Ownership Structure on non-Efficient Investment: Evidence from Brazilian Firms

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Resumo

Este trabalho examina se a sensibilidade do investimento ao fluxo de caixa deve-se a problemas de subinvestimento causados pela assimetria de informação ou por problemas de superinvestimento devido ao uso do fluxo de caixa livre em projetos de investimentos não lucrativos. Com uma amostra de 485 firmas brasileiras no período de 1997 a 2007, os resultados apontam que tanto o subinvestimento quanto o superinvestimento podem estar relacionados com a presença do maior acionista último no conselho de administração e na direção executiva. A amostra foi dividida entre firmas restritas financeiramente (índice KZ) e firmas com maiores oportunidades de investimento (q de Tobin). Os resultados indicam que firmas consideradas restritas financeiramente e firmas com maior oportunidade de investimento sofrem com subinvestimento enquanto que as firmas consideradas não restritas financeiramente e com menor oportunidade de investimento sofrem com o superinvestimento.

Palavras-chave: Sensibilidade do investimento ao fluxo de caixa; Direito de fluxo de caixa; Direito de voto;

Área principal: GE – Gestão Financeira

Abstract

This paper examines whether investment-cash flow sensitivity is due to underinvestment problems caused by asymmetric information or if it is due to overinvestment problems motivated by the use of free cash flows on unprofitable investment projects. With a sample of 485 Brazilian firms over the period of 1997 to 2007, the results showed that both underinvestment and overinvestment problems can be related to the active presence of the largest ultimate shareholder on the board and executive director. The sample was split in accordance to the presence of financial constraint (measured by KZ index) and investment opportunities (measured by Tobin's q). The results indicate that financially constrained firms and firms with high investment opportunities suffer from underinvestment, while financially unconstrained firms and firms with low investment opportunities suffer from overinvestment problems.

Keywords: **Investment-cash flow sensitivity; Cash flow rights; Control rights;**

Main area: FM – Financial Management

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1. Introduction

In this paper, our main issue is to investigate whether the investment-cash flow sensitivity is related to underinvestment due to the presence of asymmetric information or overinvestment due to managerial discretion. We used financial and ownership data from an unbalanced panel of 485 Brazilian firms over the 1997-2007 period. The main characteristic of Brazilian firms is a higher ownership concentration in the hands of a few shareholders. As pointed out by Leal and Carvalhal-da-Silva (2008), in Brazilian firms a single shareholder holds 77% of control rights and the three largest shareholders hold more than 87%. Claessens *et al* (2000a) also documented a high ownership concentration and a large divergence between control and cash flow rights in Brazilian corporations. In particular, the largest ultimate shareholder is the controller and this feature is followed by a family ownership nature. Black *et al.* (2010) examined governance corporate practices of 118 Brazilian firms in 2005. They concluded that members of the board are not independent in almost all firms, and they are usually chosen to represent the controlling shareholder's interests.

Sheleifer and Vishny (1997) pointed out that a positive side of ownership concentration is to control managers' possible abusive behavior. The presence of a large shareholder could provide incentives and resources to monitor managers' activities. However, as Brazilian firms are characterized by a high ownership concentration this could result in agency costs and asymmetric information involving large and minority shareholders. La Porta *et al.* (1998, 1999) argued that greater access to firms' information by the largest and controlling shareholder could be harmful to minority shareholders given the possibility of wealth expropriation – consequently, a possible alignment of interests between a large shareholder and a manager. Considering this issue, in the case of Brazilian firms, the underinvestment and overinvestment problems can also be influenced by agency costs from a conflict of interests between large and minority shareholders and a convergence of interests between large shareholder and managers.

Our study takes as reference the study of Wei and Zhang (2008), with improvements. Besides considering the full sample to conduct the tests, it was also performed a controlling procedure of the firms' heterogeneity by a priori classification of financial constraint and investment opportunities, measured by KZ index and Tobin's q, respectively. We also propose to investigate whether the active presence of the largest ultimate shareholder on the board and on the executive direction has influence on under or overinvestment problems. To achieve our purposes, a modified version of the accelerator model of investment was used, which was estimated by the generalized method of moments (GMM). In this model, ownership structure features were also introduced, such as pyramidal structure and the nature of the largest ultimate shareholder, i.e., family, state-owned, foreign and a shareholder agreement. These variables were introduced to analyze the ownership structure and investment decision relationship. When we control the sample considering the presence of financial constraint and investment opportunities, the results confirm that investment-cash flow sensitivity of firms considered financially constrained and firms with high investment opportunities suffer from underinvestment as suggested by Fazzari *et al* (1988). On the other hand, firms considered financially unconstrained and firms with low investment opportunities support the overinvestment hypothesis.

The rest of this paper is organized in five sections, including this introduction. Section 2 presents a brief review of the literature about ownership structure and investment-cash flow sensitivity. Section 3 describes the data and the methodology. Section 4 presents the empirical results. Section 5 presents the main conclusions.

2. Literature Review

The discussion about financial constraints on investment decisions was intensified with the seminal work of Fazzari, Hubbard and Petersen (1988). Hypothesizing that dividend payout could represent the presence of asymmetric information and cash flow could be a proxy to dependence on internal funds, the authors found that positive investment-cash flow sensitivity

was significantly greater for low payout firms. They concluded that these firms depend more on internal funds due to asymmetric information, thus investment-cash flow sensitivity could be used as a measure of financial constraint. There are numerous studies consistent with the work of Fazzari *et al*. (1988), which is based on different priori measures of financial constraints such as age, size, debt-rating, coverage ratio, business groups (Bond and Meghir, 1994; Champman *et al.*, 1996; Whited and Wu, 2006; Almeida and Campello, 2007; Carpenter and Guariglia, 2008). According to these results, financially constrained firms would invest below their optimal level of investment because asymmetric information makes external resources more expensive than internal resources (Myers and Majluf, 1984; Greenwald *et al.*, 1984), which indicates an *underinvestment* scenario.

In contrast to these studies, Kaplan and Zingales (1997) classified low payout firms identified by Fazzari *et al*. (1988) as financially constrained in accordance to balance sheets and liquidity income measures. They found that 85% of these firms could not be considered as financially constrained since they increased their investment using credit lines and internal funds. It follows that investment-cash flow sensitivity could also represent future profitability. Using a discriminant analysis to classify the firms as financially constrained and unconstrained, Cleary (1999) found results similar to Kaplan and Zingales (1997) for a bigger sample with 1317 U.S. firms. However, Moyen (2004) and Allayannis and Mozumbar (2004) found that the results of Cleary (1999) could be affected by negative observations of cash flows.

Recently, Chen and Chen (2012) inferred a downward movement of investment-cash flow sensitivity since the 1960s and they argued that: "*if one believes that financial constraint have not completely disappeared, then investment-cash flow sensitivity cannot be a good measure of financial constraints*" (p.364). Therefore, although the literature presents a variety of studies about investment-cash flow sensitivity, to the present date there is no definite conclusion if this sensitivity is a measure of financial constraint.

Another interpretation of investment-cash flow sensitivity is in agreement with Jensen (1986) and Stulz (1990). Following these authors, the positive relation between investment and cash flow reflects a tendency of managers to use the free cash flows to overinvest in unprofitable investment projects that could only benefit their own interests. As shareholders are interested in maximizing the firm's value, this managerial behavior generates conflicts of interests between managers and shareholders, increasing agency costs. Therefore, investment-cash flow sensitivity has indicated the use of internal funds (free cash flow) to supply managers' entrenchment strategies, suggesting an *overinvestment* scenario. Richardson (2006) empirically showed that Jensen and Stulz's argument can be valid. This author considered the difference of real and optimal level of investment as a proxy to overinvestment if the difference were positive; and underinvestment if the difference were negative. He found that high free cash flow firms tend to overinvest and this problem is reduced when a firm has active shareholders. However, Bergstresser (2006) contests Richardson's methodology since it is based on residual regression (difference) of investment regression which, hypothetically, is equal to zero. Nevertheless, Yang and Guariglia (2012) used the framework developed by Richardson and found empirical evidences that in negative free cash flow firms, underinvestment is mainly caused by financial constraint and, positive free cash flow firms suffer from overinvestment due to agency costs.

Degryse and De Jong (2006) suggested investigating whether investment-cash flow sensitivity reflects underinvestment or overinvestment analyzing the firm's prospects by Tobin's q. They assumed as hypothesis that if low Tobin's q firms have lower growth opportunities then these firms do not necessarily need to invest, thus investment-cash flow sensitivity could indicate managerial discretional problems. On the other hand, if high Tobin's q firms have good prospects then these firms need to perform growth investment, but the presence of asymmetric information on capital market makes external resources more expensive, thus investment-cash flow sensitivity could signalize financial constraints. The results showed that both high and low Tobin's q firms exhibit positive investment-cash flow sensitivity, hence confirming the assumed hypothesis. Hovakimian and Hovakimian (2009) also showed that investment-cash flow sensitivity is related to over and underinvestment and that it is not a statistical phenomenon. They analyzed firm's

cash flow year-by-year and found that in low cash flow years, investment-cash flow sensitivity firms face financial constraint. However, in high cash flow years, investment-cash flow sensitivity firms have internal liquidity and easier access to financial market, providing funds higher than investment expenditures, which enables firms to overinvest.

It should be noted that overinvestment might happen in firms lacking perfect monitoring and managers' incentives. Thus, some authors, e.g., Hadlock (1998) and Broussard *et al.* (2004), have introduced corporate governance, CEO compensation and ownership structure features to analyze their effects on non-optimal investment. Chen *et al.* (2011), Albuquerue and Wang (2008), Garmaise and Liu (2005) showed that better shareholders protection can reduce overinvestment problems. Broussard *et al.* (2004) examine the effects of incentives on investment-cash flow sensitivity and found that a positive effect of CEO incentives is the alignment of interests that reduces agency costs and, consequently, overinvestment problems. Pindado and De la Torre (2009) found that investment-cash flow sensitivity is strongly influenced by ownership structure. They also found that overinvestment problem can be avoided when there is an alignment of interests between owners and managers; but if firms face financial constraints and there is a monitoring of managers activity due to concentrated ownership and a convergence of interests between owners and managers, than it can result in underinvestment.

Considering agency conflicts between managers and shareholders, Hadlock (1998) investigated whether a possible alignment of interests between managers and owners could influence investment-cash flow sensitivity. He found an inverted U-shaped relation between managers' ownership and investment-cash flow sensitivity interpreting this result as an evidence of underinvestment. According to the author, investment-cash flow sensitivity decreases as managers are more concerned with shareholder value. Thus, more alignment of interests of managers and shareholders could reduce underinvestment due to asymmetric informational problems.

Following Claessens *et al.* (2000b, 2002), Wei and Zhang (2008) argued that it is necessary to consider that under and overinvestment problems are related to enhancement effects associated to cash flow rights and the entrenchment effect generated by the control rights of the largest shareholder. They suggested that high levels of cash flow rights can indicate that large shareholders are more concerned about the firm's financial decision and there could be a better monitoring of manager's activity. It then suggests that the interests of large and minority shareholders are more aligned. Reciprocally, high levels of divergence between control rights and cash flow rights of the large shareholder indicate shareholders' conflict of interests since large shareholders could be more concerned in their own private benefits. Therefore, high levels of cash flow can reduce the possibility of overinvestment problems but high levels of divergence may increase overinvestment. Based on these assumptions, Wei and Zhang (2008) observed that investment-cash flow sensitivity is reduced when the largest shareholders' cash flow rights increase, but this sensitivity increases when the difference between control and cash flow rights increases. They interpreted these results as a symptom of overinvestment.

3. Data and Methodology

This paper uses the data set constructed from Brazil's reports of Securities and Exchange Commission (CVM), and Economatica. In the information available in the reports, there are disclosure data, such as the number of shares emitted by the firm, capital shares held by the largest shareholders, shareholders agreement, manager's participation in the firm's profit and identities of the director and top executives. From Economatica, we collected information on the balance sheet and statement results of the sample firms. We excluded financial firms and firms with incomplete corporate governance data. To include as many observations as possible, we used an unbalanced panel of 485 firms over the period of 1997-2007.

To classify firms as financially constrained and unconstrained, we used the KZ index constructed by Lamont, Polk and Saá-Requejo (2001). The KZ index proposed here takes into

account all five variables used in the original equation and is calculated according to the formula presented below:

$$KZ\ Index_{it} = -\left(1.002 \cdot \frac{CF}{K_{t-1}}\right)_{it} + \left(0.2826 \cdot Q\right)_{it} + \left(3.1392 \cdot \frac{D}{TotCap}\right)_{it} - \left(39.3678 \cdot \frac{Div}{K_{t-1}}\right)_{it} - \left(1.3148 \cdot \frac{Cash}{K_{t-1}}\right)_{it} \quad (1)$$

where t is the year; i is the firm; K_{it} is the capital stock; CF_{it} is the cash flow variable; Q_{it} is Tobin's q; D_{it} is the debt of the firm; $TotCap_{it}$ is the total capital defined by debt plus stockholder's equity; Div_{it} is the dividends of preferred stocks plus dividends of common stocks and $Cash_{it}$ is the sum of cash plus short term investments.

We create a binary variable (KZ) that takes a value equal to 1 if firms have KZ index higher than the sample median; and, it takes a value of zero if firms have KZ index equal to or lower than the sample median. High KZ index indicates that firms are more likely to face financial constraint, thus firms with KZ equal to 1 were considered a priori as financially constrained and firms with KZ equal to zero were considered as financially unconstrained. Another classification a priori was done by investment opportunities, measured by Tobin's q. We follow Degryse and De Jong (2006) to split the sample into two groups: firms with Tobin's q at or higher than 1, and firms with Tobin's q below the value of 1. Tobin's q greater than one indicates that the firm has more growth investment opportunities. We expect that investment-cash flow sensitivity of low investment opportunities firms reflects an overinvestment tendency, since these firms do not really need to invest.

Our purpose is to use the investment model on financial constraint (KZ) and investment opportunities (Tobin's q) groups, taking into account the firms' ownership structure to identify over or underinvestment problems. The model is presented below:

$$\left(\frac{I}{K_{t-1}}\right)_{it} = \gamma_1\left(\frac{I}{K_{t-1}}\right)_{i,t-1} + \gamma_2\left(\frac{I}{K_{t-1}}\right)^2_{i,t-1} + \beta_1\left(\frac{CF}{K_{t-1}}\right)_{it} + \beta_2\left(\frac{S}{K_{t-1}}\right)_{it} + \beta_3\left(\frac{D}{K_{t-1}}\right)_{it} +$$

$$+ \beta_4\left(\frac{CF}{K_{t-1}}\right)_{it} \times CFR_{it} + \beta_5\left(\frac{CF}{K_{t-1}}\right)_{it} \times DIVERG_{it} + \beta'\left(Ownership\right)_{it} + \varepsilon_{it} \quad (2)$$

where CFR_{it} is the percentage of cash flow rights of the largest ultimate shareholder; $DIVERG_{it}$ is the difference between the percentage of control rights and cash flow rights of the largest ultimate shareholder; $Ownership_{it}$ represents a set of ownership structure dummies variables and ε_{it} is the error term. The division of financial variables by the capital stock enables the investment to be measured in rate and allows financial variables to be analyzed as variations of the capital stock. The choice of variables used in the model described by equation (2) considers the vast literature on investments. The introduction of lags for the dependent variable is to consider the dynamic aspect of the investment. The quadratic lag variable reflects the presence of a non-linear behavior in the adjustment process of capital stock.

In order to consider the dynamic aspect and the endogeneity problem in equation (2), the model was estimated by the generalized method of moments (GMM) suggested by Arellano and Bond (1991). The Sargan test was used to test the validity of the instruments used in the estimation. The null hypothesis of this test cannot be rejected to assure that all instruments used in the model were valid. The possibility of a serial correlation of the error term was also tested. It is assumed that the first-order serial correlation in residuals are not rejected due to the presence of lag dependent variable as covariate; but, the null hypothesis of second-order serial correlation must be rejected to ensure no serial correlation.

4. Results

Table 1 reports descriptive statistics of the firms' financial characteristics for the entire sample and for sub-samples based on KZ index and Tobin's q. We also conducted a mean comparison test by group to infer if the mean is statistically different from each other. Considering the total sample, on average, cash flow is almost 40% of capital stock and sales is more than four times capital stock. Additionally, firms have an investment rate of 8% and their

Table 1: Summary statistics of relevant financial variables

Variables	Total Sample		KZ=0 (Financially Unconstrained)		KZ=1 (Financially Constrained)		Difference between (1) and (2)		Tobin'q≥1 (High Investment Opportunities)		Tobin's q < 1 (Low Investment Opportunities)		Difference between (3) and (4)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff.	p-value	Mean	S.D.	Mean	S.D.	Diff.	p-value
I	0.081	0.967	0.129	1.071	0.015	0.427	0.113	0.0031***	0.106	0.718	0.043	0.855	0.063	0.0905*
CF/K_{t-1}	0.397	0.796	0.597	0.979	0.186	0.152	0.411	0.0000***	0.527	0.912	0.289	0.531	0.237	0.0000***
Sales/ K_{t-1}	4.669	16.12	5.191	11.06	2.42	7.062	2.771	0.0000***	4.852	12.38	2.902	5.713	1.95	0.0000***
Total Assets	3.66	1.16	5.52	1.59	4.3	1.26	1.22	0.0722*	4.86	1.26	4.25	1.38	6.1	0.2935
D/ K_{t-1}	6.079	43.59	3.992	13.68	6.102	58.88	-2.109	0.2942	3.452	11.17	6.72	59.92	-3.268	0.0000***
ROA	0.043	0.057	0.071	0.063	0.027	0.042	0.043	0.0000***	0.066	0.067	0.033	0.045	0.033	0.0000***
ROE	0.119	0.281	0.152	0.147	0.104	0.317	0.047	0.0000***	0.191	0.343	0.074	0.104	0.116	0.0000***
Tobin's q	1.11	0.742	1.218	0.834	1.062	0.611	0.156	0.0000***	1.659	0.915	0.746	0.175	0.912	0.0000***
Divergence	0.225	0.221	0.23	0.216	0.265	0.228	-0.035	0.0007***	0.213	0.222	0.278	0.222	-0.065	0.0000***
BD	0.361	0.48	0.346	0.476	0.32	0.467	0.025	0.2515	0.26	0.439	0.381	0.485	-0.12	0.0000***
Control	0.765	0.423	0.748	0.433	0.784	0.411	-0.035	0.0753*	0.723	0.447	0.797	0.401	-0.074	0.0000***
S. Ag. Control	0.047	0.213	0.059	0.237	0.053	0.224	0.006	0.5372	0.091	0.288	0.023	0.151	0.068	0.0000***
State Control	0.055	0.228	0.059	0.237	0.058	0.235	0.001	0.916	0.037	0.19	0.077	0.267	-0.039	0.0002***
Foreign Control	0.157	0.364	0.156	0.363	0.179	0.383	-0.023	0.1897	0.193	0.395	0.157	0.364	0.0362	0.0027***
Family Control	0.416	0.493	0.369	0.482	0.424	0.494	-0.054	0.0170**	0.311	0.463	0.46	0.498	-0.148	0.0000***
Pyramid	0.618	0.485	0.62	0.485	0.665	0.471	-0.045	0.0442**	0.689	0.462	0.595	0.491	0.0944	0.0000***
N	2963		904		904				874		1320			

Notes: This table reports descriptive statistics of relevant variables. The full sample consists of 2963 observations for 485 firms observed in 1997-2007 period. *I* denotes the firm's investment, measured by $(K_t - K_{t-1})/K_{t-1}$ and *K* is capital stock (net property, plant and equipment). *D* is total debt. *ROA* is net income divided by total assets. *ROE* is defined as the ratio of net income and equity. *Divergence* is *control right* minus *cash flow right. BD* is a dummy variable that takes value 1 if the largest ultimate shareholder is a member of the board and is a director. *S. Ag. Control* is a dummy variable that takes value 1 if the largest ultimate shareholder is the controlling shareholder and his nature is "shareholder agreement". *State Control* is a dummy variable that takes value 1 if the largest ultimate shareholder is the controlling shareholder and he represents the *State. Foreign Control* is a dummy variable that takes value 1 if the largest ultimate shareholder is foreign and he is the controller. *Family Control* is a dummy variable that takes value 1 if the largest ultimate shareholder is the controlling shareholder and his nature is family or individual. *Pyramid* is a dummy variable that takes value 1 if the firm has pyramid ownership structure and 0, otherwise. Symbols ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

return comprises 4% of total assets and 12% of shareholder's equity. The mean comparison test enabled to conclude that the total debt mean of higher and lower KZ index firms is statistically equal, and Tobin's q criterion failed to distinguish between large and small firms (i.e., firms have the same size by Tobin's q classification). According to financial ratios, the summary statistics confirm that higher KZ index firms tend to be more financially constrained as evidenced by the literature. Firms with higher KZ index (KZ=1) exhibit a lower investment rate, lower cash flow, lower sales, higher debt-equity ratio and lower profitability than lower KZ index firms (KZ=0), although these results were expected given how the KZ index is computed. For Tobin's q groups, we note that investment rate, cash flow, sales, profitability and free cash flow are higher for firms classified as Tobin's q greater than one. These results suggest that firms with more investment opportunities (Tobin's q≥1) appear to be less financially constrained than firms with low Tobin's q.

Table 1 also presents variables related to ownership structure and control. For the total sample, the analysis showed that, on average, the control rights of the largest ultimate shareholder (68.3%) are higher than his cash flow rights (45.7%), so the difference between control rights and cash flow rights is positive and about 22.5%. According to table 2, this result is related to a highly concentrated ownership (78%) in the hands of a large shareholder. This happens mainly if the nature of the shareholder is family or individual, which represents almost 42% of firms. Pyramidal ownership firms are distributed throughout approximately 62% of the sample firms. The largest ultimate shareholder acts as the firm's executive director in 38% of the firms and he is a member of the board in 53% of the firms. The overlapping of functions of this shareholder (i.e., the largest shareholder participates in the board and he acts as executive director simultaneously) take place in 36% of the sample firms.

The mean comparison test shows that only *control right*, *divergence*, *control*, *family control* and *pyramid* variables have mean statistically difference in the KZ index classification criterion, i.e., there is no distinction of further mean. Considering Tobin's q groups, the mean comparison test indicates that all means are statistically different, except for the *cash flow right* variable. Firms in low Tobin's q group concede more control rights to the largest ultimate shareholder and, based on *BD* variable, this shareholder actively participates in the firm.

4.1 Estimated Results

Table 2 shows the regression results estimated by GMM. We note that cash flow variable is positive and significant for all groups, except for higher KZ index firms (*KZ*=1) that show a negative coefficient. These results imply the dependency on internal funds to supply investment. For higher KZ index firms, the negative signal indicates that increases in cash flow reduce the investment rate. This result can be indicating a firms' recession period which can have avoided investment expending. Baghat *et al.* (2005) have also found negative investment-cash flow sensitivity. They interpreted this result as part of a gamble-for-resurrection strategy of distressed firms that could continue to invest to try to improve their financial prospects.

Considering the interaction variables, the variable (CF/K_{t-1})**DIVERG* is negative and statistically significant for firms with a high KZ index, and (CF/K_{t-1})**CFR* is positive and significant. This shows that as divergence between control right and cash flow right increases, the investment-cash flow sensitivity decreases. At the same time, when the largest shareholder's cash flow right increases, the dependency on internal funds increases. According to Wei and Zhang (2008), these results support the underinvestment hypothesis related to asymmetric information. Thus, the sensitivity of investment to cash flow of firms considered a priori as financially constrained (high KZ index) is probably due to the presence of asymmetric information, as found by Fazzari *et al.* (1988), Hoshi *et al.* (1991), Allayanis and Mozumbar (2004), Moyen (2004) and other studies. On the other hand, results of lower KZ index firms suggest that these firms tend to have overinvestment problems. The variable (CF/K_{t-1})**DIVERG* is positive and statistically significant while (CF/K_{t-1})**CFR* is negative and significant. This indicates that divergence of rights contributes to elevate the investment-cash flow sensitivity, and more cash

flow rights of the largest ultimate shareholder decrease this sensitivity. Therefore, the dependency on internal funds is due to a tendency of managers to overinvest free cash flow in projects that only benefits their own purpose, as suggested by Jensen (1986).

Table 2: Regression of investment by GMM estimator for the KZ index and Tobin's q groups

Independent variables	KZ=0 (Financially Unconstrained)	KZ=1 (Financially Constrained)	Tobin's q ≥1 (High Investment Opportunities)	Tobin's q<1 (Low Investment Opportunities)
$(I/K_{t-1})_{t-1}$	-0.0175***	-0.0888***	-0.0606***	-0.0535***
	(0.0005)	(0.0003)	(0.0014)	(0.0002)
$[(I/K_{t-1})_{t-1}]^2$	0.0914***	0.1427***	0.0835***	0.1434***
	(0.0001)	(0.0013)	(0.0005)	(0.0009)
CF/K_{t-1}	0.0497***	-0.2688***	0.0700***	0.1736***
	(0.0021)	(0.0206)	(0.0020)	(0.0033)
D/K_{t-1}	0.0003***	0.0004***	0.0091***	0.0002***
	(0.0001)	(0.0000)	(0.0008)	(0.0000)
S/K_{t-1}	0.0178***	0.0376***	0.0099***	0.0009***
	(0.0001)	(0.0005)	(0.0003)	(0.0002)
(CF/K_{t-1})*DIVERG	0.1489***	-0.3605***	-0.2011***	0.0677***
	(0.0029)	(0.0467)	(0.0089)	(0.0046)
(CF/K_{t-1})*CFR	-0.1853***	0.9347***	0.1709***	-0.2507***
	(0.0036)	(0.0310)	(0.0112)	(0.0049)
BD	-0.0612***	0.0362***	0.0477***	-0.0036***
	(0.0037)	(0.0028)	(0.0104)	(0.0013)
Pyramid	0.0195***	-0.0531***	-0.0028	-0.0061***
	(0.0019)	(0.0026)	(0.0037)	(0.0001)
S.Ag. Control	-0.0164***	0.0472***	0.0538***	0.0228**
	(0.0012)	(0.0056)	(0.0023)	(0.0106)
State Control	0.1285***	-0.0743**	-0.1473***	(omitted)
	(0.0460)	(0.0312)	(0.0222)	
Foreign Control	0.0033	-0.0429***	-0.051***	0.0728***
	(0.0056)	(0.0134)	(0.0060)	(0.0091)
Family Control	-0.1078***	0.0797***	0.0963***	-0.0572***
	(0.0002)	(0.0030)	(0.0064)	(0.0002)
Number of observations	615	549	616	548
AR(1)	0.0256	0.0020	0.0243	0.0044
AR(2)	0.1822	0.3214	0.4135	0.8418
Sargan test	0.3320	0.2219	0.3536	0.3853

Notes: This table reports the GMM estimation results for the investment model. *I* is the investment rate. *K* is capital stock. *CF* is cash flow. *D* is total debt. *S* is total sales. *DIVERG* is the divergence between control rights and cash flow rights. *CFR* denotes the cash flow right. *BD* is a dummy variable that takes value 1 if the largest ultimate shareholder is a member of the board and is a director. *AR* denotes p-value of serial correlation tests of first and second order. Symbols ***, **, * denote significance at 1%, 5% and 10% levels, respectively.

For lower Tobin's q firms, the variable (CF/K_{t-1})*DIVERG* is positive and significant, which implies that as divergence between control and cash flow rights increases, the investment-cash flow sensitivity decreases. On the other hand, the variable (CF/K_{t-1})*CFR* is negative and statistically significant, i.e., investment-cash flow sensitivity is reduced when the largest shareholder's cash flow right increases. These results imply that firms may suffer from overinvestment. Therefore, even without profitable opportunities of investment, managers continue to invest in their own private interests using internal funds. At the same time, in higher

Tobin's q firms, it is observed that divergence increases of control and cash flow rights contribute to reduce investment-cash flow sensitivity. However, as cash flow right increases, this sensitivity also increases. This result indicates that these firms' investment is affected by underinvestment. Thus, the dependency of internal funds might be due to the presence of asymmetric information between large and minority shareholders. Degryse and De Jong (2006) and Broussard *et al.* (2009) also documented that firms with low and high Tobin's q are affected by overinvestment and underinvestment, respectively.

The results found in table 2 show that the *BD* variable is significant at 1% level to all groups of firms. For the firms that we infer overinvestment problems (low KZ index and Tobin's q), this variable is negative, so the overlapping functions of the largest shareholder reduce the overinvestment probably due to a better monitoring of managers by the largest shareholder. This result is opposite for the underinvestment firms problem. For these firms, the presence of the largest ultimate shareholder in the board and as executive director increases investment rate, and it can indicate an alignment of interests between shareholders and managers.

Table 2 also shows that the *pyramid* variable is significant to all groups, except to high growth opportunities firms (Tobin's q≥1). Shareholder agreement control variable is significant to all firms group. For firms considered a priori as financially unconstrained (KZ=0), the shareholder agreement control reduces the investment rate, but for all other groups, this type of control positively affects investment. The *state control* variable is significant for both groups of firms, but it is positive for overinvestment problem firms, while it is negative for underinvestment problems. In the same way, when we consider the *foreign-control* variable, we also note the negative and significant signal of this variable for firms in which underinvestment was inferred. Analyzing the *family control* variable, it can be seen that it is negative and significant only for overinvestment firms, but it is positive and significant for firms with underinvestment problems. In most family-controlled firms, the manager is the controlling shareholder, i.e., it is the family members that control the firm. For this reason, for overinvestment problems firms, the presence of the controlling shareholders, such as managers or next to the managers, can reduce asymmetric informational problems between the large shareholders and managers, which reduce agency costs and increase the investment rate. On the other hand, the presence of large shareholders next to managers can contribute to increase the divergence between large and minority shareholders.

4.2 Additional test

After interpreting the results of the previous section, we deemed interesting to investigate whether the active presence of the largest ultimate shareholder in firms is really related to the overinvestment and underinvestment hypothesis. For this, the firms were grouped according to: (1) no presence of the largest ultimate shareholder on the board or in the executive direction; and (2) the presence of this shareholder in the board and the direction. Table 3 shows the results obtained by the GMM estimation.

The results presented in table 3 shows that the cash flow variable is positive and significant to both groups. This indicates that firms are dependent of internal funds to increase investment rate. Considering the interaction variables, it is noteworthy that when there is no presence of the largest ultimate shareholder on the board and as executive director, (CF/K_{t-1})**DIVERG* is positive and significant while (CF/K_{t-1})**CFR* is negative and statistically significant. As shareholders are not active on the firm's investment decisions, these results indicate that no presence of the largest shareholder on the board or executive direction contributes to managers overinvesting free cash flow on unprofitable investment projects. On the other hand, opposite signals of these variables are found for firms in which the large shareholder participates actively in the firm with these two functions. His presence on the board and simultaneously on the executive direction induces asymmetric information between large and minority shareholders and a convergence of interests between the large shareholder and

managers. This result contributes to the underinvestment hypothesis, and hence it can influence the funding of resources for new investment projects.

Table 3: Testing the active participation of the largest shareholder

Independent Variables	No presence	Presence on the board and as executive director
$(I/ K_{t-1})_{t-1}$	-0.0228***	0.0001
	(0.0001)	(0.0002)
$[(I/ K_{t-1})_{t-1}]^2$	0.0953***	0.1946***
	(0.0002)	(0.0007)
CF/K_{t-1}	0.0189***	0.0163***
	(0.0012)	(0.0019)
D/ K_{t-1}	0.0029***	0.0003***
	(0.0001)	(0.0000)
S/ K_{t-1}	0.0050***	0.0106***
	(0.0000)	(0.0000)
(CF/K_{t-1})*DIVERG	0.1837***	-0.0711***
	(0.0018)	(0.0009)
(CF/K_{t-1})*CFR	-0.0505***	0.0175***
	(0.0006)	(0.0034)
Pyramid	0.0315***	0.0240***
	(0.0027)	(0.0014)
S.Ag. Control	0.0362***	-0.0695***
	(0.0034)	(0.0052)
State Control	0.1835***	(omitted)
	(0.0690)	
Foreign Control	-0.0036	(omitted)
	(0.0073)	
Family Control	0.0472***	-0.0060***
	(0.0027)	(0.0010)
Number of Observation	911	533
AR(1)	0.0004	0.0000
AR(2)	0.4075	0.8958
Sargan Test	0.1374	0.9058

Notes: This table reports the results of GMM estimation to investment model. *No presence* is the group of firms where the largest shareholder is not active, i.e., he is not a member of the board and is not an executive director. r. *AR* denotes p-value of serial correlation tests of first and second order. Symbols ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

5. Conclusion

The literature has made available a broader and significant debate about investment-cash flow sensitivity and its connection to the likelihood of financial constraint. Many studies follow-up Fazzari *et al* (1988) and have interpreted positive investment-cash flow sensitivity as an evidence of the asymmetric information on capital market which increases the cost of external resources. However, other studies have investigated this sensitivity regarding the free cash flow hypothesis, as suggested by Jensen (1986) and Stulz (1990).

We used the GMM method to estimate the parameter of the dynamic investment model and to consider the endogeneity problem. The analysis is based on an unbalanced panel of 485 Brazilian firms from 1997 to 2007. We identify that firms classified as financially constrained by the KZ index and firms with high investment opportunities (Tobin's q≥1) may undergo underinvestment problems due to asymmetric problems, as pointed out by Fazzari *et al.* (1988) and other studies. The results also indicate that investment-cash flow sensitivity of financially constrained firms and firms with low investment opportunities are originated by overinvestment of managers' entrenchment activities, as suggested by Jensen (1986). We also find evidences

supporting that overinvestment and underinvestment problems may also be related to the active presence of the largest ultimate shareholder with regards to firm's investment decisions. Our results indicate that overinvestment problems due to a managerial tendency to overspend free cash flow can be aggravated when the largest ultimate shareholder is not an insider. On the other hand, if the largest ultimate shareholder actively participates in the firm (i.e. he is a member of the board and executive director), he contributes to increase underinvestment problems intensified by conflicts of interests between large and minority shareholders.

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