen (FHP, 1988). The main interest in this case is to verify the sensitiveness of firm's investment to cash flow as synonyms of credit constraint. The use of a large and yet few exploited dataset is one of the main contribution of the paper. It contains balance sheet information for more than 3,000 industrial firms with characteristics that may affect the degree of credit constraints, for example, size, the participation in the Brazilian stock market and level of export's sales.

Despite heterogeneity in our sample, the presence of non-listed firms imposes some difficulties. In particular, Tobin's Q can not be used as a proxy for investments opportunities. This problem is circumvented by using multiple proxies controlling for investment opportunities. For instance, we consider variation of sales at firm level and sector variation in investment and in value added at an aggregate level in order to control for investment opportunities.

Our main results indicate that Brazilian firms were credit constrained in recent years (2008-2010). Cash flow coefficient is indeed larger than what is usually obtained in the literature for other countries, such as Carpenter and Guariglia (2008), suggesting a higher degree of imperfections in the Brazilian credit market. Furthermore, this coefficient is different when firms are classified according to the three categories that may properly approximate the degree of credit constraint: size, listed on stock markets and the level of export's sales. In the first case, Brazilian firms are classified as small, middle and large considering the number of employees. Although previous evidence that analyses the impact of size on credit restrictions has been mixed in Brazil, as observed in Terra (2003) and Aldrighi and Bisinha (2010), our results are in line with the traditional literature: cash flow coefficient is insignificant or at least (depending on the econometric specification) has a lower elasticity magnitude for larger firms.

Our two other categories, companies listed on the Brazilian stock market (public versus non-public firms) and level of export to sales ratio (no export at all, below and above the median) provide evidence that investments for firms listed on stock markets and for those large exporters are not sensitive to cash flow variation. Besides, the influence of these categories is beyond any possible correlation with size. When interacting those dummies, listed and export, with size groups, our results suggest that while no-large firms are in general credit constrained, this credit restriction was softened for listed firms and large exporters. In this context, understanding stock market participation as a "domestic" source of external investment's funds and the level of export's sales as a proxy for "foreign" source, once export revenue may be seen as a collateral to get access to international financing, our results suggest that these firms' characteristics are effective to evaluate their degree of credit restrictions.

In order to perform our investigation, this paper is structured in 5 sections apart from this introduction. Section 2 provides a brief survey of the literature. Section 3 presents methodology to analyze credit restriction. Data description is presented in Section 4 as well as some descriptive statistics on the main variables. Next, we present and discuss our results, followed by robustness outcomes. Last section concludes.

2 LITERATURE AND THE BRAZILIAN CONTEXT

In a world of perfect capital markets, without transaction costs and taxes, the Modigliani-Miller Theorem asserts that financial structure of firms are irrelevant for their real decisions, in particular investments. But in reality all these assumptions are non-valid, and a special focus of the literature has been the case of asymmetric information. The asymmetries in financial markets may be due to differential information about types, where borrowers have more information about their projects risks or managerial abilities than creditors, or due to difficult verifiability of actions, where creditors cannot observe investment choices or the real capacity of repayment from borrowers. The main consequence is a gap between the internal (for example, retained profits) and external (for example, bank credit) cost of funds, explained by the creditor need to raise funds to compensate risk of bad quality borrowers (the adverse selection problem) or costly monitoring (the moral hazard problem) (Stiglitz and Weiss, 1981).

An empirical testable implication of higher costs from external sources is that increases in firm‘s cash flow must push more investment. Moreover, as supposed by major part of the literature, another implication should be a more sensitive correlation between cash flow and investment in firms where information costs (and hence the gap between the internal and external costs of funds) are higher.

The seminal researchers testing these hypotheses were Fazzari, Hubbard and Petersen (FHP, 1988). They split a sample of US firms in three categories regarding dividend payments, high, medium and low, and showed that the relation between cash flows and investments were significantly higher in the last group, which corroborates the hypothesis when one assumes that these kind of firms are more likely to suffer credit restrictions.

This paper lead to an extensive empirical literature, where two main themes have been emphasized: the need to control in an appropriate manner for investment opportunities, where otherwise a positive association between cash flow and investment may simply say that better opportunities induce firms investment and at the same time impact cash today, and a critic of the basic methodology employed in FHP regarding the criteria for splitting the firms in different classes of information costs.

Concerning the first problem, the initial proxy used for controlling investment opportunities, Tobin‘s Q, was criticized because what can be constructed using real data (mean Q) is equivalent to what in theory reflect investments opportunities (marginal Q) only under strong assumptions. Moreover, since Tobin‘s Q, as the ratio between firm market value and recomposition cost of capital, only reflects investment opportunities from an outside point of view, which may not properly capture real opportunities under imperfect capital markets (Carpenter and Guariglia, 2008). Besides, this proxy is simply absent when one analyses data with non-traded firms (Baum et al., 2011; Guariglia et al., 2011).

The response to this problem has been mixed in the literature, ranging from the development of alternative proxies that can better capture investment opportunities to a change in methodology that abandons the necessity of using Tobin’s Q. For the first approach, prospect of future expense in capital goods is used to complement information in Tobin’s Q in order to capture the internal view of opportunities (Carpenter and Guariglia, 2008), or more aggregate variables are used in this regard, as industry-level value-added growth when data base contains firms not traded publicly (Guariglia, Liu e Song, 2011). For the second, it is better exemplified by the “Euler equation approach” to the problem, where one tests if the firms’ investment behavior is consistent with the first-order condition that may prevail when they solve a dynamic programming problem under perfect markets (Bond and Meghir, 1994). Although many of these proposed solutions may be ingenious, the fact is that it is really very hard to do a proper control. Most studies are subject to the critic that a statistically positive correlation between cash flow and investment may reflect mis-measured investment opportunities.

Another challenge to this literature is given by how to classify firms regarding to levels of information costs. In an influential paper, Kaplan and Zingales (KZ, 1997) argued that theoretically the relation between the dependence of investments to internal funds and information costs was not necessarily monotonic. They reviewed the seminal article of FHP, and splitting their low dividend payment sample with respect to the probability of liquidity need, they showed that in firms more propense to be short of liquidity, the relation between cash flow and investment was weaker, contrary to the original hypothesis sustained by FHP. Moreover, an interesting insight raised by KZ is that it is difficult to say if this result is at odds with the literature so far, because in many known papers the financial criteria used to classify firms between more or less credit restricted may not correspond to the real information costs and hence effective credit constraint of this firms: for instance, firms linked to a bank (conglomerates) may be less credit constrained under an adverse selection story where the "lemons risk" limits access to capital markets, but otherwise may be more financially dependent under a story of monopsonic power of incumbent creditor.

KZ paper was the origin of a huge controversy in this literature, with some authors reaffirming KZ findings (Clearly, 1999) while others criticizing their approach (for instance, Hubbard 1998 or Allayannis and Mozumdar, 2004). One of the main arguments against KZ is that firms classified as most prone to suffer illiquidity are in general financially distressed, where creditors may seize their new generated funds as repayment for old debts weakening in this way the relationship cash flow – investment. Beyond this controversy, a point that must warm researchers refers to the properly classification of firms by categories that really measure information costs. In fact, Cleary (2007) arguments that the sensitivity of cash flow – investment between firms with more or less financial restriction depends crucially on what variables are used to classify firms as credit constrained.

The relation between investment and cash-flow was also studied in Brazil. In fact, the structure of Brazilian capital markets is suggestive that firms may be subject to credit constraints. While the banking system is considered robust and sophisticated, the segment of long term credit is a point of weakness, being covered almost exclusively by state-owned institutions. The market for corporate bonds is incipient, due, for instance, to the difficult of developing a secondary market that may provide liquidity for potential investors. On the other hand, stock market is relatively well developed, but only a few firms have access to it.

Terra (2003) is one of the main references in the Brazilian literature. More recently, we can cite the work of Aldrighi and Bisinha (2010). The general conclusion of these authors is that Brazilian firms are indeed credit-constrained. However, in odds with the conventional literature, firms that should be more credit constrained when using some standard measure (size, for instance) do not appear to have a more significant coefficient in the investment – cash flow equation. In Terra (2003), the hypothesis that the cash flow coefficient is equal for large and small firms cannot be rejected, unless in a limited period of time (1994-1997) when credit constraints were softer among large firms[1]. In Aldrighi and Bisinha (2010), the cash flow coefficient is always significant, and indeed increases with firm size. The authors suggest that financial difficulties between firms with smaller size may explain their findings, as the desire to maintain a "financial slack" avoiding in this way future liquidity problems may weaken the investment – cash flow relationship.

A main feature of both papers is that they use information of firms which are required by law to make their balance sheet data public, since their shares are available in the stock market. As mentioned in the introduction, we contribute to this literature by analyzing also firms not listed in the stock market, which correspond to the major part of Brazilian firms. And for the two main concerns of the literature cited before, our paper controls for investment opportunities using variables at the firm, as well as at the sectorial level. Furthermore, regarding the classification of firms within different information costs, we believe that the categories we use, size, access to capital markets, and export capacity, can properly measure credit constraints.

3 METHODOLOGY

The model to investigate whether Brazilians firms are credit constrained is based on Carpenter and Guariglia (2008) and Guariglia (2008), as shown in (1).

$$I_{it}/K_{it-1} = \delta(Cash\,Flow_{it}/K_{it-1}) + \beta^{'} X_{it} + \gamma_t + \mu_i + \varepsilon_{it} \tag{1}$$

where i and t identify, respectively, firms and time, I_{it} is the firm's investment, K_{it} is the firm's fixed asset, γ_t is the time-effect for controlling business-cycle effects, μ_i is the fixed-effect, and ε_{it} is the error-term. For robustness checks, the specification (1) may include covariates X_{it}, given by investment opportunities variables, that also impact the dependent variable.

[1]Indeed, the country experienced large inflows of FDI due to the privatization program in this period.

For eliminating firm-effect, we estimate equation (1) by fixed-effect and first-difference. Time-effect is controlled by imposing dummies for instant t. Furthermore, to control for industry-effect, another way to embody investment opportunities, we have included dummies for each industry j interacted with time dummies in all estimated models.

The OLS in first-difference may present the problem of endogeneity. Due to this fact, we apply Generalized Method of Moments approach (GMM) based on Arelano and Bover (1995) and Blundell and Bond (1998). This approach combines the standard set of equations in first-difference with lagged levels of regressors as instruments, with the incorporation of equations in levels with lagged first-difference as instruments.

The parameter of interest is $\hat{\delta}$. In the presence of imperfection in credit market, the estimated coefficient should be positive and statistically significant, i.e., the firm's investment is sensitive to the cash flow, as discussed previously.

Although the main aim of the paper is to evaluate whether Brazilian manufacturing firms are credit constraint, we also investigate whether there are differences in the cash flow coefficient across the following groups of firms: (i) their size, evaluated by number of employees; (ii) whether they are listed or not on the stock market; and (iii) the level of firm's exports, given by the ratio between exports and sales revenue. All these classifications allow coefficients of control variables to differ across observations in the distinct sub-samples and it will indicate the level of financial constraints faced by firms. Thus, cash flow variable may be interacted with different dummies variables:

a) $SMALL_{it}$ refers to the firms i that have a number of employees inferior than the its 25th percentile of the sample distribution at instant t, $MIDDLE_{it}$ indicates the number of employees between 25th and 75th percentile, and $LARGE_{it}$ refers to the number of employees which fall above the 75th percentile.

b) $LISTED_i$ refers to firm i listed on stock market in the period between 2007 and 2010, and NO_LISTED_i the opposite.

c) NO_EXP_{it} indicates no-exporting firm i at the instant t, EXP_LOW_{it} refers to exporting firms but with ratio which falls below the 50th percentile of the sample distribution, and EXP_HIGH_{it} indicates the opposite.

4 DATA AND SUMMARY STATISTICS

In order to evaluate the link between cash flow and investment, we use four different sources. SERASA is the main source as it contains balance sheet information for more than 28 thousand Brazilian firms with annual revenue over R$ 10 million (around US$ 5 million)[2]. From this dataset, we use different measures: capital, investment, cash flow and sale's revenue. Capital is the fixed assets value of each firm and investment is its variation. Cash flow is measured by Earnings Before Interest, Tax, Depreciation and Amortization (EBITDA). The dataset comprehends all sectors of the economy from 2006 to 2010, yet focus here will be given to industry sector from 2007 to 2010.

There are two reasons for this restriction. First, investment opportunities data is only available for the industry sector among 2007 and 2010. Basically, sectorial investment opportunities variables are given by the industry-level value added growth as well as the industry-level of fixed asset growth. These two variables are obtained from PIA-IBGE database (Brazilian Annual Survey of Industry). Second, industrial firm level data for 2006 is very reduced, including less than 1,000 firms. It is different from the period among 2007 and 2010 with more than 3,000 industrial firms. Therefore, we focused on firm level data starting in 2007 in order to keep cross-section information as wider as possible.

[2]SERASA is a company that compiles firm's financial statements and analyses these information to create credit scores.

Two other sources are utilized for this investigation. Number of employees of each firm from the Annual Social Information Report (Relação Anual de Informações Sociais – [RAIS]) of the Ministry of Labor is used to control for size. Additionally, information of the Foreign Trade Secretary (Secretaria de Comércio Exterior – [SECEX]) of the Ministry of Industrial Development and Foreign Trade regarding how much each firm has exported is considered.

To control for potential influence of outliers, we exclude firms with observations in the one percent tails of each of investment and cash flow variables. Finally, if firm's information is missing in any year from the period, we dropped it. Our final data consists of a balanced panel with 3,343 firms related to all industrial sectors. We divide our sample in three ways: listed on the Brazilian stock market (Listed); and large firms compared to Small and Medium Enterprises (SME); and their export status. As seen, the majority of firms in our sample are not listed in the stock market as well as they are SME.

As shown in Table 1, firms in our sample have around 246 employees where their exports represent only 6% of their revenues. Overall, figures represent what is expected: Firms listed on the stock market are larger in any term either by the number of employees. Regarding investment over capital, Brazilian firms in the industrial sector invest around a quarter of its capital every year. Moreover, there is no large difference between them, even when considering among the three categories defined above. What is striking is that firms not listed on the Brazilian stock market, SME and low exporters generate on average cash flow around their capital stock. On the other hand, large firms generate only 63% cash flow compared to its capital, public firms generate 44% and high exporters, 75%.

Moreover, considering these descriptive statistics, we may infer that SME firms, for instance, might be credit restricted since they have to generate much more cash flow in order to invest at the same rate as large firms. The same interpretation might be done for those not listed on the stock market. An important difference emerges in export status. Investment rate in large exporters is lower than no-exporters or those exporting below the median. However, their capacity to generate funds is lower than those other two groups. In other words, it seems that being a large exporter enables them to be less restricted. All these outcomes are rough evidences which should be corroborated by econometric scrutiny.

Finally, it is important to emphasize that SERASA database consists mainly in no-listed firms, covering a huge range of size. In this way, our study appears more suited for an investigation of credit restrictions than the ones focused on firms listed on stock markets, which are larger than the average firm in a developing country like Brazil. Furthermore, it is worth to mention that there are correct incentives for firms to provide true information to SERASA, because this information may be disclosed to the banking system and contributing to potential access to credit in more favorable conditions. The dataset is indeed representative of the Brazilian industrial sector, covering 27% of total revenues and 43% of total employment in the manufacturing sector[3].

5 EMPIRICAL RESULTS

Our results from specification (1) are presented in Table 2. Using data from 2008 to 2010[4], three approaches are explored: pooled ordinary least square (OLS); within groups (WG); and SYS-GMM. In the case of GMM approach, instruments are available for 2008. As said, two variables are applied as covariates in order to capture the sectorial investment opportunities effect: the industry-level of value added growth $VA\ Growth_{jt}$ and the industry-level of investment growth $Inv\ Growth_{jt}$. At the firm level, we impose the firm's annual sales growth variable $Sales\ Growth_{jt}$ in order to control also for investment opportunities. Time dummies and time dummies interacted with industry dummies were included in all the specification.

All estimated models have evidenced that firms are credit constraint even after controlling by industry-level

[3]For 2010 figures.

[4]Investment is measured by the differences between two years of fixed asset. Thus, we are able to construct investment only for 2008, 2009 and 2010.

variables. However, cash flow coefficients estimated by GMM have a superior impact when compared to others methods. This result may indicate that within groups estimates may still suffer from endogeneity bias.

Both sales and industry investment growth are only significant for pooled OLS estimates. Controlling for firm-effect, value added growth became statistically significant at the 10% level, nonetheless, with a wrong signal. The model in column 6 reveals an estimated coefficient equal to 0.25. Evaluated at the sample mean, this indicates an elasticity of the cash flow to capital ratio correspondent to 0.98. Indeed, this is a striking result: the impact of cash flow on investment is practically equivalent to the unity. The estimated coefficients of sales growth and investment opportunities are not significant at the 10% level.

We now evaluate the impact of cash flow on investment by classifying firms according to categories that may properly proxy for the degree of credit constraint. The first category considered is the firm's size, as shown in Table 3. Due to the fact that pooled OLS and within group coefficient may suffer from endogeneity problem, all models from now on are estimated only by system GMM. Table 3 is structured as follows: first column presents results without controls; second with controls not classified by firms' size; third column shows results where only sector controls are divided according to firms' size; last column presents outcomes where all controls are multiplied by firms' size[5].

The first two models in columns 1 and 2 indicate that all cash flow estimated coefficients are significant at the 10% level. In addition, it is not possible to reject the hypothesis that cash flow coefficients are equal across groups, according to the p-value of test χ^2 at the bottom of Table 3.

When covariates are also classified by size groups, as observed in columns 3 e 4, the coefficients of cash flow for large firms become non significant as a result of a significant and positive influence of sales growth variable. One should note that the middle firm's investment is still sensitive to cash flow even with the fact that the sales growth coefficient is positive and significant. The elasticity associated to cash flow of middle companies, evaluated at the mean, reaches 0.37. Considering the small group, the cash flow impact on investment is reduced when investment opportunities variables are considered, such that, the model's elasticity in column 4, evaluated at the sample mean, is 0.60. This reduction may be explained by the presence of positive and significant impact of industry value of added growth.

In all models, Sargan test reveals that instruments are valid. Given that in column 3 and 4 the cash flow coefficient for large groups individually is not significant at conventional levels, the tests that assess whether estimated coefficients are equal across groups associated to these models also include an additional null hypothesis, i.e., $H_0 : \hat{\delta}^{LARGE}$. As a result, the test reveals that estimated coefficient for large firms differs from the others groups. Otherwise, there is evidence that the impact of cash flow on investment is identical for small and middle firms.

When all variables are classified by size groups, we observed that the investment opportunities variables have important information about firm's investment. This outcome is essential given that the lack of control of the sales growth effect, for example, have misinterpreted the conclusion about the credit constraint validation for the group of large firms.

The participation in the Brazilian stock market is the second way to evaluate the degree of firm's credit constraint[6]. Table 4 presents regression outcomes splitting the sample into firms listed on the stock market or not.

In all models, it is not possible to verify a positive and significant impact of cash flow on investment for public companies. As discussed previously, 35 manufacturing firms available in SERASA database are listed on the stock market, yielding 105 observations from 2008 to 2010. Even after controlling for sales growth and investment opportunities, only no-listed companies reveal that credit is restrict. In this case, the elasticity, evaluated in the sample mean, is similar to GMM coefficients results of Table 2, given that the vast majority of firms compounding the database are not listed on the stock market.

[5] All tables from now on follow this structure.

[6] Brazilian stock exchange market is named Bolsa de Valores, Mercadorias & Futuros de São Paulo (BMF&BOVESPA).

Furthermore, when assessing whether estimated coefficients are equal across both groups, with the exception of model in column 1, the null hypothesis is not rejected at conventional level for three models, despite their isolated significance.

Finally, the last way to evaluate the degree of credit constraint is classifying firms by their export to sales ratio, as presented in Table 5. As discussed before, export revenue may be seen as potential collateral, in this way facilitating access to international financial markets and alleviating credit constraints.

According to Table 5, with the exception of the first model, when firms have a large ratio of export over sales, the impact of cash flow on investment is statistically null as a consequence of the significant effect of the control variables, specially, sales growth and industry-level of investment growth. On the other hand, financial constraint condition remains valid for both no-exporters and low-export firms.

The model in column 4 has an elasticity of cash flow on investment for non-exporters, evaluated at the sample mean, equal to 0.52, whereas elasticity for lower exporters is smaller (exactly 0.35). However, tanking into account that the cash flow impact is null for the high-export group, the null hypothesis of the test that assumes that coefficients are equal across these groups is not rejected at the 10% level. In fact, only in the case of large exporters, it is possible to reject the null hypothesis.

Comparing these outcomes with that related to the models in Table 3, we can found some similarities. Firstly, the proxy variables for investment opportunities are important to explain firm's investment. Furthermore, they alter the magnitude of cash flow coefficient associated to the groups with high level of credit constraint. The most important evidence is that without the presence of covariates, the cash flow is always significant.

6 ROBUSTNESS CHECKS

In our previous analysis, it is possible that listed firms on stock markets and their export shares on sales are really not size independent. Instead, larger firms tend to be over-represented in these two groups, such that, the credit constraint degree measured by these two classifications is again an evaluation between large and non-large firms. To prevent this kind of effect, these groups (firms listed or not on the stock market and export's share) are interacted to groups of size. Tables 6 and 7 report these results.

Table 6 presents the estimated models considering four different firm's groups created by the interaction between dummies of firms listed or not on stock market and size. As both small and middle size firms have evidenced that cash flow coefficient is statistically equal across groups (see Table 3 outcomes), we re-classify them into large and no-large firms. The latter includes small and middle enterprises (SME). The main reason for this procedure is to create different financial constraints groups with sufficient number of observation. This is an important procedure given that there is only one small firm listed on the stock market while middle size companies sum eleven.

According to columns 1 to 3 of Table 6, the estimated models continue to evidence that credit is constrained for closed firms. Considering the model in column 4, only the group of unlisted and no-large firms have evidenced that credit is constrained as a consequence of the significant and positive impact of the sales firm's growth variable. Hence, Brazilian firms listed on the stock market are not credit constraint and this condition is valid even for non-large firms. Associated to this result, with exception of the model in column 2, the test that evaluate whether cash flow impact on investment are equal across no-large firms reveals that the null hypothesis is rejected.

In general, size classification does not influence the general results about the relationship between cash flow and firms listed on the stock market. Regardless size interaction, the investments of companies listed on BMF&BOVESPA is not sensitive to cash flow. In this sense, there is evidence that this classification is not capturing size effect. It seems a good proxy for the degree of firm's external financial constraint related to a type of domestic accessibility to credit resources. A possible explanation for this is related to the prerequisites to become a public company. Public companies must have independently audited balance sheets, protect minority shareholders, among other corporate governance issues. These restrictions provide a positive signaling to capital markets and might, therefore, help to alleviate credit constraints.

Furthermore, it is important to point out that, in the model in column 4 the elasticity for closed and non-large companies, evaluated at sample mean, is 0.66, i.e., the impact of 1.0% in cash flow implies an increase of 0.66% in investment, similar to the elasticity of small firms groups in regressions of Table 2. Moreover, the coefficient of value added growth for no-large and closed companies is positive and significant. Nevertheless, opportunity investment information does not affect the significance of cash flow on firm's investment.

Table 7 reports the outcomes related to the models where variables are classified by firm's size and by the firm's degree of exports to sales ratio, together. One should note that, as shown in Table 5, both, no-exporters as well as low-export firms are credit constrained and coefficients associated to them are statistically equal across the two groups. In this sense, we reclassify them into the following groups: $EXP\_NO\_HIGH_{it}$ referring to firms with exports to sales ratio which falls below the 50th percentile of the export to sales ratio distribution, and EXP_HIGH_{it} indicates the opposite.

Considering the same export group, with the exception of model 2, firm's size does not influence the impact of cash flow on investment, especially when dummies interactions are extended to the control variables. Similarly to the general results of Table 5, the cash flow coefficient is statistically null for large exporters. Focusing on firms with significant cash flow impact, i.e., the no-high exporters group (firms with zero or low export to ratio sales), there is not strong evidence that the coefficients across these two groups are different.

In this sense, interacting export groups to the firm's size do not affect the mainly results reported in Table 5. It suggests that export status proposed here does not capture size effect. Otherwise, as discussed, this classification may be associated to our perspective, i.e. the degree of firm's external financial constraint.

Finally, one caveat with the above analysis is that there are too few firms that are simultaneously listed on stock market and small, so comparison between public versus closed small firms lacks robustness. Otherwise, results here are in line with those obtained when we interact size and export capacity, what give us more confidence that the influence of both being listed on stock markets and export capacity are beyond any possible correlation with size: while in general no-large firms are credit-constrained, this restriction was softened for firms in this group who are listed on the stock market, or those who attained significant revenues from exports.

7 CONCLUSION

In this paper, we evaluate whether Brazilian firms are credit constrained and, especially, which conditions prevail for the existence of credit restrictions. Our results back up previous studies using Brazilian data, which say that they are credit restricted. Moreover, we found that Brazilian firms' elasticity is on average 5 times more constrained than British firms' elasticity. Despite confirming what has been previously investigated, we found that firms not listed on the stock market are credit constraint yet those listed are not. Terra (2003) and Aldrighi and Bisinha (2010) found that firms listed on the stock market are credit constrained.

Regarding results on firms' size, our findings go on the usual direction of international literature, where credit constraints are softened for larger firms, while in Aldrighi and Bisinha (2010) prevails the opposite result and Terra (2003) can only replicate a result similar to ours in a limited period of years in her sample. In addition, we find that companies more devoted to exports, measured as the ratio exports/sales, are not credit constrained, whereas firms that export below the median are credit restricted. Our results are valid, indeed, when one considers the size's bias. That is to say, even small companies that are public or high exporters do not experience credit restrictions, accordingly to our outcomes.

Yet, it is important to note that not only does the period of time are quite different but also the composition of firms covered by those studies, we should also note that the latter authors ignore some important methodological issues which are acknowledged in this paper, such as endogeneity and sector opportunities investments controls.

Our findings in this paper may also have some valuable policy implications. First, we have noticed that credit restriction occurs with firms generating resources around their capital stock level, in other words, when ratio of cash flow over capital is close to one. Having those results in mind, this might be an indication on which firm is restricted to invest, since they are already investing all they can with their own resources. Thus, if this ratio is close to one, those firms might be target for public policy.

Second, in a developing country like Brazil, where capital is scarce and long term credit is usually provided by state-owned banks, availability of other sources of funds are vital for accelerating economic growth. If we understand the stock market as an "inside" source of funds for firms in a country and export capacity as a proxy for "outside" source of funds, once export revenue may be seen as a collateral to get access to international financing, our results suggest that both were valuable for eliminate the evidences of credit restraints for Brazilian firms.

Of course, what our methodology strictly permits to investigate is a comparison of the levels of credit constraints among firms with certain characteristics (size, listed or not on the Brazilian stock markets and export capacity), and some hidden factors may determine both the degree of credit constraints and these characteristics. But, at the same time, our results show that the categories mentioned systematic reduce or eliminate credit constraints for Brazilian firms, even after controlling for a series of observable variables that may impact the investment decision, reinforcing our suspicion that there is indeed a casual effect. Whether this is the case, we can propose that government efforts should be made, for instance, to develop the stock market (or to help firms to achieve the standards required to go public) and to stimulate exports, in this way contributing to alleviate credit constraints of domestics firms and sponsoring their investments.

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Table 1: Descriptives Statistics - Mean (2008-2010)

Variables	ALL	LARGE	SME	LISTED	NOT LISTED	NO EXP	EXP LOW	EXP HIGH
Investment/Capital	0.24	0.25	0.24	0.26	0.24	0.27	0.23	0.19
Cash Flow/Capital	0.94	0.63	1.05	0.44	0.95	0.99	1.05	0.75
Employees	246	1,247	144	4,776	380	376	455	492
Export/Sales (%)	6%	8%	6%	4%	6%	0%	1%	23%
Number of Obs.	10,029	2,562	7,466	105	9,924	4,900	2,626	2,502

Table 2: The effects of industry firm's cash-flow on investment.

Dependent variable: I_{it} / K_{it-1}	Pooled OLS (1)	(2)	WG (3)	(4)	SYS-GMM (5)	(6)
$Cash\ Flow_{it} / K_{it-1}$	0.06***	0.06***	0.13***	0.13***	0.26***	0.25*
	(0.01)	(0.01)	(0.02)	(0.02)	(0.08)	(0.14)
$Sales\ growth_{it}$		0.14***		-0.01		0.11
		(0.02)		(0.03)		(0.43)
$VA\ growth_{jt}$		0.06		-0.14*		0.01
		(0.08)		(0.08)		(0.07)
$Inv\ growth_{jt}$		0.03***		-0.01		-0.04
		(0.01)		(0.01)		(0.19)
Sample Size	6,686	6,686	6,686	6,686	10,029	10,029
j-statistic (p-value)					0.97	0.57

Notes: robust standard errors are reported in parenthesis, *j-statistic* refers to Sargan test of the overidentifying restrictions,

* indicates significance at the 10% level, ** 5% and *** 1%.

Instruments for estimated model by system GMM in column (5) are $Cash\ Flow_{it-2}/K_{it-3}$ for first-difference equation and $\Delta(Cash\ Flow_{it-1}/K_{it-2})$ for level equation. Instruments of model in column (6) are $Cash\ Flow_{it-2}/K_{it-3}$, $Sales\ growth_{it-2}$, $VA\ growth_{it-2}$ and $Inv\ growth_{jt-2}$ for first-difference equation and $\Delta(Cash\ Flow_{it-1}/K_{it-2})$, $\Delta(Sales\ growth_{it-1})$, $\Delta(VA\ growth_{it-1})$ and $\Delta(Inv\ growth_{jt-1})$ for level equation.

Time dummies and time dummies interacted with industry dummies were included in all the specification and also in the standard instruments sets of first-difference equation in the case of SYS-GMM models.

Table 3: The effects of firm's cash-flow on investment classified by small, middle and large firms.

Dependent Variable: I_{it} / K_{it-1}	SYS-GMM Models			
	(1)	(2)	(3)	(4)
$[Cash Flow_{it} / K_{it-1}] \times SMALL_{it}$	0.30***	0.22**	0.15***	0.11**
	(0.10)	(0.11)	(0.05)	(0.04)
$[Cash Flow_{it} / K_{it-1}] \times MIDDLE_{it}$	0.14**	0.11**	0.12**	0.10**
	(0.05)	(0.05)	(0.05)	(0.04)
$[Cash Flow_{it} / K_{it-1}] \times LARGE_{it}$	0.36***	0.31**	0.12	0.12
	(0.12)	(0.14)	(0.09)	(0.11)
$Sales growth_{it}$		0.34	0.32*	
		(0.23)	(0.18)	
$[Sales growth_{it}] \times SMALL_{it}$				0.21
				(0.34)
$[Sales growth_{it}] \times MIDDLE_{it}$				0.64**
				(0.29)
$[Sales growth_{it}] \times LARGE_{it}$				0.89*
				(0.54)
$VA growth_{jt}$		-0.003		
		(0.14)		
$[VA growth_{jt}] \times SMALL_{it}$			0.34*	0.52*
			(0.20)	(0.27)
$[VA growth_{jt}] \times MIDDLE_{it}$			0.15	0.05
			(0.18)	(0.23)
$[VA growth_{jt}] \times LARGE_{it}$			0.07	-0.26
			(0.28)	(0.30)
$Inv growth_{jt}$		0.04		
		(0.03)		
$[Inv growth_{jt}] \times SMALL_{it}$			-0.03	0.03
			(0.09)	(0.08)
$[Inv growth_{jt}] \times MIDDLE_{it}$			0.18**	0.14
			(0.09)	(0.09)
$[Inv growth_{jt}] \times LARGE_{it}$			0.15	0.16
			(0.15)	(0.17)
$H_0^1 : \hat{\delta}^{SMALL} = \hat{\delta}^{MIDDLE}$	0.26	0.37	0.33	0.48
$H_0^2 : \hat{\delta}^{MIDDLE} = \hat{\delta}^{LARGE}$	0.13	0.17	0.04	0.004
$H_0^3 : \hat{\delta}^{SMALL} = \hat{\delta}^{LARGE}$	0.71	0.54	0.006	0.03
Sample Size	10,029	10,029	10,029	10,029
j-statistic (p-value)	0.26	0.37	0.63	0.36

Notes: robust standard errors are reported in parenthesis, *j-statistic* refers to Sargan test of the overidentifying restrictions,
* indicates significance at the 10% level, ** 5% and *** 1%. For the models in the column (3) e (4), the tests that assess whether estimated coefficients are equal across groups also include a second restriction regarding the cash flow for the large group as null.

The instruments for estimated model by system GMM in column (1) are [*Cash Flow*$_{it-2}$/K_{it-3}]×(*Size Dummies*$_{it-2}$) for first-difference equation and [Δ(*Cash Flow*$_{it-1}$/K_{it-2})]×(*Size Dummies*$_{it-1}$) for level equation.

Instruments of model in column (2) are [*Cash Flow*$_{it-2}$/K_{it-3}]×(*Size Dummies*$_{it-2}$), *Sales growth*$_{it-2}$, *VA growth*$_{it-2}$ and *Inv growth*$_{jt-2}$ for the first-difference equation and [Δ(*Cash Flow*$_{it-1}$/K_{it-2})]×(*Size Dummies*$_{it-1}$), Δ(*Sales growth*$_{it-1}$), Δ(*VA growth*$_{it-1}$) and Δ(*Inv growth*$_{jt-1}$) for the level equation.

The model of column (3) includes as instruments [*Cash Flow*$_{it-2}$/K_{it-3}]×(*Size Dummies*$_{it-2}$), *Sales growth*$_{it-2}$, [*VA growth*$_{it-2}$]×(*Size Dummies*$_{it-2}$) and [*Inv growth*$_{jt-2}$]×(*Size Dummies*$_{it-2}$) for the first-difference equation and [Δ(*Cash Flow*$_{it-1}$/K_{it-2})]×(*Size Dummies*$_{it-1}$), Δ(*Sales growth*$_{it-1}$), [Δ(*VA growth*$_{it-1}$)]×(*Size Dummies*$_{it-1}$) and [Δ(*Inv growth*$_{jt-1}$)]×(*Size Dummies*$_{it-1}$) for the level equation. The model in column (4) includes the instruments of model in column (3). However, [*Sales growth*$_{it-2}$]×(*Size Dummies*$_{it-2}$) instruments takes the place of *Sales growth*$_{it-2}$ for first-difference equation and [Δ(*Sales growth*$_{it-1}$)]×(*Size Dummies*$_{it-1}$) instruments takes the place of Δ(*Sales growth*$_{it-1}$).

Time dummies and time dummies interacted with industry dummies have been included in all the specification and also in the standard instruments sets of first-difference equation.

Table 4: The effects of firm's cash-flow on investment classified by listed or not on the stock market.

Dependent Variable: I_{it} / K_{it-1}	SYS-GMM (1)	(2)	(3)	(4)
$[Cash\,Flow_{it} / K_{it-1}] \times LISTED_{it}$	-0.18	-0.14	0.09	0.08
	(0.36)	(0.32)	(0.17)	(0.16)
$[Cash\,Flow_{it} / K_{it-1}] \times NOT\_LISTED_{it}$	0.27***	0.26*	0.24*	0.23*
	(0.08)	(0.14)	(0.13)	(0.13)
$Sales\,growth_{it}$		0.09	0.12	
		(0.44)	(0.39)	
$[Sales\,growth_{it}] \times LISTED_{it}$				0.002
				(0.32)
$[Sales\,growth_{it}] \times NOT\_LISTED_{it}$				0.16
				(0.39)
$VA\,growth_{jt}$		-0.03		
		(0.18)		
$[VA\,growth_{jt}] \times LISTED_{it}$			-0.55	-0.44
			(0.41)	(0.41)
$[VA\,growth_{jt}] \times NOT\_LISTED_{it}$			-0.01	0.002
			(0.18)	(0.17)
$Inv\,growth_{jt}$		0.004		
		(0.07)		
$[Inv\,growth_{jt}] \times LISTED_{it}$			-0.12	-0.06
			(0.32)	(0.33)
$[Inv\,growth_{jt}] \times NOT\_LISTED_{it}$			0.02	0.02
			(0.07)	(0.06)
$H_0^1 : \hat{\delta}^{LISTED} = \hat{\delta}^{NOT\_LISTED}$	0.002	0.18	0.16	0.18
Sample Size	10.029	10.029	10.029	10.029
j-statistic (p-value)	0.38	0.44	0.70	0.79

Notes: robust standard errors are reported in parenthesis, *j-statistic* refers to Sargan test of the overidentifying restrictions, * indicates significance at the 10% level, ** 5% and *** 1%.

The instruments for estimated model by system GMM in column (1) are [*Cash Flow*$_{it-2}$/K_{it-3}]×(*Listed Firms Dummies*$_{it-2}$) for first-difference equation and [Δ(*Cash Flow*$_{it-1}$/K_{it-2})]×(*Listed Firms Dummies*$_{it-1}$) for level equation.

Instruments of model in column (2) are [*Cash Flow*$_{it-2}$/K_{it-3}]×(*Listed Firms Dummies*$_{it-2}$), *Sales growth*$_{it-2}$, *VA growth*$_{it-2}$ and *Inv growth*$_{jt-2}$ for the first-difference equation and [Δ(*Cash Flow*$_{it-1}$/K_{it-2})]×(*Listed Firms Dummies*$_{it-1}$), Δ(*Sales growth*$_{it-1}$), Δ(*VA growth*$_{it-1}$) and Δ(*Inv growth*$_{jt-1}$) for the level equation. The model of column (3) includes as instruments [*Cash Flow*$_{it-2}$/K_{it-3}]×(*Listed Firms Dummies*$_{it-2}$), *Sales growth*$_{it-2}$, [*VA growth*$_{it-2}$]×(*Listed Firms Dummies*$_{it-2}$) and [*Inv growth*$_{jt-2}$]×(*Listed Firms Dummies*$_{it-2}$) for the first-difference equation and [Δ(*Cash Flow*$_{it-1}$/K_{it-2})]×(*Listed Firms Dummies*$_{it-1}$), Δ(*Sales growth*$_{it-1}$), [Δ(*VA growth*$_{it-1}$)]×(*Listed Firms Dummies*$_{it-1}$) and [Δ(*Inv growth*$_{jt-1}$)]×(*Listed Firms Dummies*$_{it-1}$) for the level equation. The model in column (4) includes the instruments of model in column (3). However, [*Sales growth*$_{it-2}$]×(*Listed Firms Dummies*$_{it-2}$) instruments takes the place of *Sales growth*$_{it-2}$ for first-difference equation and [Δ(*Sales growth*$_{it-1}$)]×(*Listed Firms Dummies*$_{it-1}$) instruments takes the place of Δ(*Sales growth*$_{it-1}$).

Time dummies and time dummies interacted with industry dummies have been included in all the specification and also in the standard instruments sets of first-difference equation.

Table 5: The effects of firm's cash-flow on investment classified by export to sales ratio.

Dependent Variable: I_{it} / K_{it-1}	SYS-GMM			
	(1)	(2)	(3)	(4)
$[Cash\,Flow_{it} / K_{it-1}] \times NO\_EXP_{it}$	0.22***	0.13**	0.15**	0.14***
	(0.06)	(0.06)	(0.05)	(0.05)
$[Cash\,Flow_{it} / K_{it-1}] \times EXP\_LOW_{it}$	0.12**	0.07*	0.07*	0.08**
	(0.05)	(0.04)	(0.04)	(0.04)
$[Cash\,Flow_{it} / K_{it-1}] \times EXP\_HIGH_{it}$	0.21*	0.16	0.14	0.14
	(0.12)	(0.11)	(0.10)	(0.09)
$Sales\,growth_{it}$		0.48**	0.50**	
		0.19	(0.18)	
$[Sales\,growth_{it}] \times NO\_EXP_{it}$			0.02	0.43*
			(0.19)	(0.25)
$[Sales\,growth_{it}] \times EXP\_LOW_{it}$			0.56	0.41
			(0.39)	(0.37)
$[Sales\,growth_{it}] \times EXP\_LARGE_{it}$			-0.32	0.60*
			(0.30)	(0.36)
$VA\,growth_{jt}$		0.10		
		(0.13)		
$[VA\,growth_{jt}] \times NO\_EXP_{it}$			0.02	0.14
			(0.19)	(0.21)
$[VA\,growth_{jt}] \times EXP\_LOW_{it}$			0.56	0.54
			(0.39)	(0.42)
$[VA\,growth_{jt}] \times EXP\_HIGH_{it}$			-0.32	-0.44
			(0.30)	(0.36)
$Inv\,growth_{jt}$		0.07**		
		(0.03)		
$[Inv\,growth_{jt}] \times NO\_EXP_{it}$			0.11*	0.10
			(0.06)	(0.06)
$[Inv\,growth_{jt}] \times EXP\_LOW_{it}$			-0.30	-0.23
			(0.21)	(0.18)
$[Inv\,growth_{jt}] \times EXP\_HIGH_{it}$			0.37*	0.39*
			(0.20)	(0.20)
$H_0^1 : \hat{\delta}^{NO\_EXP} = \hat{\delta}^{EXP\_LOW}$	0.29	0.32	0.22	0.24
$H_0^2 : \hat{\delta}^{EXP\_LOW} = \hat{\delta}^{EXP\_HIGH}$	0.53	0.09	0.10	0.06
$H_0^3 : \hat{\delta}^{NO\_EXP} = \hat{\delta}^{EXP\_HIGH}$	0.94	0.06	0.01	0.01
Sample Size	10.029	10.029	10.029	10.029
j-statistic (p-value)	0.03	0.36	0.80	0.35

Notes: robust standard errors are reported in parenthesis, *j-statistic* refers to Sargan test of the overidentifying restrictions,
* indicates significance at the 10% level, ** 5% and *** 1%. For the models in the columns (2) to (4), the tests that assess whether estimated coefficients are equal across groups also include a second restriction regarding the cash flow null for high-export group.
The instruments for estimated model by system GMM in column (1) are [$Cash\ Flow_{it-2}/K_{it-3}$]×($Export\ Dummies_{it-2}$) for first-difference equation and [Δ($Cash\ Flow_{it-1}/K_{it-2}$)]×($Export\ Dummies_{it-1}$) for level equation.
Instruments of model in column (2) are [$Cash\ Flow_{it-2}/K_{it-3}$]×($Export\ Dummies_{it-2}$), $Sales\ growth_{it-2}$, $VA\ growth_{it-2}$ and $Inv\ growth_{jt-2}$ for the first-difference equation and [Δ($Cash\ Flow_{it-1}/K_{it-2}$)]×($Export\ Dummies_{it-1}$), Δ($Sales\ growth_{it-1}$), Δ($VA\ growth_{it-1}$) and Δ($Inv\ growth_{jt-1}$) for the level equation. The model of column (3) includes as instruments [$Cash\ Flow_{it-2}/K_{it-3}$]×($Export\ Dummies_{it-2}$), $Sales\ growth_{it-2}$, [$VA\ growth_{it-2}$]×($Export\ Dummies_{it-2}$) and [$Inv\ growth_{jt-2}$]×($Export\ Dummies_{it-2}$) for the first-difference equation and [Δ($Cash\ Flow_{it-1}/K_{it-2}$)]×($Export\ Dummies_{it-1}$), Δ($Sales\ growth_{it-1}$), [Δ($VA\ growth_{it-1}$)]×($Export\ Dummies_{it-1}$) and [Δ($Inv\ growth_{jt-1}$)]×($Export\ Dummies_{it-1}$) for the level equation. The model in column (4) includes the instruments of model in column (3). However, [$Sales\ growth_{it-2}$]×($Export\ Dummies_{it-2}$) instruments takes the place of $Sales\ growth_{it-2}$ for first-difference equation and [Δ($Sales\ growth_{it-1}$)]×($Export\ Dummies_{it-1}$) instruments takes the place of Δ($Sales\ growth_{it-1}$).
Time dummies and time dummies interacted with industry dummies have been included in all the specification and also in the standard instruments sets of first-difference equation.

Table 6: Effects of firm's cash-flow on investment classified by listed or not on the stock market and firm's size.

Dependent Variable: I_{it} / K_{it-1}	SYS-GMM (1)	(2)	(3)	(4)
$[Cash\,Flow_{it} / K_{it-1}] \times LISTED_{it} \times NO\_LARGE_{it}$	-0.06	-0.12	0.18	0.11
	(0.30)	(0.29)	(0.26)	(0.36)
$[Cash\,Flow_{it} / K_{it-1}] \times LISTED_{it} \times LARGE_{it}$	-0.27	-0.25	0.16	0.16
	(0.57)	(0.47)	(0.11)	(0.13)
$[Cash\,Flow_{it} / K_{it-1}] \times NOT\_LISTED_{it} \times NO\_LARGE_{it}$	0.24***	0.17*	0.16***	0.15**
	(0.08)	(0.10)	(0.06)	(0.06)
$[Cash\,Flow_{it} / K_{it-1}] \times NOT\_LISTED_{it} \times LARGE_{it}$	0.31**	0.29**	0.18*	0.10
	(0.14)	(0.14)	(0.10)	(0.12)
$Sales\,growth_{it}$		0.30	0.31	
		(0.29)	(0.22)	
$[Sales\,growth_{it}] \times LISTED_{it} \times NO\_LARGE_{it}$				0.98
				(1.01)
$[Sales\,growth_{it}] \times LISTED_{it} \times LARGE_{it}$				-0.11
				(0.58)
$[Sales\,growth_{it}] \times NOT\_LISTED_{it} \times NO\_LARGE_{it}$				0.13
				(0.27)
$[Sales\,growth_{it}] \times NOT\_LISTED_{it} \times LARGE_{it}$				1.36**
				(0.64)
$VA\,growth_{jt}$		0.04		
		(0.15)		
$[VA\,growth_{jt}] \times LISTED_{it} \times NO\_LARGE_{it}$			0.79	1.03
			(0.51)	(0.76)
$[VA\,growth_{jt}] \times LISTED_{it} \times LARGE_{it}$			-0.93**	-0.64
			(0.42)	(0.59)
$[VA\,growth_{jt}] \times NOT\_LISTED_{it} \times NO\_LARGE_{it}$			0.11	0.34*
			(0.15)	(0.20)
$[VA\,growth_{jt}] \times NOT\_LISTED_{it} \times LARGE_{it}$			0.08	-0.37
			(0.29)	(0.34)
$Inv\,growth_{it}$		0.04		
		(0.05)		
$[Inv\,growth_{jt}] \times LISTED_{it} \times NO\_LARGE_{it}$			-0.46	-0.89
			(0.40)	(1.03)
$[Inv\,growth_{jt}] \times LISTED_{it} \times LARGE_{it}$			-0.04	0.14
			(0.31)	(0.35)
$[Inv\,growth_{jt}] \times NOT\_LISTED_{it} \times NO\_LARGE_{it}$			0.06	0.09
			(0.05)	(0.06)
$[Inv\,growth_{jt}] \times NOT\_LISTED_{it} \times LARGE_{it}$			0.09	0.05
			(0.17)	(0.20)
$H_0^1 : \hat{\delta}^{LISTED} = \hat{\delta}^{NOT\_LISTED}$ *for no large firms*	0.03	0.37	0.01	0.05
$H_0^2 : \hat{\delta}^{LISTED} = \hat{\delta}^{NOT\_LISTED}$ *for large firms*	0.12	0.13	0.15	0.55
Sample Size	10.029	10.029	10.029	10.029
j-statistic (p-value)	0.33	0.48	0.66	0.51

Notes: robust standard errors are reported in parenthesis, *j-statistic* refers to Sargan test of the overidentifying restrictions.
* indicates significance at the 10% level, ** 5% and *** 1%. For all models, the test that assess whether estimated coefficients are equal across groups also include two more additional restriction regarding the cash flow null for firms which are listed on stock market. No large firms group includes small and middle groups.
The instruments for estimated model by system GMM in column (1) are [$Cash\ Flow_{it-2}/K_{it-3}$]×(*List/Size Dummies*$_{it-2}$) for first-difference equation and [Δ($Cash\ Flow_{it-1}/K_{it-2}$)]×(*List/Size Dummies*$_{it-1}$) for level equation.
Instruments of model in column (2) are [$Cash\ Flow_{it-2}/K_{it-3}$]×(*List/Size Dummies*$_{it-2}$), $Sales\ growth_{it-2}$, $VA\ growth_{it-2}$ and $Inv\ growth_{jt-2}$ for the first-difference equation and [Δ($Cash\ Flow_{it-1}/K_{it-2}$)]×(*List/Size Dummies*$_{it-1}$), Δ($Sales\ growth_{it-1}$), Δ($VA\ growth_{it-1}$) and Δ($Inv\ growth_{jt-1}$) for the level equation.
The model of column (3) includes as instruments [$Cash\ Flow_{it-2}/K_{it-3}$]×(*List/Size Dummies*$_{it-2}$), $Sales\ growth_{it-2}$, [$VA\ growth_{it-2}$]×(*List/Size Dummies*$_{it-2}$) and [$Inv\ growth_{jt-2}$]×(*List/Size Dummies*$_{it-2}$) for the first-difference equation and [Δ($Cash\ Flow_{it-1}/K_{it-2}$)]×(*List/Size Dummies*$_{it-1}$), Δ($Sales\ growth_{it-1}$), [Δ($VA\ growth_{it-1}$)]×(*List/Size Dummies*$_{it-1}$) and [Δ($Inv\ growth_{jt-1}$)]×(*List/Size Dummies*$_{it-1}$) for the level equation. The model in column (4) includes the instruments of model in column (3). However, [$Sales\ growth_{it-2}$]×(*List/Size Dummies*$_{it-2}$) instruments takes the place of $Sales\ growth_{it-2}$ for first-difference equation and [Δ($Sales\ growth_{it-1}$)]×(*List/Size Dummies*$_{it-1}$) instruments takes the place of Δ($Sales\ growth_{it-1}$). Time dummies and time dummies interacted with industry dummies have been included in all the specification and also in the standard instruments sets of first-difference equation.

Table 7: Effects of firm's cash-flow on investment classified by export to sales ratio and firm's size.

Dependent Variable: I_{it} / K_{it-1}	SYS-GMM			
	(1)	(2)	(3)	(4)
$[Cash Flow_{it} / K_{it-1}] \times EXP\_HIGH_{it} \times NO\_LARGE_{it}$	0.17	0.14	0.12	0.11
	(0.12)	(0.11)	(0.09)	(0.08)
$[Cash Flow_{it} / K_{it-1}] \times EXP\_HIGH_{it} \times LARGE_{it}$	0.26*	0.18	0.18	0.15
	(0.15)	(0.14)	(0.12)	(0.14)
$[Cash Flow_{it} / K_{it-1}] \times EXP\_NO\_HIGH_{it} \times NO\_LARGE_{it}$	0.20***	0.08	0.12**	0.16***
	(0.06)	(0.07)	(0.04)	(0.04)
$[Cash Flow_{it} / K_{it-1}] \times EXP\_NO\_HIGH_{it} \times LARGE_{it}$	0.33*	0.26	0.20*	0.23*
	(0.17)	(0.17)	(0.10)	(0.13)
$Sales growth_{it}$		0.58**	0.46**	
		(0.24)	(0.20)	
$[Sales growth_{it}] \times EXP\_HIGH_{it} \times NO\_LARGE_{it}$				0.19
				(0.34)
$[Sales growth_{it}] \times EXP\_HIGH_{it} \times LARGE_{it}$				1.67
				(1.03)
$[Sales growth_{it}] \times EXP\_NO\_HIGH_{it} \times NO\_LARGE_{it}$				0.29
				(0.27)
$[Sales growth_{it}] \times EXP\_NO\_HIGH_{it} \times LARGE_{it}$				0.02
				(0.59)
$VA growth_{it}$		0.05		
		(0.15)		
$[VA growth_{it}] \times EXP\_HIGH_{it} \times NO\_LARGE_{it}$			-0.03	0.11
			(0.37)	(0.24)
$[VA growth_{it}] \times EXP\_HIGH_{it} \times LARGE_{it}$			-0.68	0.80
			(0.55)	(0.39)
$[VA growth_{it}] \times EXP\_NO\_HIGH_{it} \times NO\_LARGE_{it}$			0.20	0.05
			(0.17)	(0.05)
$[VA growth_{it}] \times EXP\_NO\_HIGH_{it} \times LARGE_{it}$			0.31	-0.17
			(0.40)	(0.27)
$Inv growth_{it}$		0.07*		
		(0.03)		
$[Inv growth_{it}] \times EXP\_HIGH_{it} \times NO\_LARGE_{it}$			0.18	0.11
			(0.25)	(0.24)
$[Inv growth_{it}] \times EXP\_HIGH_{it} \times LARGE_{it}$			0.75*	0.80**
			(0.40)	(0.39)
$[Inv growth_{it}] \times EXP\_NO\_HIGH_{it} \times NO\_LARGE_{it}$			0.06	0.05
			(0.05)	(0.05)
$[Inv growth_{it}] \times EXP\_NO\_HIGH_{it} \times LARGE_{it}$			-0.26	-0.17
			(0.26)	(0.27)
$H_0^1 : \hat{\delta}^{EXP\_HIGH} = \hat{\delta}^{EXP\_NO\_HIGH}$ *for no large firms*	0.000	0.159	0.029	0.003
$H_0^2 : \hat{\delta}^{EXP\_HIGH} = \hat{\delta}^{EXP\_NO\_HIGH}$ *for large firms*	0.018	0.148	0.056	0.101
Sample Size	10.029	10.029	10.029	10.029
j-statistic (p-value)	0.04	0.45	0.73	0.83

Notes: robust standard errors are reported in parenthesis, *j-statistic* refers to Sargan test of the overidentifying restrictions.
* indicates significance at the 10% level, ** 5% and *** 1%. For all models, the test that assess whether estimated coefficients are equal across groups also include two more additional restriction regarding the cash flow as null for firms which are listed on stock market. No large firms group includes small and middle groups.
The instruments for estimated model by system GMM in column (1) are [$Cash Flow_{it-2}/K_{it-3}$]×($Export/Size Dummies_{it-2}$) for first-difference equation and [$\Delta(Cash Flow_{it-1}/K_{it-2})$]×($Export/Size Dummies_{it-1}$) for level equation.
Instruments of model in column (2) are [$Cash Flow_{it-2}/K_{it-3}$]×($Export/Size Dummies_{it-2}$), $Sales growth_{it-2}$, $VA growth_{it-2}$ and $Inv growth_{jt-2}$ for the first-difference equation and [$\Delta(Cash Flow_{it-1}/K_{it-2})$]×($Export/Size Dummies_{it-1}$), $\Delta(Sales growth_{it-1})$, $\Delta(VA growth_{it-1})$ and $\Delta(Inv growth_{jt-1})$ for the level equation.
The model of column (3) includes as instruments [$Cash Flow_{it-2}/K_{it-3}$]×($Export/Size Dummies_{it-2}$), $Sales growth_{it-2}$, [$VA growth_{it-2}$]×($Export/Size Dummies_{it-2}$) and [$Inv growth_{jt-2}$]×($Export/Size Dummies_{it-2}$) for the first-difference equation and [$\Delta(Cash Flow_{it-1}/K_{it-2})$]×($Export/Size Dummies_{it-1}$), $\Delta(Sales growth_{it-1})$, [$\Delta(VA growth_{it-1})$]×($Export/Size Dummies_{it-1}$) and [$\Delta(Inv growth_{jt-1})$]×($Export/Size Dummies_{it-1}$) for the level equation. The model in column (4) includes the instruments of model in column (3). However, [$Sales growth_{it-2}$]×($Export/Size Dummies_{it-2}$) instruments takes the place of $Sales growth_{it-2}$ for first-difference equation and [$\Delta(Sales growth_{it-1})$]×($Export/Size Dummies_{it-1}$) instruments takes the place of $\Delta(Sales growth_{it-1})$. Time dummies and time dummies interacted with industry dummies have been included in all the specification and also in the standard instruments sets of first-difference equation.