UNIVERSITY OF SÃO PAULO
SÃO CARLOS SCHOOL OF ENGINEERING

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The effect of ownership-control divergence on investment sensitivity to idiosyncratic risk: evidence from an emerging economy

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To my parents, Cassio e Rita.

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“The revolutionary idea that defines the boundary between modern times and past is the mastery of risk: the notion that the future is more than a whim of the gods and that man and woman are not passive before nature” (BERNSTEIN, 1996, p. 1).

ABSTRACT

CAIXE, D. F. **The effect of ownership-control divergence on investment sensitivity to idiosyncratic risk: evidence from an emerging economy**. 2018. 90 p. Thesis (Ph.D. degree) − São Carlos School of Engineering, University of São Paulo, São Carlos, 2017.

This study investigates the moderating role of the agency conflict between controlling and minority shareholders on the investment-risk relationship. When the ownership-control structure is concentrated, the agency theory indicates that the separation between cash-flow rights and voting rights induces the controlling shareholder to extract private benefits. To assess the effect of ownership-control divergence on the investment-risk relation, we use system generalized method of moments estimator (SYS-GMM) in longitudinal data from 412 Brazilian firms between 1997 and 2010. Our results show that investment is less sensitive to idiosyncratic risk for companies in which the largest shareholder presents high levels of ownership-control divergence. The impact of excess voting rights on the investment-risk sensitivity holds after we group firms according to distinct corporate governance and financial characteristics, such as financial constraints, family control, board independence, and the type of control-enhancing mechanism. Board independence does not affect controlling shareholders' behavior toward risky investments. Among the control-enhancing mechanisms, the issuance of dual class shares is the main driver of the lower investment sensitivity to idiosyncratic risk. Our findings are consistent with entrenchment effects in the sense that dominant shareholders may select riskier projects when investing other people’s money, which have both managerial and policy implications.

Keywords: Investment decisions. Idiosyncratic risk. Ownership-control divergence. Agency problems. Emerging economy.

RESUMO

CAIXE, D. F. **O efeito da divergência propriedade-controle na sensibilidade do investimento ao risco idiossincrático: evidência de uma economia emergente**. 2018. 90 p. Tese (Doutorado) – Escola de Engenharia de São Carlos, Universidade de São Paulo, São Carlos, 2017.

Este estudo investiga o papel moderador do conflito de agência entre acionistas controladores e minoritários no relacionamento investimento-risco. Quando a estrutura de propriedade e controle é concentrada, a teoria da agência indica que a separação entre direitos de fluxo de caixa e direitos de voto induz o acionista controlador a extrair benefícios privados. Para avaliar o efeito da divergência propriedade-controle na relação investimento-risco, utilizamos o estimador de método dos momentos generalizado sistêmico (MMG-SIS) em dados longitudinais de 412 empresas brasileiras entre 1997 e 2010. Nossos resultados mostram que o investimento é menos sensível ao risco idiossincrático para empresas em que o maior acionista apresenta altos níveis de divergência propriedade-controle. O impacto dos direitos de voto em excesso na sensibilidade investimento-risco mantém-se após agruparmos as empresas de acordo com características de governança corporativa e financeiras, tais como restrições financeiras, controle familiar, independência do conselho e o tipo de mecanismo para aumento do controle. A independência do conselho não afeta o comportamento dos acionistas controladores em relação a investimentos arriscados. Entre os mecanismos para aumento do controle, a emissão de duas classes de ações é a principal direcionadora da menor sensibilidade do investimento ao risco idiossincrático. Nossas descobertas são consistentes com os efeitos de entrincheiramento no sentido de que os acionistas dominantes podem selecionar projetos mais arriscados ao investirem o dinheiro de outras pessoas, o que tem implicações gerenciais e políticas.

Palavras-chave: Decisões de investimento. Risco idiossincrático. Divergência propriedade-controle. Problemas de agência. Economia emergente.

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SUMMARY

1 INTRODUCTION

In modern corporations, long-term value creation should guide investment decisions (RAPPAPORT, 1997). To create value, entrepreneurs need to be willing to take risk[1] in selecting positive net present value projects (TILMAN, 2009). At the same time, agency costs impact the firms' value maximization, as managers/controlling shareholders can pursue self-interest goals that do not promote value creation (JENSEN; MECKLING, 1976; CLAESSENS, et al., 2002). Previous studies have shown that corporate risk-taking and agency problems are relevant determinants of long-term economic growth (ACEMOGLU; ZILIBOTTI, 1997; JOHN; LITOV; YEUNG, 2008; MORCK; WOLFENZON; YEUNG, 2005; STULZ, 2005). Since economic development depends on sustained economic growth[2], understanding how agency conflicts affect the investment-risk relationship may help policy makers to find channels that contribute to economic welfare.

The empirical literature on the investment-risk relationship at the firm-level uses distinct proxies to measure uncertainty, which are related to cash flows (MINTON; SCHRAND, 1999), stock returns (LEAHY; WHITED, 1996; BULAN, 2005; BLOOM; BOND; VAN REENEN, 2007; BAUM; CAGLAYAN; TALAVERA, 2010), products revenues (GUISO; PARIGI, 1999), and political environment (BAKER; BLOOM; DAVIS, 2016; GULEN; ION, 2016). These studies find, in most cases, a negative correlation between investment and risk.

One stream of this literature explores the impact of agency problems on the investment-risk relationship. For example, Panousi and Papanikolaou (2012) and Glover and Levine (2015) provide empirical evidence that investment sensitivity to idiosyncratic risk depends on insider ownership and managerial compensation contracts, respectively. Both studies use U.S. firms, in which agency problems arise from a clash of interests between managers and outside shareholders.

However, outside Anglo-Saxon countries, the main agency conflict occurs between controlling and minority shareholders due to ownership-control concentration (LA PORTA; LOPEZ-DE-SILANES; SHLEIFER, 1999; CLAESSENS; DJANKOV; LANG, 2000; LINS, 2003; FACCIO; LANG, 2002). In the presence of a controlling shareholder, the corporate governance literature argues that the separation between dominant shareholder's voting and cash flow rights promote entrenchment effects (CLAESSENS, et al., 2002). This is because the

[1] In this study, risk and uncertainty are treated as synonyms. The classic distinction between risk and uncertainty are attributed to Knight (1921). Risk is related to objective probabilities, while uncertainty is associated with subjective probabilities. However, the modern choice theory does not make such a distinction, since it assumes that agents always deal with subjective probabilities (SAVAGE, 1954). Furthermore, according to LeRoy and Singell Jr. (1987), Knight (1921) shared this modern view.
[2] See Betancourt (1996) and Mobarak (2005).

excess voting rights of the largest shareholder increase his incentive to extract private benefits of control at the expense of the minority shareholders' wealth (ALBUQUERUE; WANG, 2008; DOIDGE et al., 2009).

Our study, therefore, explores the moderating role of the agency conflict between controlling and minority shareholders on the investment-risk relationship. More precisely, we examine if the controlling shareholder's ownership-control divergence affects the investment sensitivity to idiosyncratic risk. To do so, we construct a longitudinal data set of Brazilian companies over the period of 1997 to 2010. To alleviate potential sources of endogeneity, such as unobservable heterogeneity, feedback effect and simultaneity, we estimate dynamic investment models by SYS-GMM (WINTOKI; LINCK; NETTER, 2012; FLANNERY; HANKINS, 2013), controlling for investment determinants, such as Tobin's Q, cash flow, leverage and firm size.

The Brazilian context is particularly interesting to assess the effects of agency problems between controlling and minority shareholders on investment decisions for several reasons. First, similar to most firms around the world, Brazilian companies are controlled by a dominant owner. Second, the excess voting rights of the controlling shareholder are very expressive. In addition to the use of pyramids structures, Brazilian firms often issue non-voting stocks, which is an effective way to separate cash flow rights from control rights.

Indeed, Kabbach-Castro, Crespí-Cladera and Aguilera (2013) report that, on average, the largest shareholder in Brazilian listed firms holds 24% more voting rights than cash-flow rights, and on the 4^{st} quartile firms, the largest shareholder's voting rights exceed his cash flow rights by 58%. Additionally, the issuance of dual class shares is more prevalent in Latin American countries (CLAESSENS; YURTOGLU, 2013; KABBACH-CASTRO; CRESPÍ-CLADERA; AGUILERA, 2013) when compared to Asian (CLAESSENS; DJANKOV; LANG, 2000) and European (FACCIO; LANG, 2002) nations.

Our results show that investment is less sensitive to idiosyncratic risk for companies in which controlling shareholders present high levels of ownership-control divergence. Considering that ownership-control divergence could be correlated with corporate characteristics that might affect the investment-risk relationship (i.e., financial constraints, family control, board independence and the type of control-enhancing mechanisms), we provide several robustness tests.

Chu et al.'s (2014) results indicate that excess voting rights increase the company's external financing cost, and Panousi and Papanikolaou (2012) find that financially constrained firms are more sensitive to idiosyncratic risk. Similarly, Claessen et al. (2002) show that ownership-control divergence is greater in family-controlled firms, and Zahra's (2005) study provides evidence that family ownership is positively associated with corporate risk-taking. To address these possibilities, we first check if such variables affect investment sensitivity to idiosyncratic risk. Next, we estimate the coefficients on non-systematic risk for companies with similar (or equal) corporate characteristics (regarding financial constraints and family control) but with distinct levels of excess voting rights. Our results are robust to these alternative explanations.

We also explore the role of control-enhancing mechanisms on the investment-uncertainty relationship. In Brazilian firms, the ownership-control wedge is reached by the use of pyramid structures and dual class shares. Once these mechanisms increase the separation of cash flow and control rights, the corporate governance literature suggests that they are associated with detrimental effects for companies (LINS, 2003; SINGH; GAUR, 2009; BAULKARAN, 2014). Thereby, we also check if the impact of excess voting rights on investment sensitivity to idiosyncratic risk depends on the type of control-enhancing mechanism.

Finally, we also investigate the role of the board of directors on the investment-risk relationship. Some studies show that board independence is related to beneficial effects for firms (KLEIN, 2002; BLACK; JANG; KIM, 2006; KANAGARETNAN; LOBO; WHALEN, 2007). Hence, we check if board independence regarding executives and controlling shareholder influences investment-risk sensitivity, and if it can mitigate the effect of excess voting rights on this relationship.

Our study contributes to the corporate governance literature in several ways. First, we document a significant economic impact of potential agency problems between controlling and minority shareholders on the investment-risk relationship. Since excess voting rights increase the private benefits of control, the dominant shareholder may choose riskier projects to achieve self-interest goals, which is consistent with entrenchment effects of concentrated ownership-control structures. Prior research, such as Panousi and Papanikolaou (2012) and Glover and Levine (2015), focuses on the classic agency conflict, typical of widely held companies, which are rare outside Anglo-Saxon countries. Second, our results signal that firms with dual class shares are less sensitive to idiosyncratic risk, corroborating the view that the issuance of non-voting shares is the most effective control-enhancing mechanism for separating voting rights from cash flow rights. Third, we provide evidence that board composition does not affect the investment-risk relationship. Specifically, board independence does not mitigate the impact of ownership-control divergence on the investment sensitivity to idiosyncratic risk, indicating that the directors act according to controlling shareholder's preferences.

This study is structured in five sections, starting with this introduction. In Section 2, we present a literature review on the main theoretical and empirical research on the investment-risk relationship and develop the hypothesis of this study. Section 3 describes the data and presents the empirical model. Our results are analyzed in Section 4. Finally, Section 5 concludes, presenting managerial and policy implications, as well as limitations and avenues for future research.

2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

This section is organized in four subsections. In subsections 2.1 and 2.2, we briefly review the main theoretical and empirical studies on the investment-uncertainty relationship, respectively. Subsection 2.3 focuses on the agency theory, discussing entrenchment effects, tunneling distortion behavior, and how the ownership-control structure may affect corporate risk-taking. Lastly, in Subsection 2.4, we develop the hypothesis of this study.

2.1 Theoretical literature on the investment-risk relationship

Theoretical research has extensively explored the relationship between corporate investment and distinct types of uncertainty. Such literature has provided mixed results. This is because, depending on assumptions about the shape of production and adjustment cost functions, competition in product markets and firm's behavior toward risk, the effect of uncertainty on investment can be positive, negative or null. In this section, we present some of the main theoretical explanations for the impact of risk on investment.

One stream of literature, started by Hartman (1972) and further developed by Abel (1983), indicates that there is a positive relation between uncertainty over future output prices and investment. Hartman's (1972) discrete-time model assumes that a risk-neutral firm in a perfect competition market faces a linear homogeneous production function (constant returns to scale) and convex (and symmetric) costs of adjustment, such as in the neoclassical investment setting[3]. Such combination implies that the sum of expected cash flows generated by a marginal unit of capital is a convex function of output price. Therefore, by Jensen's inequality[4], an increase in variance of output price raises the value of discounted cash flows on a marginal unit of capital, leading to a greater investment.

However, Pindyck's (1982) continuous-time model shows that the impact of output price (and demand) uncertainty on investment depends on the shape of marginal adjustment cost function. If the cost function is convex, uncertainty increases investment; but if it is concave, uncertainty reduces investment (for both competitive and monopolistic firms).

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[3] According to the neoclassical theory of investment, the firm's objective is to maximize the present value of its cash-flows. Its first version, developed by Jorgenson (1963), derive the optimal capital stock (not the optimal investment rate) under homogeneous of degree one production function and exogenously given output. In the modern version of the neoclassical theory, which adds cost of installing new investment to the model, the firm do not control its capital stock but its investment rate (LUCAS, 1967; GOULD, 1968; TREADWAY, 1969).

[4] Hartman (1972, p. 262) defines Jensen's inequality as "the expected value of a real-valued, convex function increases or remains unchanged when the joint distribution of the arguments undergoes a mean preserving spread".

Finally, Abel (1983) argues that Pindyck's (1982) specification is based on a "target" rate of investment, which may be not optimal. Building on a special case of Pindyck's (1982) model, Abel (1983) shows that Hartman's (1973) results hold for convex, concave, and linear marginal adjustment cost functions.

A second stream of literature follows the real options theory and predicts a negative relationship between investment and uncertainty[5]. This theory includes studies such as McDonald and Siegel (1986), Pindyck (1988, 1991, 1993) and Dixit and Pindyck (1994), which are based on Arrow's (1968) insights about the importance of investment irreversibility for capital policy. The real options approach assumes simultaneously that corporate investments are mostly irreversible (due to the firm's or industry's capital specificity) and delayable. In these models, because of uncertainty, an irreversible investment involves an opportunity cost[6], which is the option of investing later, when additional information may impact on timing and/or amount of the expenditure. Hence, such as an American call option, greater uncertainty raises the value of investing in the future, increasing the full cost on a marginal unit of capital and therefore reducing the firm's investment.

Caballero (1991) argues that the negative effect of risk on investment is a consequence of the assumption of imperfect competition, generally used by real options models. He shows that even under asymmetric adjustment costs, which allow investment irreversibility, when the firm is perfectly competitive the results of Hartman (1972) and Abel (1983) hold.

Pindyck (1993) states that Caballero's (1991) model ignores industry-wide uncertainty by treating the firm in isolation. Pindyck (1993) proposes that industry-wide uncertainty decreases investment under perfect competition. In addition, Dixit and Pindyck (1994) demonstrate that the result of options models holds when considering firm-specific and industry-wide uncertainties.

Abel et al. (1996) add to this literature by showing that the impact of uncertainty over future returns to capital on investment is ambiguous. They develop a general options model in which the firm deals with two options: (1) the option to invest (call option), which is related to the possibility to expand capital stock in the future; and (2) the option to disinvest (put option), which is related to the possibility to reduce capital stock in the future. Since greater uncertainty increases the values of both options, riskier projects are associated with two opposite effects on investment. First, it may reduce the firm's incentive to invest, because the call option only adds value to the firm if it is kept alive, i.e., not investing today. Second, it may increase the firm's

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[5] Over future demand, operating costs, product prices, interest rates etc. (PINDYCK, 1991).

[6] McDonald and Siegel (1986) show that such opportunity cost can be large, indicating that investment rules that disregard it, like Net Present Value (NPV), lead to not optimal investment decisions.

incentive to invest, once to acquire the put option the firm needs to invest today. Thereby, the values of such two options determine the net impact of uncertainty on investment.

A third stream of literature proposes that agency problems may also help understanding the investment-uncertainty relationship (DEMARZO et al., 2012; WEN; XIA; YANG, 2017). DeMarzo et al. (2012) focus on the agency conflict between managers and outside shareholders, which arises from the separation of ownership and management. Their model adds the managerial incentive problem to the Tobin's *q* model of investment[7] by assuming that the manager can divert the firm's output for his private benefit and managerial contract takes account this possibility. To avoid self-dealing by the agent, an optimal incentive contract establishes that managerial compensation is positively related to corporate profitability. In this situation, firm's idiosyncratic productivity shocks raise manager's payoff volatility, increasing the probability of termination, which involves the liquidation of the firm or the replacement of the manager. As the termination is costly for investors, they decrease firm value, reducing Tobin's Q and, consequently, corporate investment. Therefore, due to agency problems, idiosyncratic risk is expected to have a negative effect on investment even for risk-neutral managers and investors.

Unlike DeMarzo et al. (2012), Wen, Xia and Yang (2017) explore the agency conflict between controlling and minority shareholders. Building on Dixit and Pindyck's (1994) model, they treat investment like a growth option, which can be exercised, or not, according to the preferences of a risk-averse, undiversified controlling shareholder. This lack of diversification implies that idiosyncratic risk decreases corporate investment. But, when the divergence between cash-flow and voting rights of the controlling shareholder is high, the growth option tend to be exercised, because the private benefits of control are greater than the non-diversification costs.

Finally, Bolton, Cheng and Wang (2011, 2013) show that adding external financing costs on the Tobin's *q* model of investment may also help explaining the impact of uncertainty on investment. They argue that if the firm is subject to costs of raising external funds, corporate value also depends on firm's cash holdings, once hoarding cash to finance its future projects can decrease future financing costs. Bolton, Cheng and Wang (2011) demonstrate that greater cash stock volatility, caused by increased cash-flow volatility due to systematic and

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[7] The Tobin's *q* theory of investment is introduced by Brainard and Tobin (1968) and Tobin (1969), who defined the average *q* (Tobin's Q), the ratio of firm's market value to its replacement cost. In modern *q* theory of investment, there is a relationship between firm's investment and marginal *q*, which is ratio of market value of an additional unit of capital to its replacement cost (LUCAS; PRESCOTT, 1971; MUSSA, 1977). More precisely, the firm should invest (or disinvest) until marginal *q* is equal to 1. Hayashi (1982) demonstrates that average *q* equals marginal *q* under perfect competition and linear homogeneity (constant returns to scale) of the adjustment cost and production functions.

idiosyncratic productivity shocks, reduces corporate value and investment because it raises the likelihood of a costly liquidation. In their model, the firm exposure to systematic and idiosyncratic risks can be mitigated by financial hedging and liquidity management, respectively. Bolton, Cheng and Wang (2013) expands Bolton, Cheng and Wang's (2011) model by assuming that external financing costs are also stochastic. In this case, company risk premium presents productivity and financing components. Since both risk premiums decreases with firm's cash holdings (i.e., depends on the company's liquidity management), idiosyncratic risk also increases corporate cost of capital, affecting the firm's investment and value.

2.2 Empirical literature on the investment-risk relationship at the firm level

Empirical literature on the investment-risk relationship using firm-level data is recent compared to theoretical research. Although the model specifications, estimation techniques and risk proxies are heterogeneous (see Table 1), in most cases, the empirical studies have found that uncertainty decreases corporate investment. We can group these studies in two literature streams: (a) those in which stock returns are not used in risk measure construction, and (b) those in which risk proxies are constructed from stock returns.

The first stream includes studies such as Guiso and Parigi (1999), Minton and Schrand (1999), Baker et al. (2016) and Gulen and Ion (2016). To measure uncertainty, Guiso and Parigi (1999) use the variance of future demand for the company's products, based on officers' and owners' perceptions. Their results indicate that risk is negatively related to investment by reducing the investment-demand sensitivity. Minton and Schrand (1999) choose the variation coefficient of the company's operating cash flows as the risk proxy. They find that cash flow volatility decreases investment, especially for firms with high levels of cash flow. Baker et al. (2016) and Gulen and Ion (2016) explore the relationship between corporate investment and aggregate political uncertainty, measured mainly by the volume of newspaper articles debating policy-related uncertainty. Overall, both papers find a negative impact of political uncertainty on investment, notably for firms in policy-sensitive industries (BAKER; BLOOM; DAVIS, 2016) and with a greater degree of investment irreversibility (GULEN; ION, 2016).

In the second stream, the authors tend to use risk measures based on the firm's stock returns. The main advantage of this approach is that asset prices reflect any aspect of the company's environment that is relevant for investors (LEAHY; WHITED, 1996). Another benefit of this procedure is that it allows total corporate uncertainty to be captured by a single variable (i.e., the volatility of the firm's stock returns), making it easy to decompose the risk into its distinct types (like idiosyncratic and systematic) (BULAN, 2005). Table 1 shows the main articles, describing the location of the study and the empirical technique. We briefly describe the main results of these studies in turn.

Table 1 − Empirical studies on the investment-risk relationship

Study	Place	Model(s)	Estimation technique(s)	Risk proxy(ies)	Overall risk impact
Leahy and Whited (1996)	U.S.	Static	OLS[(1)]	Forecast variance of the firm's stock returns, and systematic risk	Negative for forecast variance of the firm's stock returns / none
Guiso and Parigi (1999)	Italy	Dynamic	Li (1985)'s estimator	Variance of future demand for the firm's products	Negative by affecting investment-demand sensitivity
Minton and Schrand (1999)	U.S.	Static	OLS	Variation coefficient of the firm's operating cash flows	Negative for firms with high levels of cash flow
Bond and Cummins (2004)	U.S.	Dynamic	GMM[(2)]	Standard deviation of the firm's stock returns (a), variation coefficient of the firm's EPS[(3)] (b), and square of the difference between forecast EPS and realized EPS (c)	Negative for (b) / negative for (a) by affecting investment-demand sensitivity
Bulan (2005)	U.S.	Static	2SLS[(4)]	Idiosyncratic, industry and market risks	Negative for idiosyncratic and industry risks
Bloom et al. (2007)	U.K.	Static	GMM	Standard deviation of the firm's stock returns	Negative by affecting investment-demand sensitivity
Baum et al. (2010)	U.S.	Dynamic	GMM	Intrinsic, extrinsic and systematic risks	Negative by affecting investment-cash flow sensitivity
Panousi and Papanikolaou (2012)	U.S.	Static and Dynamic	OLS, 2SLS and GMM	Idiosyncratic and systematic risks	Negative for idiosyncratic risk, especially for firms with high level of insider ownership
Glover and Levine (2015)	U.S.	Static and Dynamic	OLS and GMM	Idiosyncratic risk	Negative depending on managers' compensation contracts
Baker et al. (2016)	U.S.	Static	OLS	Political uncertainty	Negative for firms in policy-sensitive industries
Gulen and Ion (2016)	U.S.	Static	OLS and 2SLS	Political uncertainty	Negative especially for firms with a high degree of investment irreversibility

(1) Ordinary least squares; (2) generalized method of moments; (3) earnings per share; (4) two-stage least squares.

Leahy and Whited (1996) is one of the first empirical works to investigate the investment-risk relationship using microeconomic data. They use two risk proxies: the forecast variance of the firm's stock returns (employing a vector auto regression technique); and the covariance between company and market returns (proxy for systematic risk). Their results show that only the first measure reduces investment, but its explanation power disappears with the inclusion of Tobin's Q in the model.

Bond and Cummins (2004) and Bloom, Bond and Van Reenen (2007) reach similar overall results when they measure uncertainty by the standard deviation of the firm's stock returns. The authors find that risk decreases investment sensitivity to sales growth, consistent with the view that uncertainty weakens the investment response to demand shocks. Hence, their findings corroborate Guiso and Parigi's (1999) results, suggesting that such an effect can be captured using distinct risk measures.

Bulan (2005) decomposes total firm uncertainty into idiosyncratic, industry and market risks. She finds that only the first two are negatively related to corporate investment, and the economic effect of firm-specific uncertainty is the most expressive. Baum et al. (2010) also analyze the relationship between investment and three risk types: intrinsic (based on the volatility of the firm's stock returns); extrinsic (based on the volatility of a market index's returns); and systematic (covariance between company and market returns). Their results indicate that uncertainty impacts investment, especially through cash flow. Precisely, intrinsic and systematic risks increase investment sensitivity to cash flow, while extrinsic uncertainty reduces the effect of cash flow on investment.

More recently, such papers as Panousi and Papanikolaou (2012), and Glover and Levine (2015) began to explore the role of agency conflict between managers and outside shareholders on the investment-risk relation. First, Panousi and Papanikolaou (2012) show that idiosyncratic, not systematic risk, is negatively associated with investment, consistent with Bulan's (2005) findings. Second, they provide evidence that investment-risk sensitivity is stronger for firms in which the managers hold more ownership stakes. Glover and Levine (2015) complement Panousi and Papanikolaou's (2012) results. They find that the impact of firm-specific risk on investment depends on the structure of the managers' incentive-based compensation contracts.

2.3 Agency theory and corporate risk-taking

The agency theory is one of the major building blocks of modern financial theory (JENSEN; SMITH, 1984) and is the conceptual framework for corporate governance studies (SHLEIFER; VISHNY, 1997; DENIS; MCCONNELL, 2003). Ross (1973) defines the agency relationship as a common mode of social interaction, which arises between two parties when one of them (principal) hires the other (agent) to act on its behalf, and delegates some decision-making power. Assuming both parties are utility maximizers, it is possible that the agent makes decisions that are not in the principal's best interests, leading to agency costs (JENSEN; MECKLING, 1976). In modern corporations, distinct types of agency conflicts arise from two extreme ownership structures, described as follows.

When all owners hold small equity stakes[8], the corporate ownership structure is dispersed, and the main agency conflict occurs between managers and outside shareholders (principal-agent model) (BERLE; MEANS, 1932; HELWEGE; PIRINSKY; STULZ, 2007). Because executives are utility maximizers and have discretion over the firms' financial and investment decisions, they can act on their behalf, pursuing non-value-maximizing objectives (WILLIAMSON, 1963). Managerial ownership aligns the insiders' and shareholders' interests, as the former receives direct wealth outcomes from their choices, which may increase firm value (alignment effect) (JENSEN; MECKLING, 1976). However, high levels of insider ownership may decrease company value, since managers have sufficient control to seek self-interest goals, and outside shareholders find it difficult to discipline the officers' actions (entrenchment effect) (MORCK; SHLEIFER; VISHNY, 1988; STULZ, 1988).

The dispersed ownership structure is a feature of the Anglo-Saxon model of corporate governance. Though, around the world, firms often have a large shareholder, being controlled by families, financial institutions or the State (LA PORTA; LOPEZ-DE-SILANES; SHLEIFER, 1999; CLAESSENS; DJANKOV; LANG, 2000; LINS, 2003; FACCIO; LANG, 2002). With ownership concentration, agency problems arise from conflicts of interest between controlling and minority shareholders (principal-principal model) (YOUNG et al., 2008; RENDERS; GAEREMYNCK, 2012). Dominant shareholders are interested in firm value maximization, having enough power to monitor the manager's actions. Thus, ownership concentration may be associated with greater company value (alignment effect) (SHLEIFER; VISHNY, 1986; CLAESSENS, et al., 2002). Conversely, the divergence between cash flow and voting rights of controlling owners may reduce firm value, once they could benefit from extracting wealth from the firm while bearing only a part of the costs related to a lower company valuation (entrenchment effect) (CLAESSENS, et al., 2002; CLAESSENS; FAN, 2002; LINS, 2003).

Control-ownership divergence is obtained by using control-enhancing devices, such as pyramid structures, dual class shares and cross-ownership ties (ISS, 2007). These mechanisms

[8] The corporate governance literature normally classifies firms as widely held if the voting rights stakes of the largest ultimate shareholder do not exceed the 20% (or 10%) threshold (See, for example, La Porta, Lopez-de-Silanes and Shleifer (1999), and Faccio and Lang (2002)).

can allow the largest owner to achieve (or hold) the majority of votes in the shareholder meeting, while retaining relatively small ownership stakes (BEBCHUK; KRAAKMAN; TRIANTIS, 2000). Excess voting rights incentivize controlling shareholder to pursue private benefits at the cost of the minority shareholders (ALBUQUERUE; WANG, 2008; DOIDGE et al., 2009). These benefits can be pecuniary, such as payment of excessive salaries, transference of assets to other firms under their control, and buying (or selling) company securities at an "unfair" price; or non-pecuniary, such as status, political influence, and on-the-job shirking (DYCK; ZINGALES, 2004; MORCK; WOLFENZON; YEUNG, 2005).

Since the dominant shareholder's private benefits may command their decisions, the ownership-control wedge could affect the selection of risk investments. According to John, Litov and Yeung (2008), if the largest owner achieves corporate control through mechanisms that promote control-ownership disparity, two opposite risk-taking behaviors should be considered. First, because the controlling shareholder wealth is, at least partially, concentrated within the firms under his control, he is likely to direct investments in a more conservative way than a totally diversified investor would. In other words, due to his large exposure to the companies he controls, the largest owner may avoid riskier investments in an attempt to preserve his wealth.

John, Litov and Yeung (2008) label the second risk-taking behavior as "tunneling distortion". Dominant shareholders can transfer ("tunnel") corporate resources to other firms under their control[9] or to their personal account (taking the form of theft), which is a widespread practice especially in locations with poor investor protection (JOHSON et al., 2000; BERTRAND; MEHTA; MULLAINATHAN, 2002). Thereby, tunneling practices may encourage corporate risk-taking, as the controlling shareholder can transfer any gains of riskier projects to companies in which he owns high cash flow rights, leaving potential losses to be absorbed by the firms in which he holds low ownership stakes.

Based on these two opposite hypotheses, some studies have empirically tested the impact of the ownership-control structure on corporate risk-taking[10]. Such papers have reached mixed results. Using a cross-country sample, Paligorova (2010) finds that the cash flow rights of the largest shareholder are positively related to risk-taking only for companies that are part of business groups. Faccio, Marachica and Mura (2011) show that ownership concentration increases European firms' risk-taking, and the latter depends on the diversification level of the

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[9] "Cash can be transferred in many ways: the firms can give each other high (or low) interest rate loans, manipulate transfer prices, or sell assets to each other at above or below market prices, to list just a few" (BERTRAND; MEHTA; MULLAINATHAN, 2002, p. 122).

[10] In these studies, corporate risk-taking is measured by the volatility of profitability ratios (like return on assets or return on equity).

controlling owner. Saghi-Zedek and Tarazi (2015) provide evidence that greater excess voting rights of the dominant shareholder are generally associated with more risk-taking by Western European banks. In contrast, Su, Li and Wan (2017)'s results indicate that ownership-control divergence leads to lower risk-taking by Chinese firms.

2.4 Hypothesis development

Studies focusing on the moderating role of the ownership-control structure on investment-risk sensitivity are rare, except for Panousi and Papanikolaou (2012). The authors find that managerial ownership increases investment sensitivity to idiosyncratic risk, indicating that the agency conflict between managers and outside shareholders may be a key channel behind the investment-risk relationship. However, as mentioned earlier, outside Anglo-Saxon countries, agency problems arise from a clash of interests between controlling and minority shareholders due to ownership-control concentration. Based on three theoretical arguments, we believe that such a type of agency conflict may also impact investment sensitivity to idiosyncratic risk, especially through ownership-control divergence.

First, since the controlling shareholder drives the firm's investment decisions, his willingness to take risks affects corporate risk-taking. Due to his large control stakes, the dominant owner participates directly in the selection (or replacement) of board members, who, in turn, choose the executive officers[11]. So, managers, in most cases, may act according to the largest shareholder's interests (JAMESON; PREVOST; PUTHENPURACKAL, 2014). Therefore, the controlling owner's risk-taking preferences may impact the company's risk investment decisions (JOHN; LITOV; YEUNG, 2008; FACCIO; MARCHICA; MURA, 2011).

Second, idiosyncratic risk may affect investment decisions for firms with concentrated ownership. This is because the largest shareholder is not a totally diversified investor, i.e., he does not bear only systematic risk, since the controlled firm's market capitalization accounts for a significant part of his wealth (ANDERSON; REEB, 2003; STULZ, 2005; JOHN; LITOV; YEUNG, 2008). Moreover, some empirical studies on the investment-risk relation, such as Bulan (2005), Panousi and Papanikolaou (2012) and Glover and Levine (2015), show that idiosyncratic risk is negatively associated with investment even for widely held companies. Leahy and Whited (1996), Bulan (2005) and Panousi and Papanikolaou (2012) also find that systematic risk plays no role in explaining investment.

Third, ownership-control divergence of the dominant shareholder is associated with greater private benefits, which may lead to a lower investment sensitivity to idiosyncratic risk.

[11] In an extreme control situation, the controlling owner is the company's CEO and Chairman.

When voting rights exceed cash flow rights, the controlling owner can use corporate resources to pursue self-interest goals without bearing the total costs related to the discount on the firm value by outside investors (CLAESSENS; FAN, 2002). Consequently, excess voting rights increase the largest shareholder's incentive to seek private benefits of control, which may result in wealth expropriation from the minority shareholders (ALBUQUERUE; WANG, 2008; DOIDGE et al., 2009). The seminal work by Claessens et al. (2002) indicates that ownership-control divergence decreases firm value, signaling that it may capture entrenchment effects. Moreover, John, Litov and Yeung (2008) argue that excess voting rights may encourage corporate risk-taking, since the dominant shareholder can select riskier investments to transfer its cash flows for firms in which he holds high ownership stakes. Saghi-Zedek and Tarazi (2015)'s empirical results are, in general, consistent with this "tunneling distortion hypothesis".

From the above findings, we propose the following hypothesis:

Hypothesis 1: *Investment is less (more) sensitive to idiosyncratic risk for firms with high (low) levels of divergence between cash flow and voting rights of the largest shareholder*.

3 METHOD

In this section, we present the method of the study. Section 3.1 exposes the sample-selection procedure and the data sources. Section 3.2 explains the construction of our proxies for idiosyncratic and systematic risks. In Section 3.3, we describe our empirical model. Finally, Section 3.4 discusses endogeneity concerns and shows how the SYS-GMM estimator addresses them.

3.1 Sample

Our sample comprises 412 unique publicly traded companies over the 1997 to 2010 period, forming an unbalanced panel of 3,003 firm-year observations. We exclude financial companies[12] due to comparability problems, since their capital structures differs significantly from non-financial ones, and they are subject to specific risk factors (VIALE; KOLARI; FRASER, 2009). Firms with missing values for any variable of the study are also dropped. To address the effect of outliers, all variables are winsorized at the 1% and 99% levels.

We collect stock market and accounting firm-level data from the Economatica® database and deflate them by the Broad Consumer Price Index (IPCA[13] is the Portuguese acronym). Corporate governance data are taken from Aldrighi and Mazzer Neto (2007), and Aldrighi (2014)[14]. The former and the latter cover the 1997-2002 and 2003-2010 periods, respectively. In both database, the corporate governance variables are constructed from the company reports given to the Securities and Exchange Commission of Brazil (CVM is the Portuguese acronym)[15].

3.2 Measuring idiosyncratic and systematic risks

We use weekly stock returns to construct our risk variables, since most Brazilian stocks are not traded every day. According to Panousi and Papanikolaou (2012), returns on weekly frequency may mitigate microstructure effects while yielding precise estimates of idiosyncratic and systematic risks. Studying U.S. firms, the authors also use weekly returns in their risk

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[12] We classify the firms as financial companies if they pertain to “Finance and Insurance” sector regarding North American Industry Classification System (NAICS Level 1). Panousi and Papanikolaou (2012) also exclude financial firms.

[13] IPCA is the official inflation index in Brazil. Following Baum, Caglayan and Talavera (2010), we use a consumer price index to deflate stock market and accounting firm-level data.

[14] We thank professor Dante Mendes Aldrighi for making the data available to us.

[15] Corporate governance data are collected from Annual Information Reports and Reference Forms for 1997-2008 and 2009-2010 periods, respectively.

proxies' construction, because, even in the world's most liquid stock market, not all equity shares are traded daily.

To measure idiosyncratic and systematic risks, for every firm *i* and every year *t*, we regress the company's stock excess return on the Fama and French (1993, 1996) three-factor risk premiums:

$$R_{i,\tau} - R_{F,\tau} = \beta_{0,i} + \beta_{1,i} \cdot \left(R_{M,\tau} - R_{F,\tau}\right) + \beta_{2,i} \cdot R_{SMB,\tau} + \beta_{3,i} \cdot R_{HML,\tau} + \varepsilon_{i,\tau} \tag{1}$$

where τ indexes weeks; R_i is the stock return of firm *i*; R_M is the value-weighted market portfolio return; R_F is the risk-free rate; R_{SMB} is the difference between the returns on value-weighted portfolios of small and big stocks; R_{HML} is the difference between the returns on value-weighted portfolios of high and low book-to-market equity stocks; β_0 is the intercept; β_1, β_2 and β_3 are the slopes on market, size and value premiums, respectively; and ε is the error term.

The capital asset pricing theory states that the market portfolio comprises all risky assets in the economy (SHARPE, 1964; LINTNER, 1965). So, rather than use a stock index, such as Ibovespa[16], in which only securities that are traded daily participate, we build yearly value-weighted market portfolios that include all stocks with available data on weekly returns. Following Fama and French (1993, 1996), big and small value-weighted portfolios encompass stocks that are among the top and bottom 30 percent of values of market capitalization, respectively. Similarly, value and growth value-weighted portfolios comprise stocks belonging to the highest and the lowest 30 percent of values of book-to-market equity, in this sequence. Finally, we use the Selic interest rate[17] converted to weekly frequency as the risk-free rate.

Based on Panousi and Papanikolaou (2012)[18], and Glover and Levine (2015)[19], the idiosyncratic risk of firm *i* in year *t* is measured by the standard deviation of the residual in regression (1) over *n* trading weeks:

$$\sigma_{i,t}^{idi} = \sqrt{\frac{1}{n}\sum_{\tau=1}^{n} \hat{\varepsilon}_{i,\tau}{}^{2}} \tag{2}$$

[16] Ibovespa is the São Paulo Stock Exchange Index.
[17] The Special Settlement and Custody System (Selic in Portuguese acronym) rate is the reference interest rate for Brazilian government bonds. It is the basic interest rate for guiding monetary policy.
[18] The authors also measure their risk proxies through the two-factor model (market and industry) and the capital asset pricing model (CAPM). All models (including the Fama-French three-factor model) yield idiosyncratic risk proxies that present high correlation and lead to quite similar results.
[19] The authors use daily returns in idiosyncratic risk construction through the Fama-French three-factor model.

The firm's total risk (σ^{total}) is composed of the sum of its systematic (σ^{sys}) and unsystematic (σ^{idi}) parts (SHARPE, 1964). Hence, as in Panousi and Papanikolaou (2012), we measure systematic risk of firm *i* in year *t* as follows:

$$\sigma_{i,t}^{sys} = \sqrt{\left(\sigma_{i,t}^{total}\right)^2 - \left(\sigma_{i,t}^{idi}\right)^2} \tag{3}$$

3.3 Empirical model

To assess the effect of ownership-control divergence on investment sensitivity to idiosyncratic risk, we estimate the following model:

$$\left(\frac{I_t}{K_{t-1}}\right)_{i,t} = \beta_0 + \beta_1\left(\frac{I_t}{K_{t-1}}\right)_{i,t-1} + \beta_2\sigma_{i,t-1}^{idi}\times DIV_L + \beta_3\sigma_{i,t-1}^{idi}\times DIV_H + \beta_4\sigma_{i,t-1}^{sys} + \beta_5 Q_{i,t-1} + \beta_6\left(\frac{CF_t}{K_{t-1}}\right)_{i,t-1} + \beta_7 LEV_{i,t-1} + \beta_8 SIZE_{i,t-1} + \beta_9 NEG_{i,t-1} + \sum_{n=1}^{3}\delta_n\, CG\_Segment_{i,t-1} + \eta_i + \omega_t + \nu_{i,t} \tag{4}$$

where *i* is the firm; *t* is the year; I is the firm's investment, defined as $K_t - K_{t-1}$; K is capital stock (fixed assets); σ^{idi} is idiosyncratic risk; DIV_L and DIV_H are dummy variables for low and high ownership-control divergence, respectively; σ^{sys} is systematic risk; Q is Tobin's Q; CF is cash flow; LEV is leverage ratio; $Size$ is firm size; NEG is stock negotiability index; $CG\_Segment$ are three dummy variables for Bovespa's[20] premium listing segments: $DN1$ (Nível 1), $DN2$ (Nível 2), and DNM (Novo Mercado); η is firm fixed-effects (unobservable heterogeneity); ω is year fixed-effects; and ν is error term. A detail description of all variables is provided in Table 2.

We measure ownership-control divergence by the percentage point difference between the voting and cash flow rights of the largest ultimate shareholder (LUS[21]) $- DIV$. The seminal work of Claessens et al. (2002) uses this variable to capture the impact of the controlling owner's excess voting rights on firm value. In addition, Doidge et al. (2009) show that such a measure is a good proxy for the dominant shareholder's private benefits of control. Because the company's ownership-control structure usually does not vary yearly, we create dummy variables for excess voting rights. Every year, firms are sorted into quintiles according to their

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[20] Bovespa is the Portuguese acronym for São Paulo Stock Exchange.

[21] LUS is defined as the shareholder who holds, directly and indirectly (in case of pyramid structures), the greatest stake in company's voting rights.

lagged value of DIV. Then, we classify companies that belong to the first two quintiles as low ownership-control divergence firms (DIV_L), and those that belong to the last two quintiles as high ownership-control divergence firms (DIV_H). To investigate if the excess voting rights of the controlling shareholder affect investment sensitivity to unsystematic risk, we apply the Wald test to verify the statistical significance of the difference between the $\sigma_{i,t-1}^{idi} \times DIV_L$ and $\sigma_{i,t-1}^{idi} \times DIV_H$ coefficients.

Table 2 − Variables definitions

Abbreviation	Definition
K	Capital stock, defined as property, plant, and equipment.
I	Firm's investment, defined as $K_t - K_{t-1}$.
σ^{idi}	Standard deviation of the residual in the regression of the firm's weekly stock excess return on the Fama and French (1993, 1996) three-factor risk premiums.
σ^{total}	Standard deviation of the firm's weekly stock return.
σ^{sys}	Square root of the difference between the squared total risk and squared idiosyncratic risk.
Q	Proxy for Tobin's Q, defined as the sum of the firm's book total debt and market equity divided by total assets.
CF	Cash flow, defined as net income plus depreciation and amortization expenses.
LEV	Firm leverage, defined as total debt divided by total assets.
$Size$	Firm size, defined as the natural log of total assets.
NEG	Stock negotiability index, defined by the Economatica® system as $NEG_t = \sqrt{\left(\frac{n_t}{N_t}\right) \times \left(\frac{v_t}{V_t}\right)}$ where t is the year; n is the number of trades with the stock on the local market; N is total number of trades on the local market; v is the amount traded with the stock (in Brazilian currency) on the local market; V is the total amount traded (in Brazilian currency) on the local market.
CON	Percentage of voting rights held by the largest ultimate shareholder.
OWN	Percentage of cash flow rights held by the largest ultimate shareholder.
DIV	Ownership-control divergence of the largest ultimate shareholder, defined as $CON - OWN$.
$DN1$	Dummy variable that equals one if the company is listed in the Nível 1 premium segment.
$DN2$	Dummy variable that equals one if the company is listed in the Nível 2 premium segment.
DNM	Dummy variable that equals one if the company is listed in the Novo Mercado premium segment.
WW	WW index, defined by Whited and Wu (2006) as: $WW_t = -0{,}091\frac{CF_t}{TA_t} - 0{,}062DDiv_t + 0{,}021\frac{TLTD_t}{TA_t} - 0{,}044LNTA_t + 0{,}102ISG_t - - 0{,}035SG_t$ where t is the year; CF is cash flow; TA is total assets; $DDiv$ is a dummy for dividend payment; $TLTD$ is total long-term debt; $LNTA$ is the natural log of total assets; ISG is the industry's sales growth; and SG is the firm's sales growth.
KZ	KZ index, defined by Lamont, Polk and Saá-Requejo as: $KZ_t = -1{,}002\frac{CF_t}{K_{t-1}} + 0{,}283Q_t + 3{,}139\frac{D_t}{IC_t} - 39{,}368\frac{Div_t}{K_{t-1}} - 1{,}315\frac{Cash_t}{K_{t-1}}$ where t is the year; CF is cash flow; K is property, plant, and equipment; Q is Tobins's Q; $D_{i,t}$ is total debt; IC is invested capital; $Div_{i,t}$ is dividends; and $Cash$ is cash plus short-term investments.

Equation (4) includes distinct types of controls to mitigate econometric biases related to the omission of relevant explanatory variables. The introduction of lagged investment rate as an independent variable addresses the dynamic aspect of investment, since Guiso and Parigi (1999), Bond and Cummins (2004) and Baum, Caglayan and Talavera (2010) find a positive relation between past and current investment. Controlling for systematic risk is important to ensure that we are capturing the impact of idiosyncratic risk on investment, as these types of uncertainty may be correlated[22]. In studies focusing on investment determinants, Tobin's Q and cash flow ratio are standard controls. The former accounts for the company's growth opportunities, while the latter may capture the effect of liquidity constraints on investment (FAZZARI; HUBBARD; PETERSEN, 1988) but also may act as a proxy for the firm's future profitability (GOMES, 2001). We control for leverage, since highly leveraged companies may invest less (MYERS, 1977), and leverage may increase stock return volatility (CHRISTIE, 1982). The model also includes a size variable, once smaller firms tend to be riskier, and company size may affect investment, even though the sign of this relationship is not clear. According to Xing (2008), large firms present lower investment growth rates because they have more unproductive capital. In contrast, Handlock and Pierce (2010) argue that small firms are more financially constrained, which might result in lower investment rates. Equation (4) also controls for stock negotiability for two reasons. First, Attig et al. (2006) and Chu, Liu and Tian (2015) show that excess voting rights decrease the liquidity of equity shares. Second, Muñoz (2013) provide empirical evidence that investment is positively related to stock liquidity. Finally, we include three dummy variables for Bovespa's premium segments, as firms that integrate them must adopt stronger corporate governance rules related to the ownership-control structure, board composition, minority shareholders rights and disclosure practices[23].

3.4 Estimation

Empirical papers on corporate finance, which study the effects and causes of investment decisions, are often subject to endogeneity problems that, if unsolved, may lead to biased and inconsistent coefficients[24]. Unobservable heterogeneity, feedback effect and simultaneity are potential sources of endogeneity in corporate finance studies[25]. This section explains how the

[22] Moreover, systematic risk increases firm's equity cost of capital, which may reduce corporate investment.
[23] See Braga-Alves and Shastri (2011), Carvalho and Pennacchi (2012), and BM&FBovespa's website (www.bmfbovespa.com.br) for detail description of these rules.
[24] Roberts and Whited (2013) provide a formal discussion on causes and consequences of endogeneity.
[25] Wintoki, Linck and Netter (2012) formally explain how SYS-GMM can alleviate these potential sources of endogeneity.

system generalized method of moments estimator (SYS-GMM), developed by Arellano and Bover (1995) and Blundell and Bond (1998), can mitigate such sources of endogeneity. We also describe the used instruments for all explanatory variables of Equation (4) and present the employed tests to verify the validity of these instruments.

The feedback effect (or dynamic endogeneity) arises from dynamic specifications, i.e., models in which lag (or lags) of the depend variable is a relevant explanatory variable, similar to in Equation (4) (WINTOKI; LINCK; NETTER, 2012). In this case, if the past investment rate affects any regressor in Equation (4), and we do not include it as independent variable, our model would suffer from omitted variable bias. Traditional panel estimators, such as fixed effects and random effects, cannot address dynamic models, since they are based on the strict exogeneity assumption. It states that the model's current error cannot be correlated with the past, current and future values of any regressor (WOOLDRIGE, 2002). Therefore, the inclusion of the lagged dependent variable as regressor violates such an assumption. In contrast, GMM can estimate dynamic models, since the regressors just need to be sequentially exogenous, i.e., model's current error cannot be correlated with past values of the regressors (KUERSTEINER; PRUCHA, 2013). Hence, it is possible to construct instruments of endogenous variables with their own lags. More precisely, the Arellano and Bond (1991) difference GMM (DIFF-GMM) estimates first-differenced equations by using lagged levels of endogenous variables as instruments. In turn, the SYS-GMM estimator adds levels equations in the estimation process and instruments regressors in levels with their lags in differences[26]. Examining the statistical properties of five robust techniques[27] for estimating dynamic panel models in corporate finance datasets, Flannery and Hankins (2013) conclude that SYS-GMM should be the default choice when dealing with endogenous variables. These researchers also show that SYS-GMM estimates are not affected by panel imbalance.

Another source of endogeneity, which may also result in omitted variable bias, is unobserved heterogeneity. This refers to time-invariant variables that may affect dependent and explanatory variables but are not observable by researchers. If corporate decisions are also based on nonpublic information, then some relevant factors[28] may be unobservable to econometricians (ROBERTS; WHITED, 2013). Fixed effects and random effects estimators can control for such time-invariant firm characteristics. In DIFF-GMM, first-differencing eliminates unobserved heterogeneity. However, as mentioned earlier, the SYS-GMM

[26] It promotes asymptotic efficiency gains relative to DIFF-GMM.
[27] The five robust techniques they tested are DIFF-GMM, SYS-GMM, least squares dummy variable correction (LSDVC), four period differencing (LD4), and longest differencing (LD).
[28] Monitoring technology, intangible assets and managerial ability are examples of unobservable relevant factors (HIMMELBERG; HUBBARD; PALIA, 1999; WINTOKI; LINCK; NETTER, 2012).

estimation procedure also involves equations in level, which still include firm-specific effects. Hence, to address that, SYS-GMM assumes that the correlation between unobserved heterogeneity and explanatory variables is constant over time (ARELLANO; BOVER, 1995; BLUNDELL; BOND, 1998).

The third source of endogeneity is simultaneity (or reverse causality). It occurs when, simultaneously, the explanatory variable of interest (or other regressors) causes the dependent variable, and the latter also causes the former (ROBERTS; WHITED, 2013). In a first moment, apparently it is not the case of Equation (4), as we use the lagged idiosyncratic risk as regressor. Nevertheless, according to Panousi and Papanikolaou (2012), we should consider this possibility, because firms can commit today to undertake investments in the future, which may increase the contemporaneous firm market value, affecting the current volatility of stock returns. A potential solution to reverse causality is finding an external strictly exogenous instrument for endogenous variables and employing the two-stage least squares estimator (2SLS) (CAMERON; TRIVEDI, 2005). However, identifying strictly exogenous instruments is very difficult, and the SYS-GMM estimator may address simultaneity by estimating a dynamic model and selecting valid internal instruments for endogenous variables (WINTOKI; LINCK; NETTER, 2012).

Following Panousi and Papanikolaou's (2012) recommendation, we treat idiosyncratic and systematic risks as endogenous. Investment rate, Tobin's Q, cash flow ratio and leverage ratio are also considered endogenous, based on the treatment given to these variables in papers that use the GMM estimator, such as Bond and Cummins (2004), Bloom, Bond and Van Reenen (2007) and Baum, Caglayan and Talavera (2010). Studies, such as Demsetz and Villalonga (2001) and Wintoki, Linck and Netter (2012), show the importance of treating corporate governance variables as endogenous to avoid finding spurious estimates for these regressors. Therefore, we assume that the dummy variables for ownership-control divergence and Bovespa's listing segments are endogenous. Firm size is also considered endogenous, since it is affected by corporate investment, which is an endogenous choice. We also treat stock negotiability as endogenous. Recently, Kang, Wang and Eom (2017) found that corporate investment impacts the firm's stock liquidity. So, if a company commits today to making investments in the future, such an allocation decision may affect the current stock liquidity. Hence, our model may be subject to simultaneity bias if we do not treat stock negotiability as endogenous. Finally, year dummies are considered exogenous.

To examine the consistency of the SYS-GMM estimator, we check the validity of the used instruments. With this purpose, three specification tests are employed. The first is the Arellano and Bond (1991) test for serial correlation in residuals. For all tested models in this paper, we do not find second-order autocorrelation in the first-differenced residuals, signaling that our GMM instruments are exogenous. The second is the Hansen test of over-identification (*J* statistic) (HANSEN, 1982). In all estimated regressions, the Hansen test *p*-values do not reject the null hypothesis of instruments' joint validity. Following Roodman (2006), since the SYS-GMM estimation process also involves instruments in differences for levels equations, we use the Difference-in-Hansen test (*C* statistic) to check the validity of a subset that does not include these instruments. The results of the Difference-in-Hansen test indicate that such a subset of instruments is valid for all employed specifications.

Instruments proliferation weakens the Hansen test, leading it to over-accepting the hypothesis of instruments' joint validity (ROODMAN, 2009). To address this concern, following Bloom, Bond and Van Reenen (2007)[29] and Baum, Caglayan and Talavera (2010)[30], we limit the number of lags employed as instruments. Precisely, only the second and third lags of endogenous variables in levels are used as instruments for the first-differenced equation, while only the first lag of endogenous variables in difference are used as instruments for the levels equation[31], as the earlier lags are mathematically redundant (BLUNDELL; BOND, 1998; ROODMAN, 2006).

[29] Bloom, Bond and Van Reenen (2007) use the second and third lags of endogenous variables as GMM instruments.
[30] Baum, Caglayan and Talavera (2010) use the second through fourth lags of endogenous variables as GMM instruments.
[31] For example, consider the lagged idiosyncratic risk variable ($\sigma_{i,t-1}^{idi}$). For the first-differenced equation, the SYS-GMM instruments are: $\sigma_{i,t-3}^{idi}$ and $\sigma_{i,t-4}^{idi}$. For the levels equation, the SYS-GMM instrument is: $\Delta\sigma_{i,t-2}^{idi}$.

4 RESULTS

This section presents the results of the study. In Subsection 4.1, we analyze the descriptive statistics of the research variables. In Subsection 4.2, we estimate the effect of ownership-control divergence on the investment-risk relation. Subsections 4.3 and 4.4 check if the results of Subsection 4.2 are driven by financial constraints and family control, respectively. In Subsection 4.5, we expose the results of an additional test that explores the effect of control-enhancing mechanisms (pyramids structures and dual class shares) on our previous findings. In Subsections 4.6 and 4.7, we check if board independence can mitigate the impact of excess voting rights on investment sensitivity to idiosyncratic risk.

4.1 Descriptive statistics

Table 3 presents the descriptive statistics of the main variables. We consider three groups: (1) total sample; (2) firms with high levels of ownership-control divergence (DIV_H); and (3) firms with low levels of ownership-control divergence (DIV_L). To compare the descriptive statistics for the last two subsamples, we test for the equality of means.

The mean of the percentage of voting rights held by the largest ultimate shareholder is greater than 50% for the total sample (67.3%), DIV_L subsample (57.1%) and DIV_H subsample (79.6%). Hence, on average, even companies with low levels of excess voting rights have a majority shareholder. Such descriptive statistics show that the main agency conflict in Brazilian firms occurs between controlling and minority shareholders, as suggested by previous studies, such as Aldrighi and Mazzer Neto (2007), Aguilera et al. (2012), and Caixe and Krauter (2013).

For the DIV_H subsample, the mean of ownership-control divergence is 47.3%, which is very expressive. In these companies, the dominant owner exercises control while retaining only 32.1% of the cash flow rights, on average. This finding signals that Brazilian firms with high excess voting rights present a pattern of ownership that is very close to controlling-minority structures, which are characterized by controlling shareholders with relatively small ownership stakes. Bebchuk, Kraakman and Triantis (2000) demonstrate that agency costs related to inefficient investment decisions are greater for companies with such structures when compared to those in which the largest owner holds the majority of cash flow rights. In contrast, for the DIV_L subsample, the mean of ownership-control divergence is only 3.8%, and the dominant shareholder holds 53.3% of cash flow rights on average.

Table 3 − Descriptive statistics

	Total Sample			DIV_H			DIV_L			$DIV_H - DIV_L$	
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range	Mean Difference	*p*-value
I_t/K_{t-1}	0.066	0.392	0.188	0.065	0.361	0.196	0.072	0.422	0.187	-0.007	0.671
σ^{idi}	0.105	0.144	0.071	0.112	0.179	0.051	0.104	0.114	0.085	0.008	0.173
σ^{sys}	0.019	0.022	0.014	0.020	0.022	0.014	0.019	0.023	0.012	0.001	0.172
Q	0.822	0.617	0.587	0.734	0.497	0.559	0.926	0.702	0.636	-0.193	0.000
CF_t/K_{t-1}	0.190	0.924	0.348	0.156	0.935	0.341	0.257	0.895	0.386	-0.100	0.007
LEV	0.271	0.199	0.255	0.276	0.201	0.263	0.265	0.193	0.255	0.012	0.153
$Size$	13.255	1.795	2.366	13.099	1.827	2.664	13.419	1.656	1.968	-0.320	0.000
NEG	0.168	0.381	0.082	0.160	0.348	0.086	0.174	0.378	0.088	-0.014	0.349
CON	0.673	0.263	0.406	0.796	0.173	0.321	0.571	0.295	0.546	0.225	0.000
OWN	0.430	0.265	0.420	0.321	0.170	0.248	0.533	0.307	0.544	-0.212	0.000
DIV	0.243	0.224	0.375	0.473	0.152	0.212	0.038	0.057	0.075	0.435	0.000
WW	-0.628	0.103	0.131	-0.619	0.105	0.142	-0.635	0.098	0.113	0.015	0.000
KZ	-0.833	5.870	2.579	-0.697	5.920	2.556	-1.018	6.039	2.781	0.321	0.189
$Observations$	3,003			1,195			1,209				

This table reports summary statistics of the study variables for the total sample and firms with distinct levels of ownership-control divergence. Every year, we sort the companies into quintiles based on the ownership-control divergence of the largest ultimate shareholder. Firms pertaining to the first two quintiles and the last two quintiles are classified as low ownership-control divergence (DIV_L) and high ownership-control divergence (DIV_H), respectively. Subscript *t* indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; CON is percentage of voting rights held by the largest ultimate shareholder; OWN is percentage of cash flow rights held by the largest ultimate shareholder; DIV is ownership-control divergence of the largest ultimate shareholder ($CON - OWN$); WW is the Whited and Wu (2006) index of financial constraints; and KZ is the Lamont, Polk and Saá-Requejo (2001) index of financial constraints. Variable definitions are in Table 2. We also report *p*-values of *t*-test for variables means equality.

According to the t-test, firms with high excess voting rights present lower Tobin's Q and cash flow ratio and are smaller and more financially constrained (for WW index), on average. Since these companies have lower growth opportunities and are more financially constrained, it is expected that they invest less. Although the investment mean is lower for the DIV_H group, the t-test does not reject the means equality hypothesis. Firms with high ownership-control wedge present greater idiosyncratic risk and systematic risk means. This may be partly motived by their also greater leverage mean, which indicates that such companies bear greater financial (default) risk, on average. However, for the idiosyncratic risk, systematic risk and leverage ratio, the mean differences regarding the DIV_H and DIV_L groups are not statistically significant. Finally, firms with high excess voting rights have lower stock negotiability mean, but the t-test does not reject the means equality hypothesis.

4.2 Effect of ownership-control divergence on the investment-risk sensitivity

In this section, we investigate the impact of the divergence between control and cash flow rights of the largest ultimate shareholder on investment sensitivity to idiosyncratic risk. Table 4 reports the parameter estimates of Equation (4). All models are estimated by SYS-GMM. Depending on the specification, the model includes industry dummies. To keep the industry fixed effects manageable, we use the North American Industry Classification System (NAICS Level 1), as the Standard Industrial Classification System is not available in the Economatica® database.

The first two columns present the model results without interactions between idiosyncratic risk and the dummy variables of distinct levels of ownership-control divergence. The coefficient on lagged firm-specific risk is negative and statistically significant in specifications with and without industry dummy controls, supporting the empirical findings of Bulan (2005), Panousi and Papanikolaou (2012), and Glover and Levine (2015). Our estimates indicate that the effect of idiosyncratic risk on investment is also economically significant. For specifications (1) and (2), an increase in firm-specific risk from the first to the third quartile of the distribution is associated with a 3[32] percentage points decrease in the investment-capital ratio approximately. This is a considerable drop, as the panel mean of the investment-capital ratio is 6.6%. We can also note that an increase in idiosyncratic volatility from the first to the

[32] To calculate this economic impact, we multiply the interquartile range of idiosyncratic risk (from Table 3) by the coefficient of idiosyncratic risk (from Table 4). So, the economic impact is 2.9 (0.071×-0.405) and 2.8 (0.071×-0.392) percentage points decrease in specifications (1) and (2), respectively.

third quartile leads to a drop in the investment rate of approximately 16% (0.03 / 0.188) of the interquartile range of the investment-capital ratio.

Table 4 − Effect of ownership-control divergence on the investment-risk sensitivity

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$(I_t/K_{t-1})_{t-1}$	0.065^{***}	0.060^{**}	0.055^{**}	0.050^{**}
	(0.024)	(0.024)	(0.025)	(0.025)
σ^{idi}_{t-1}	-0.405^{***}	-0.392^{***}		
	(0.046)	(0.044)		
$\sigma^{idi}_{t-1} \times DIV_L$			-0.584^{***}	-0.574^{***}
			(0.097)	(0.097)
$\sigma^{idi}_{t-1} \times DIV_H$			-0.266^{***}	-0.262^{***}
			(0.035)	(0.036)
σ^{sys}_{t-1}	-0.691	-0.583	0.116	0.166
	(0.474)	(0.431)	(0.466)	(0.477)
Q_{t-1}	0.103^{***}	0.099^{***}	0.109^{***}	0.105^{***}
	(0.035)	(0.032)	(0.035)	(0.036)
$(CF_t/K_{t-1})_{t-1}$	0.015	0.014	-0.017	-0.019
	(0.017)	(0.017)	(0.016)	(0.015)
LEV_{t-1}	-0.119	-0.121	-0.163^{**}	-0.164^{**}
	(0.092)	(0.093)	(0.083)	(0.083)
$Size_{t-1}$	-0.035^{***}	-0.026^{**}	-0.017	-0.004
	(0.012)	(0.012)	(0.011)	(0.014)
NEG_{t-1}	0.077^{*}	0.090^{**}	0.028	0.024
	(0.040)	(0.044)	(0.035)	(0.040)
Wald test:				
$DIV_H - DIV_L$			0.318	0.312
p-value			0.001	0.001
Industry dummies	No	Yes	No	Yes
Observations	2,470	2,470	1,969	1,969
AR(1) (p-value)	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.521	0.522	0.866	0.903
Hansen's J (p-value)	0.406	0.629	0.920	0.940
Hansen's C (p-value)	0.539	0.591	0.510	0.537

This table reports the SYS-GMM estimation results of equation (4). The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. We interact lagged idiosyncratic (σ^{idi}_{t-1}) risk with ownership-divergence quintile dummies. Here, DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively. The set of controls includes the following lagged variables: firm's investment rate $[(I_t/K_{t-1})_{t-1}]$; systematic risk (σ^{sys}_{t-1}); Tobin's Q (Q_{t-1}); cash flow ratio $[(CF_t/K_{t-1})_{t-1}]$; leverage ratio (LEV_{t-1}); firm size ($Size_{t-1}$); stock negotiability (NEG_{t-1}); dummies for Bovespa's premium listing segments; and year dummies (the last two types of dummies are not reported for space constraints). See Table 2 for variable definitions. Depending on the specification, we include NAICS Level 1 industry dummies. We present the difference in coefficients on σ^{idi}_{t-1} across the DIV_L and DIV_H groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences, respectively. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%).

In the third and fourth columns, we report the model results for a subsample that only comprises firms with low and high levels of excess voting rights. To examine if the investment-risk relationship varies with the degree of ownership-divergence, we estimate the coefficient on firm-specific risk separately for companies in the bottom (first and second) and top (fourth and fifth) excess voting rights quintiles. Depending on the industry dummies inclusion, the difference in the idiosyncratic risk coefficients for firms with high and low ownership-control divergence ranges from 0.312 to 0.318 and is statistically significant at the 1% level according to the Wald test. For DIV_H group companies, an increase in firm-specific volatility from the first to the third quartile of the distribution decreases the investment-capital ratio by 1.4[33] percentage points (specification 3), relative to the group mean of 6.5%. By contrast, for DIV_L group companies, an increase in firm-specific volatility from the first to the third quartile of the distribution decreases the investment-capital ratio by 5[34] percentage points (specification 3), relative to the group mean of 7.2%.

Our results show that investment is less sensitive to idiosyncratic risk for firms with greater divergence between cash flow and voting rights of the controlling shareholder. Such evidence can be interpreted as a consequence of "tunneling distortion behavior", posited by John, Litov and Yeung (2008). Excess voting rights may incentivize the dominate owner to pursue private benefits of control related to tunneling practices by selecting riskier investments. This is because the largest shareholder can transfer the riskier projects' cash flows from the firm to other firms in which he has greater ownership shares. Moreover, if such projects destroy value, he will not bear the entire costs of a decrease in the company's market value due to his smaller equity stakes. Therefore, ownership-control divergence may increase corporate risk-taking by reducing investment sensitivity to firm-specific risk.

With respect to control variables, the coefficients on lagged investment-capital ratio and lagged Tobin's Q are statistically significant in all specifications. The former indicates that investment is positively related to past investment, consistent with the empirical results of Guiso and Parigi (1999), Bond and Cummins (2004), and Baum, Caglayan and Talavera (2010), which also employ dynamic models. Among all regressors, Tobin's Q ranks first in terms of economic

[33] In specification (3), the economic impact is an approximately 1.4 (0.051×-0.266) percentage points decrease, which is approximately 7.1% (0.014 / 0.196) of the interquartile range of the investment-capital ratio for DIF_H group firms. In specification (4), the economic impact is an approximately 1.3 (0.051×-0.262) percentage points decrease, which is approximately 6.6% (0.013 / 0.196) of the interquartile range of the investment-capital ratio for DIF_H group firms.

[34] In specification (3), the economic impact is an approximately 5 (0.085×-0.584) percentage points decrease, which is approximately 26.7% (0.05 / 0.187) of the interquartile range of the investment-capital ratio for DIF_L group firms. In specification (4), the economic impact is an approximately 4.9 (0.085×-0.574) percentage points decrease, which is approximately 26.2% (0.049 / 0.187) of the interquartile range of the investment-capital ratio for DIF_L group firms.

significance. In regression (2)[35], an increase in Tobin's Q from the first to the third quartile of the distribution increase investment rate by 5.8 percentage points (0.587 × 0.099), which is approximately 30.9% (0.058 / 0.188) of interquartile range of investment-capital ratio.

Leverage, firm size and stock negotiability variables present significant coefficients only in two specifications. The sign of the former indicates that financial (default) risk decreases investment rate, as other empirical studies on the investment-risk relation indicate, such as Baum, Caglayan and Talavera (2010), Panousi and Papanikolaou (2012), and Glover and Levine (2015). Firm size (natural log of total assets) is also negatively associated with investment, supporting the view that small firms tend to invest more than large ones, since the latter have more unproductive capital (XING, 2008). The coefficient on stock negotiability is positive in accordance with Muñoz's (2013) findings, which show that stock liquidity increases corporate investment. It may be interpreted by the cost channel view, which argues that stock liquidity decreases the cost of raising external capital, motivating equity issuances that could finance more investments (BUTLER; GRULLON; WESTON, 2005).

The systematic risk and cash flow ratio are not statistically significant in all specifications. Using distinct proxies for systematic volatility, Leahy and Whited (1996), Bulan (2005) and Panousi and Papanikolaou (2012) also find that such type of uncertainty does not affect the firm's investment. The insignificance of the coefficient on the cash flow ratio is not puzzling, as our estimates are computed for the total sample (or a subsample of firms with low and high DIV), and investment-cash flow sensitivity is usually a typical behavior of financially constrained companies (FAZZARI; HUBBARD; PETERSEN, 1988).

4.3 Investment-risk sensitivity and financial constraints

Companies with high ownership-control divergence might be more financially constrained. For a large sample of U.S. firms, Lin, Má and Xuan (2011) find that excess voting rights of managers (officers and directors) increase the company's external financial constraints. Similarly, investigating Western European and East Asian firms, Chu et al. (2014) provide evidence that the wedge between cash flow and voting rights of controlling shareholders is positively related to corporate external financing costs. Moreover, in Table 3, the t-test for means equality indicates that companies with high excess voting rights are, on average, more financially constrained, according to the WW index. So, our results in Section 4.2 could be driven not by greater ownership-control divergence per se, but by the firm's greater external financial constraints.

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[35] Regression (2) is the specification in which Tobin's Q presents its smallest coefficient.

In this section, we address the possibility that our findings might be related to financial constraints rather than to excess voting rights. To address such concern, we estimate coefficients on idiosyncratic risk for companies with distinct levels of ownership-control divergence but with similar degrees of financial constraints. We use two proxies for financial constraints: the Lamont, Polk and Saá-Requejo (2001) index (KZ); and the Whited and Wu (2006) index (WW). First, the firms are sorted into quintiles based on their lagged values of KZ or WW indexes, and we classify them as financially unconstrained or financially constrained if they belong to the first two quintiles or to the last two quintiles, respectively. Next, within each group of companies with a close degree of financial constraints, we sort the firms into quintiles according to their lagged value of excess voting rights (DIV). Again, companies pertaining to the first two quintiles are labeled low ownership-control divergence firms (DIV_L), and those pertaining to the last two quintiles are labeled high ownership-control divergence firms (DIV_H). A similar double-sorting procedure is used by Panousi and Papanikolaou (2012). This approach generates groups of firms with expressive dispersion in excess voting rights, but very similar levels of financial constraints (see tables A.1 and A.2 in Appendix A for summary statistics of these portfolios). Table 5 reports the results of this robustness test.

In columns (1) and (2), we first examine if investment sensitivity to idiosyncratic risk depends on the degree of the company's financial constraints. According to the Wald test, the difference in coefficients on unsystematic volatility for firms classified as financially unconstrained and financially constrained is not statistically significant, when we use both the KZ and WW indexes. Hence, ours estimates do not corroborate Panousi and Papanikolaou's (2012) results, which signal that investment-risk sensitivity is stronger for financially constrained companies. Our results may be observed because firms with high ownership-control divergence tend to be more financially constrained (see Table 3), since the findings in Section 4.2 indicate that excess voting rights reduce investment sensitivity to idiosyncratic risk.

In columns (3) and (4), we investigate the impact of ownership-control divergence on the investment-risk sensitivity separately for two groups: (a) financially unconstrained firms; and (b) financially constrained firms. Here, the double-sorting procedure described earlier is used. The difference in coefficients on idiosyncratic volatility for firms with low and high excess voting rights is statistically significant for both subsamples. For group (a), the differences range from 0.405 to 0.691, depending on the proxy for financial constraints, and the Wald test p-values range from 0.002 to 0.027. For group (b), the differences range from 0.263 to 0.405, depending on the proxy for financial constraints, and the Wald test p-values range from 0.004 to 0.061.

Based on Table 5 regressions, there is no evidence that our results in Section 4.2 are driven by financial constraints. First, we do not find that investment is less sensitive to idiosyncratic risk for financially constrained firms [specifications (1) and (2)]. Moreover, we observe that ownership-control divergence decreases investment-risk sensitivity for both financially unconstrained and financially constrained companies [specifications (3) and (4)].

Table 5 − Effect of ownership-control divergence, controlling for financial constraints

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times Unconstrained$	-0.376***	-0.314***		
	(0.106)	(0.072)		
$\sigma_{t-1}^{idi} \times Constrained$	-0.358***	-0.384***		
	(0.082)	(0.074)		
$\sigma_{t-1}^{idi} \times DIV_L \times Unconstrained$			-0.941***	-0.599***
			(0.218)	(0.185)
$\sigma_{t-1}^{idi} \times DIV_H \times Unconstrained$			-0.250***	-0.194***
			(0.066)	(0.059)
$\sigma_{t-1}^{idi} \times DIV_L \times Constrained$			-0.529***	-0.709***
			(0.139)	(0.148)
$\sigma_{t-1}^{idi} \times DIV_H \times Constrained$			-0.266***	-0.304***
			(0.051)	(0.060)
Wald test:				
$Constrained - Unconstrained$	0.018	-0.070		
p-value	0.860	0.459		
$DIV_H \times Unconstrained - DIV_L \times Unconstrained$			0.691	0.405
p-value			0.002	0.027
$DIV_H \times Constrained - DIV_L \times Constrained$			0.263	0.405
p-value			0.061	0.004
Index of financial constraints	KZ	WW	KZ	WW
Observations	1,971	1,964	1,562	1,565
AR(1) (p-value)	0.000	0.000	0.001	0.000
AR(2) (p-value)	0.516	0.555	0.558	0.795
Hansen's J (p-value)	0.968	0.992	1.000	1.000
Hansen's C (p-value)	0.644	0.712	0.809	0.912

This table reports the SYS-GMM estimation results of the robustness test regarding financial constraints. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is lagged idiosyncratic risk. $Unconstrained$ and $Constrained$ indicate the dummies for the first two and last two financial constraint indexes quintiles, respectively. We use two measures of financial constraints: the Lamont, Polk and Saá-Requejo (2001) index (KZ); and the Whited and Wu (2006) index (WW). DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within $Unconstrained$ and $Constrained$ groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences, respectively. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%). The results hold after the inclusion of NAICS Level 1 industry dummies (see Table B.1 in Appendix B for details).

4.4 Investment-risk sensitivity and family control

It is suspected that our findings in Section 4.2 might be associated with family control rather than with ownership-control divergence for three reasons. First, Claessens et al. (2002) find that excess voting rights are more expressive in family-controlled firms. Indeed, most of our total firm-year observations come from family-controlled companies, which present greater ownership-control wedges compared to non-family-controlled ones (See Table A.3 in Appendix A). Second, Zahra's (2005) results indicate that family ownership is positively related to risk-taking for U.S. manufacturing firms. Third, Saghi-Zedek and Tarazi (2015) show that the positive effect of excess voting rights of the dominant shareholder on risk-taking by European banks is stronger for family-controlled firms.

To evaluate if our results are not promoted by high ownership-control divergence per se, but as a consequence of family-controlled firms' behavior, we estimate the effect of excess voting rights on investment-risk relation separately for family-controlled and non-family-controlled firms. First, companies are grouped in two blocks: firms in which the largest ultimate shareholder is a family member ($Family$); and firms in which the largest ultimate shareholder is not a family member (Non_Family). In sequence, within each group, we sort companies into quintiles according to their lagged value of ownership-control divergence (DIV). Firms located in the first two quintiles are classified as low excess control rights companies (DIV_L), and those located in the last two quintiles are classified as high excess control rights companies (DIV_H). Table 6 presents the results of this robustness test.

In the first two specifications, we explore the difference in investment-risk sensitivities for family-controlled and non-family-controlled firms. The former presents a lower coefficient on idiosyncratic volatility. This may be driven by the greater ownership-control divergence of family companies relative to non-family ones, since the results in Section 4.1 show that excess voting rights decrease investment sensitivity to unsystematic risk. However, the Wald test p-values do not reject the null hypothesis that the coefficients are equal in regressions (1) and (2).

In specifications (3) and (4), we verify the impact of ownership-control disparity on investment sensitivity to idiosyncratic risk separately for family-controlled and non-family-controlled companies. In both groups, the coefficient on non-systematic volatility is lower for firms with high excess voting rights, based on the Wald test p-values. For non-family-controlled companies, the difference in sensitivities range from 0.325 to 0.373, depending on the industry dummies inclusion, and is statistically significant at the 5% level. For family-controlled firms, the difference in coefficients range from 0.328 to 0.329, depending on the industry dummies inclusion, and is statistically significant at the 5% level.

Table 6 − Effect of ownership-control divergence, controlling for family control

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times Non\_Family$	-0.402***	-0.395***		
	(0.056)	(0.058)		
$\sigma_{t-1}^{idi} \times Family$	-0.387***	-0.374***		
	(0.055)	(0.054)		
$\sigma_{t-1}^{idi} \times DIV_L \times Non\_Family$			-0.678***	-0.621***
			(0.159)	(0.148)
$\sigma_{t-1}^{idi} \times DIV_H \times Non\_Family$			-0.305***	-0.296***
			(0.051)	(0.047)
$\sigma_{t-1}^{idi} \times DIV_L \times Family$			-0.617***	-0.606***
			(0.168)	(0.169)
$\sigma_{t-1}^{idi} \times DIV_H \times Family$			-0.288***	-0.278***
			(0.053)	(0.052)
Wald test:				
$Family - Non\_Family$	0.015	0.021		
p-value	0.828	0.755		
$DIV_H \times Non\_Family - DIV_L \times \ Non\_Family$			0.373	0.325
p-value			0.019	0.032
$DIV_H \times Family - DIV_L \times \ Family$			0.329	0.328
p-value			0.043	0.042
Industry dummies	Yes	No	Yes	No
Observations	2,470	2,470	1,946	1,946
AR(1) (*p*-value)	0.000	0.000	0.000	0.000
AR(2) (*p*-value)	0.514	0.533	0.679	0.618
Hansen's J (*p*-value)	0.890	0.925	1.000	1.000
Hansen's C (*p*-value)	0.406	0.489	0.635	0.647

This table reports the SYS-GMM estimation results of the robustness test regarding family control. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is lagged idiosyncratic risk. Non_Family and $Family$ indicate the dummies for non-family-controlled and family-controlled firms, respectively. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within Non_Family and $Family$ groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. Depending on the specification, we include NAICS Level 1 industry dummies. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test *p*-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences, respectively. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%).

Overall, the Table 6 regressions indicate that family control does not affect investment-risk sensitivity [columns (1) and (2)]; and investment is less sensitive to idiosyncratic volatility for firms with high excess voting rights regardless of if the company control is familiar or not [columns (3) and (4)]. Therefore, we cannot conclude that our findings in Section 4.2 are motived by family-controlled firms' behavior per se.

4.5 Investment risk-sensitivity and control-enhancing mechanisms (CEMs)

As mentioned in Section 2.3, the separation of cash flow and voting rights can be reached through distinct types of control-enhancing mechanisms, which can allow a shareholder to control a company while holding small equity stakes. In Brazil, among these devices, pyramid structures and dual class shares are prevalent. The former occurs when a dominant owner controls a company (or several companies) indirectly through another (other) firm(s) that he also controls, which may lead to the creation of business groups (BENA; ORTIZ-MOLINA, 2013). Pyramids are the most common CEM around the world (LA PORTA; LOPEZ-DE-SILANES; SHLEIFER, 1999), having a massive presence in East Asia (CLAESSENS; DJANKOV; LANG, 2000). In turn, the issuance of distinct stock classes with differential voting rights is the easiest way to separate cash flow and control rights since such a device does not need the creation of multiple companies (BEBCHUK; KRAAKMAN; TRIANTIS, 2000). However, dual class equity structures are forbidden by law in some countries[36], being more predominate in Latin American (CLAESSENS; YURTOGLU, 2013).

There are controversial explanations for how pyramid structures could affect firm performance. Agency theory first linked this CEM to corporate governance problems due to its ability to separate ownership from control (BERLE; MEANS, 1932), incentivize tunneling practices (BERTRAND; MEHTA; MULLAINATHAN, 2002) and increase agency costs (CLAESSENS; FAN; LANG, 2006). Consistent with this view, pyramid structures may be negatively associated with corporate profitability (SINGH; GAUR, 2009) and value (LINS, 2003). Furthermore, Morck, Wolfenzon and Yeung (2005) posit that the massive presence of pyramidal business groups in many countries may lead to resource misallocation at the firm level, retarding economic growth. On the other hand, in environments with poor investor protection, pyramids may be used to provide payoff and financing advantages for firms, and not to separate cash flow and voting rights (ALMEIDA; WOLFENZON, 2006; BENA; ORTIZ-MOLINA, 2013). Such perspective is in accordance with the resource-based view, which suggests that pyramid structures may be beneficial for firms, as group-affiliated companies are able to share financial and intangible resources with other member companies (CHANG; HONG, 2000). In this sense, such benefits may provide competitive advantages for firms that

[36] For example, differentiation in voting rights is not allowed by corporate law in some Asian (China, Japan, Singapore) and European (Belgium and Spain) countries (NENOVA, 2003).

are part of business groups, resulting in greater corporate profitability (KHANNA; RIVKIN, 2001) and value (KHANNA; PALEPU, 2000).

Similar to pyramid structures, we can also find distinct explanations for the possible relation between dual class shares and firm performance. According to agency theory, the issuance of non-voting stocks disrespects the "one share-one vote" principle, which is a socially optimal control allocation rule (HARRIS; RAVIV, 1988). The violation of this principle may increase the private benefits of control, promoting the occurrence of costs related to inefficiencies[37] in takeovers (GROSSMAN; HART, 1988) and sales of corporate control (BEBCHUK, 1994). For Baulkaran (2014), these inefficiencies are partly a consequence of the difficulty in replacing a controlling shareholder/manager in dual class firms, since he faces no (or little) discipline from the market for corporate control. Consistent with this perspective, the author provides empirical evidence that the issuance of dual class shares reduces corporate value. In contrast, there is an opposite view in the corporate governance literature, which argues that dual class shares could be a valuable anti-takeover device for two reasons. First, dual class structures may mitigate "managerial myopia", which occurs when insiders, in the face of a potential takeover, focus on short-term goals rather than long-term value creation to hold their positions (STEIN, 1988). Second, without the dual class shares anti-takeover device, entrepreneurs may avoid accessing funds through IPOs[38] for fear of losing control, which may lead to the abandonment of value-enhancing projects, inhibiting firm growth (BURKART; LEE, 2008). Corroborating with this perspective, Von der Crone and Plaksen (2010) find that dual class structures increase firm value.

In this section, we examine if the effect of ownership-control divergence on the investment-risk relation depends on the type of device used to reach such disparity between cash flow and voting rights. With this purpose, first we group firms into two blocks based on control-enhancing mechanism presence (pyramid structure and dual class shares, separately): companies that make use of the device (CEM_Yes); and companies that do not make use of the device (CEM_No). Then, within each block, firms are sorted into quintiles regarding the levels of excess control rights (DIV). As in previous tests, companies within the first two quintiles are classified as low ownership-control divergence firms (DIV_L), and those within the last two quintiles are classified as high ownership-control divergence firms (DIV_H) (See tables A.4 and A.5 in Appendix A for descriptive statistics of these portfolios). Table 7 reports the results of this additional test.

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[37] Theses inefficiencies are related to distortions on price paid in a takeover or a sale of corporate control, since the amount paid takes in account the private benefits of control.
[38] Initial public offerings.

Table 7 − Effect of ownership-control divergence, controlling for type of CEM

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times CEM\_No$	-0.444***	-0.623***		
	(0.071)	(0.152)		
$\sigma_{t-1}^{idi} \times CEM\_Yes$	-0.388***	-0.372***		
	(0.050)	(0.043)		
$\sigma_{t-1}^{idi} \times DIV_L \times CEM\_No$			-0.631***	-1.365***
			(0.173)	(0.353)
$\sigma_{t-1}^{idi} \times DIV_H \times CEM\_No$			-0.301***	-0.443***
			(0.058)	(0.114)
$\sigma_{t-1}^{idi} \times DIV_L \times CEM\_Yes$			-0.651***	-0.595***
			(0.119)	(0.112)
$\sigma_{t-1}^{idi} \times DIV_H \times CEM\_Yes$			-0.259***	-0.280***
			(0.043)	(0.037)
Wald test:				
$CEM\_Yes - CEM\_No$	0.056	0.251		
p-value	0.435	0.088		
$DIV_H \times CEM\_No - DIV_L \times CEM\_No$			0.330	0.922
p-value			0.049	0.008
$DIV_H \times CEM\_Yes - DIV_L \times CEM\_Yes$			0.392	0.315
p-value			0.001	0.005
Mechanism	Pyramid	Dual class	Pyramid	Dual class
Observations	2,470	2,470	1,958	2,027
AR(1) (p-value)	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.551	0.505	0.276	0.506
Hansen's J (p-value)	0.809	0.707	1.000	1.000
Hansen's C (p-value)	0.578	0.448	0.494	0.426

This table reports the SYS-GMM estimation results of the additional test regarding control-enhancing mechanisms. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is idiosyncratic risk. CEM_No and CEM_Yes indicate the dummies for CEM non-usage and CEM usage, respectively. We consider two control-enhancing mechanisms: pyramid structures and dual class shares. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within CEM_No and CEM_Yes groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences, respectively. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%). The results hold after the inclusion of NAICS Level 1 industry dummies (see Table B.2 in Appendix B for details).

In column (1), we compare the investment-risk sensitivities for non-pyramid and pyramid firms. The former present lower coefficient on unsystematic volatility relative to the latter. However, the Wald test p-value does not reject the null hypothesis that the coefficients are equal for both groups. This result is not inconsistent with "tunneling distortion hypothesis". Although, the pyramid structure might incentivize tunneling practices (BERTRAND; MEHTA; MULLAINATHAN, 2002), they can also be done by non-group-affiliated companies. This is because the transfer of resources out of a firm to its dominant owner can also occur through other firms that do not participate in the pyramid but are controlled by the largest shareholder.

As described by Johnson et al. (2000), tunneling can assume many forms, such as transfer price manipulation, asset sale at non-market prices and loan contracts with high (or low) interest rates, which can also occur between two firms that are not part of the same pyramid structure.

Regression (2) checks if the issuance of distinct stock classes by the company may impact its investment sensitivity to idiosyncratic volatility. The coefficient on unsystematic risk is greater for dual class firms relative to non-dual class ones. Moreover, the Wald test p-value indicates that the difference in sensitivities is statistically significant at the 10% level. A priori, we could interpret this result as evidence that our previous findings are driven by dual class shares presence rather than greater ownership-control divergence. However, the use of dual class shares may also be acting as a proxy for greater excess voting rights, since dual class firms present, on average, greater ownership-control wedges compared to non-dual class ones (see Table A.5).

In specifications (3) and (4), we investigate the effect of excess voting rights on the investment-uncertainty sensitivity separately for the CEM_No and CEM_Yes groups, regarding pyramid structures and dual class shares, respectively. In both groups, investment is less sensitive to idiosyncratic volatility for companies with high ownership-divergence. The difference in coefficients on unsystematic risk ranges from 0.315 to 0.922, depending on the group and type of mechanism, and the Wald test p-values range from 0.001 to 0.049.

From the Table 7 results, we can conclude that what influences the investment-risk relation is not the type of CEM used by the company, but the level of ownership-control divergence. This is because excess voting rights reduce investment response to idiosyncratic risk for companies that use or do not use the corresponding CEM [specifications (3) and (4)]. Furthermore, regression (1) does not show that pyramid firms are less sensitive to unsystematic volatility compared to non-pyramid ones, denoting that pyramid structure presence is not a good proxy for ownership-control disparity. Therefore, we can interpret that as evidence in favor of Almeida and Wolfenzon's (2006) theory and Bena and Ortiz-Molina's (2013) results, which suggest that pyramid structures are not used with the primary goal of separating cash flow and voting rights. In contrast, according to regression (2), dual class companies present weaker investment-risk sensitivity compared to non-dual class companies, indicating that issuance of distinct stock classes is a good proxy for excess voting rights. This result makes sense, since the use of dual class shares is the most effective CEM to separate cash flow rights from voting rights (BEBCHUK; KRAAKMAN; TRIANTIS, 2000).

4.6 Investment-risk sensitivity and board independence

One primary internal corporate governance mechanisms is the board of directors. The board's responsibilities include but are not limited to selecting, monitoring and compensating executive officers, while pursuing company value maximization (DENIS; MCCONNELL, 2003). The board effectiveness depends, at least in part, on directors' autonomy regarding executives (FAMA; JENSEN, 1983; JOHN; SENBET, 1998). So, board independence may improve the corporate governance model, which is recommended by codes of best practices[39] and is required by law in some countries[40]. It is also possible to find an empirical association between greater board independence and greater firm valuation (BLACK; JANG; KIM, 2006), lower earnings management (KLEIN, 2002) and lower information asymmetry (KANAGARETNAN; LOBO; WHALEN, 2007). On the other hand, ownership-control divergence is related to agency costs, and some papers provide empirical evidence that it may decrease company value (CLAESSENS et al., 2002), induce earnings manipulation (HAW et al., 2004) and increase asymmetric information (ATTIG et al., 2006). Hence, in this section, we analyze if board independence could mitigate the effect of the disparity between control and cash flow rights of the dominant owner on the investment-risk sensitivity.

We use three proxies for board independence, exploring Brazilian corporate features. The first two are: CEO board membership; and CEO duality, i.e., when the CEO is also the Chairman. These proxies are chosen because it is common to find CEOs presiding the board, and it is even more usual to see CEOs on the boards of Brazilian firms (see Table A.6 and A.7 in Appendix A for details). The third is based on the percentage of outside directors on the board. According to Brazilian law 6404 of 1976, in publicly traded companies, at least two thirds of board members must be non-executive directors. Therefore, we use 66.7% of outside directors as a threshold to classify the firms as having high (> 66.7%) or low (≤ 66.7%) board independence (see Table A.8 in Appendix A for detail description of these groups).

To investigate the impact of board independence on our findings, we use a similar double-sorting procedure as employed in the previous sections. First, we divide the sample into two groups according to our three proxies for board independence separately: low board independence firms (BI_L); and high board independence firms (BI_H). Then, within each group, we sort firms into excess voting rights quintiles. Again, we classify them as low ownership-control divergence companies (DIV_L) and high ownership-control divergence companies

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[39] See, for example, OECD's (2004) and ICGN's (2009) codes.
[40] Like, for example, France, Russia and China.

(DIV_H) if they belong to first two and last two quintiles, respectively. Table 8 presents the results of this additional test.

Table 8 − Effect of ownership-control divergence, controlling for board independence

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)	(5)	(6)
$\sigma_{t-1}^{idi} \times BI_L$	-0.440***	-0.396***	-0.465***			
	(0.059)	(0.065)	(0.087)			
$\sigma_{t-1}^{idi} \times BI_H$	-0.351***	-0.385***	-0.381***			
	(0.049)	(0.048)	(0.049)			
$\sigma_{t-1}^{idi} \times DIV_L \times BI_L$				-0.759***	-0.792***	-0.670***
				(0.183)	(0.190)	(0.153)
$\sigma_{t-1}^{idi} \times DIV_H \times BI_L$				-0.309***	-0.280***	-0.320***
				(0.052)	(0.054)	(0.056)
$\sigma_{t-1}^{idi} \times DIV_L \times BI_H$				-0.505***	-0.568***	-0.677***
				(0.134)	(0.132)	(0.154)
$\sigma_{t-1}^{idi} \times DIV_H \times BI_H$				-0.239***	-0.252***	-0.248***
				(0.040)	(0.041)	(0.043)
Wald test:						
$BI_H - BI_L$	0.089	0.011	0.084			
p-value	0.171	0.879	0.354			
$DIV_H \times BI_L - DIV_L \times BI_L$				0.450	0.512	0.350
p-value				0.014	0.007	0.022
$DIV_H \times BI_H - DIV_L \times BI_H$				0.266	0.316	0.429
p-value				0.052	0.016	0.006
Proxy for board independence	CEO on board	CEO is Chairman	Outside direct.(%)	CEO on board	CEO is Chairman	Outside direct.(%)
Observations	2,470	2,470	2,470	1,952	1,967	1,973
AR(1) (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.494	0.516	0.524	0.819	0.864	0.996
Hansen's J (p-value)	0.896	0.866	0.894	1.000	1.000	1.000
Hansen's C (p-value)	0.737	0.627	0.450	0.386	0.411	0.531

This table reports the SYS-GMM estimation results of the additional test regarding board independence. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is idiosyncratic risk. BI_L and BI_H indicate the dummies for low and high board independence, respectively. We use three proxies for board independence: CEO board membership; CEO duality; and percentage of outside directors. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within BI_L and BI_H groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences, respectively. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%). The results hold after the inclusion of NAICS Level 1 industry dummies (see Table B.3 in Appendix B for details).

In the first three regressions, we verify if investment sensitivity to unsystematic volatility varies with the level of board independence. Firms with low board independence present a lower coefficient on idiosyncratic risk regarding our three proxies. Nonetheless, the difference in sensitivities of investment to risk for firms with low and high board independence is not statistically significant according to the Wald test p-values.

In columns (4), (5) and (6), we explore the impact of ownership-control disparity on investment-risk relation separately for companies with low and high board independence. For both groups, we observe that firms with high excess voting rights are less sensitive to idiosyncratic risk, based on the Wald test. The difference in coefficients on non-systematic volatility range from 0.266 to 0.512, depending on the group and board independence proxy, and the *p*-values range from 0.006 to 0.052.

Overall, the Table 8 regressions do not show that board independence mitigate the effect of ownership-control divergence on the investment-risk sensitivity. The first three columns do not indicate that board independence directly impacts the relationship between investment and idiosyncratic risk. Added to that, in the last three specifications, we also observe that excess voting rights weaken investment-risk sensitivity for both companies with high and low board independence.

4.7 Investment-risk sensitivity and the largest shareholder position on corporate governance bodies

Our previous proxies for board independence are related to directors' autonomy regarding executives. However, as discussed in Section 2.3, with ownership-control concentration, the mean agency conflict occurs between the controlling and minority shareholders. In this situation, the board's autonomy with respect to the dominant owner is also important, since directors not affiliated to the largest shareholder may be less susceptible to his influence, providing more protection to minority shareholders' interests. Consequently, this type of board independence could be beneficial for firms, resulting in greater company valuation according to some empirical studies. For example, Yeh and Woidtke (2005) find a negative association between the proportion of directors affiliated to the controlling shareholder and corporate value for Taiwanese firms. Consistent with Yeh and Woidtke's (2005) results, Lefort and Urzúa (2008) provide evidence that the percentage of directors not elected by the dominant owner increases the value of Chilean companies. Their findings are corroborated by Dahya, Dimitrov and McConnell's (2008) results, which indicate a positive relation between board independence regarding the largest shareholder and corporate value for firms from 22 countries. More recently, Jameson, Prevost and Puthenpurackal (2014) show that controlling owner presence on the board reduces the value of Indian companies, and this effect is not mitigated by a greater proportion of independent directors.

In this section, we check if the influence of ownership-control divergence on investment sensitivity to idiosyncratic risk might be alleviated by board of directors' independence with respect to the controlling shareholder. To measure board independence, we consider the dominant owner board membership, based on Jameson, Prevost and Puthenpurackal's (2014) results. This proxy is also chosen for two reasons. First, even if the largest shareholder elects most of the board members, such directors do not necessarily act according to his interests (SHLEIFER; VISHNY, 1997). On the other hand, when the controlling owner is on the board, he does not just exert his control implicitly, but he is also a direct voice in this corporate governance mechanism (BERTRAND; MULLAINATHAN, 2001). Second, the dominant shareholder is usually a board member in Brazilian companies. More than half of our sample firms have the largest owner on the board of directors (see Table A.9 in Appendix A). In addition, our analysis is not limited to the board of directors, we also test if controlling shareholder presence on executive board[41] might affect our previous findings.

To reach this section's goal, we again use a double-sorting procedure. First, the sample is divided in two groups according to the dominant owner presence on corporate body (board of directors or executive board, separately): firms in which the LUS is a body member (LUS_on); and firms in which the LUS is not a body member (LUS_out). In sequence, within each group, we sort the companies into quintiles, based on their levels of ownership-control disparity. Once again, firms located in the first two and the last two quintiles are labeled low excess control rights companies (DIV_L) and high excess control rights companies (DIV_H), respectively. Table 9 reports the results of this additional test.

In Table 9, models (1) and (2), we investigate if investment sensitivity to firm-specific uncertainty varies with controlling shareholder presence on board of directors and executive board, respectively. Regarding both corporate governance bodies, the difference in coefficients on unsystematic volatility for the LUS_on and LUS_out groups are not statistically significant according to the Wald test p-values. Therefore, there is no evidence that dominant owner membership in board of directors and executive board affects investment-risk sensitivity per se.

In Table 9, models (3) and (4), we estimate the coefficient on idiosyncratic risk for firms with low and high ownership-control wedge separately for the LUS_on and LUS_out groups. For both groups, companies with high excess voting rights present weaker investment-risk sensitivity. The difference in sensitivities range from 0.295 to 0.596, depending on the group and corporate governance body, and the Wald test p-values range from 0.001 to 0.073.

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[41] See Table A.10 in Appendix A for detail description of firm portfolios grouped according to LUS executive board membership.

Table 9 − Effect of ownership-control divergence, controlling for LUS presence on corporate governance bodies

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times LUS\_on$	-0.408***	-0.398***		
	(0.060)	(0.060)		
$\sigma_{t-1}^{idi} \times LUS\_out$	-0.381***	-0.393***		
	(0.052)	(0.052)		
$\sigma_{t-1}^{idi} \times DIV_L \times LUS\_on$			-0.574***	-0.929***
			(0.168)	(0.193)
$\sigma_{t-1}^{idi} \times DIV_H \times LUS\_on$			-0.279***	-0.333***
			(0.050)	(0.051)
$\sigma_{t-1}^{idi} \times DIV_L \times LUS\_out$			-0.690***	-0.659***
			(0.143)	(0.157)
$\sigma_{t-1}^{idi} \times DIV_H \times LUS\_out$			-0.297***	-0.321***
			(0.060)	(0.058)
Wald test:				
$LUS\_out - LUS\_on$	0.027	0.005		
p-value	0.702	0.942		
$DIV_H \times LUS\_on - DIV_L \times LUS\_on$			0.295	0.596
p-value			0.073	0.001
$DIV_H \times LUS\_out - DIV_L \times LUS\_out$			0.393	0.338
p-value			0.007	0.041
Governance body	Board of Directors	Executive Board	Board of Directors	Executive Board
Observations	2,470	2,470	1,959	1,950
AR(1) (p-value)	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.511	0.516	0.750	0.573
Hansen's J (p-value)	0.874	0.933	1.000	1.000
Hansen's C (p-value)	0.376	0.524	0.404	0.514

This table reports the SYS-GMM estimation results of the additional test regarding LUS corporate governance body membership. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is idiosyncratic risk. Lus_out and Lus_on indicate the dummies for LUS absence and LUS presence on body, respectively. We consider two corporate governance bodies: Board of Directors; and Executive Board. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within LUS_out and LUS_on groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences, respectively. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%). The results hold after the inclusion of NAICS Level 1 industry dummies (see Table B.4 in Appendix B for details).

Globally speaking, our results do not indicate that dominant shareholder presence on the board of directors (or executive board) influences the moderating role of ownership-control divergence on investment-risk sensitivity. Adding that to the results in the previous section, we cannot state that board independence is able to interfere in the way that idiosyncratic risk impacts on corporate investment and in the effect of excess control rights on this relationship. Apparently, for firms with high concentrated ownership-control structures, such as Brazilian ones, investment decisions are guided by the largest shareholder's preferences regardless of the board composition, due to his control domain. Examining Brazilian companies, Gelman, Kabbach-Castro and Seidler (2015) observe that some controllers coordinate the votes of the directors elected by them through shareholders’ agreements. Our finding is also in line with Masulis and Zhang’s (2017) study on the relationship between independent directors and firm performance. Such researchers exclude firms with a controlling shareholder from their sample, assuming that, in these firms, board independence plays no role in protecting minority shareholders’ interests.

5 CONCLUSIONS

In this study, we document a negative relationship between investment and idiosyncratic risk for Brazilian companies, which generally present high ownership-control concentration. Furthermore, our main results show that the negative effect of unsystematic risk on investment is weaker for firms with high levels of excess voting rights. We interpret this evidence as consistent with the "tunneling distortion hypothesis" (JOHN; LITOV; YEUNG, 2008). According to this perspective, ownership-control divergence incentivizes the controlling shareholder to select excessively risky projects to tunnel their gains to firms in which he holds greater equity stakes. He could also transfer riskier investments' cash flows from the controlled firm to his personal accounts, which is illegal everywhere but is common (and often undetected), especially in emerging markets (JOHSON et al., 2000). Based on the entrenchment hypothesis, we suggest that excess voting rights may reduce investment-risk sensitivity because, if riskier projects destroy value, the dominant owner bears only a fraction of the costs related to a drop in the firm value (CLAESSENS, et al., 2002; CLAESSENS; FAN, 2002). Hence, such risk-taking behavior is more pronounced for companies in which the largest shareholder owns the majority of the voting rights while holding a small percentage of the corporate cash flow rights. This controlling-minority structure (CMS) can be found in a substantial portion of Brazilian firms that we classify as having high ownership-control divergence.

We also provide evidence that the issuance of dual class shares, not the presence of pyramid structures, is a good proxy for high ownership-control divergence. This result is consistent with Almeida and Wolfenzon's (2006) theory, which argues that the primary objective of using pyramids is not to separate voting rights from cash flow rights, but to reach payoff and financing advantages for companies. On the other hand, the issuance of distinct stock classes is the most effective way to increase excess voting rights (BEBCHUK; KRAAKMAN; TRIANTIS, 2000). Thereby, we suggest that, when the controlling shareholder wants to increase his private benefits through ownership-control divergence, he usually chooses dual class shares rather than pyramid structures.

Another interested finding is related to the board of directors. Our results show that board independence does not affect the investment-risk relation. More precisely, board independence regarding executives and the controlling shareholder is not able to mitigate the impact of ownership-control divergence on investment sensitivity to idiosyncratic risk. This is in accordance with Rosenstein and Wyatt's (1990) results, which indicate that owners select outside directors to benefit from immediate excess returns after their appointment, suggesting that such directors are not chosen for outside guidance gains. In a more simplistic view, we also may interpret our results based on the control dominance exercised by the largest shareholder. When the controlling owner holds the majority of voting rights, he can elect most of the board members, which will act according to his interests or will be replaced. In Brazil, for example, some shareholders' agreements allow controllers to coordinate the votes of the directors elected by them (GELMAN; KABBACH-CASTRO; SEIDLER, 2015). Therefore, the dominant shareholder's preferences guide corporate decisions regardless of the board composition. It is consistent with the view that independent directors do not increase minority shareholders' protection in companies with a controlling shareholder (MASULIS; ZHANG, 2017).

This study has an important managerial implication. Since firm-specific risk decreases corporate investment, reducing the company's exposure to this type of uncertainty may increase its investment. So, our results emphasize the importance of risk management, especially for firms controlled by a shareholder who, in most cases, is not a totally diversified investor. In this situation, cash management and insurance contracts are crucial risk management tools for mitigating the firm's exposure to idiosyncratic risk (MCNEIL; FREY; EMBRECHTS, 2005; BOLTON; CHEN; WANG, 2011).

Our findings also provide policy-making implications. First, if the lower investment-risk sensitivity for firms with high ownership-control divergence results in wealth expropriation of the minority shareholders, policy-makers should restrict the issuance of non-voting shares. Although dual class shares are more common in Latin America, they are also frequent in other places, such as Italy, Germany and the UK (ISS, 2007). In the Brazilian case, Law 10303 of 2001 decreased the maximum limit of non-voting shares stake from two thirds to one half of the total shares. However, it is applicable only for firms that are making IPOs after 2001. Furthermore, such a limit is still high, since, in an extreme situation, the dominant shareholder could control the company by holding 50% of the voting rights plus one vote share and only 25% of the total shares. A second policy-making implication relates to monitoring of managers and transparency about the firm's investment decisions. Apparently, in the presence of a controlling shareholder, the board of directors does not effectively monitor the executives on the behalf of all shareholders. More precisely, our results indicate that the directors do not monitor the opportunistic behavior of a dominant owner, encouraged by ownership-control divergence. In this sense, policy-makers should consider increasing the participation of directors elected by minority shareholders, principally for firms with high excess voting rights of the controlling shareholder. A regulatory alternative is to enforce high transparency regarding investment decisions for such companies.

The present study has two main limitations. First, our model does not control for the use of risk management tools, such as cash management, insurance contracts and financial derivatives. Since they can reduce the firm's exposure to distinct types of uncertainties, controlling for them might impact the investment sensitivity to idiosyncratic and systematic risks. Finally, we do not test if the effect of ownership-control divergence on the investment-risk relationship leads to over-investment by the firm. This additional check is important for verifying if we can accurately interpret our results as consistent with the tunneling distortion and entrenchment hypotheses.

Future research could explore the primary limitations of our study. These investigations could assess the role of risk management tools in affecting the influence of ownership-control divergence on the investment-risk relationship. In addition, forthcoming studies could examine if the weaker investment sensitivity to idiosyncratic risk for companies with high excess voting rights results in over-investment by the company. To do so, they could use Richardson's (2006) and Biddle, Hilary and Verdi's (2009) models to estimate deviations from the expected investment. Finally, another interesting issue is how investor protection may alleviate the impact of ownership-control divergence. To this end, future studies could expand our sample, including other countries where ownership-control concentration predominates, such as European and Asian nations.

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APPENDIX A − Descriptive statistics for portfolios sorted on corporate characteristics

Table A.1 − Descriptive statistics for financially constrained and unconstrained firms (KZ index)

Group	Constrained			Unconstrained		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.039	0.369	0.178	0.100	0.455	0.205
σ^{idi}	0.124	0.163	0.097	0.092	0.129	0.061
σ^{sys}	0.022	0.024	0.015	0.017	0.019	0.012
Q	0.802	0.543	0.496	0.864	0.717	0.698
CF_t/K_{t-1}	-0.161	0.971	0.240	0.542	0.953	0.567
LEV	0.384	0.186	0.202	0.176	0.184	0.224
$Size$	13.420	1.860	2.470	12.766	1.603	2.068
NEG	0.166	0.376	0.080	0.121	0.286	0.070
DIV	0.245	0.230	0.403	0.240	0.218	0.369
$Observations$	1,195			1,207		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.025	0.316	0.175	0.057	0.416	0.179	0.079	0.410	0.185	0.138	0.533	0.239
σ^{idi}	0.122	0.186	0.067	0.121	0.138	0.110	0.102	0.168	0.047	0.083	0.082	0.067
σ^{sys}	0.023	0.024	0.016	0.022	0.025	0.016	0.018	0.019	0.014	0.016	0.019	0.011
Q	0.698	0.421	0.411	0.902	0.607	0.597	0.725	0.549	0.599	1.040	0.833	0.800
CF_t/K_{t-1}	-0.212	1.054	0.265	-0.119	0.874	0.225	0.485	0.885	0.487	0.680	1.060	0.733
LEV	0.383	0.187	0.194	0.368	0.181	0.189	0.187	0.200	0.225	0.150	0.154	0.203
$Size$	13.310	1.938	3.273	13.521	1.799	2.104	12.573	1.544	2.295	13.046	1.547	1.833
NEG	0.164	0.356	0.080	0.180	0.401	0.088	0.099	0.240	0.063	0.141	0.278	0.089
DIV	0.488	0.145	0.221	0.026	0.038	0.051	0.470	0.140	0.173	0.031	0.044	0.071
$Observations$	478			480			481			483		

This table reports summary statistics for financially constrained and unconstrained firms, considering distinct levels of ownership-control divergence. $Unconstrained$ and $Constrained$ are dummies for the first two and last two KZ index quintiles, respectively. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within $Unconstrained$ and $Constrained$ groups). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.2 − Descriptive statistics for financially constrained and unconstrained firms (WW index)

Group	Constrained			Unconstrained		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.037	0.396	0.173	0.096	0.415	0.182
σ^{idi}	0.124	0.162	0.087	0.085	0.117	0.056
σ^{sys}	0.026	0.028	0.022	0.015	0.015	0.009
Q	0.696	0.601	0.538	0.941	0.619	0.617
CF_t/K_{t-1}	-0.100	1.180	0.432	0.356	0.560	0.289
LEV	0.271	0.241	0.293	0.288	0.159	0.215
$Size$	11.692	1.198	1.595	14.864	1.141	1.600
NEG	0.041	0.115	0.030	0.337	0.528	0.468
DIV	0.261	0.219	0.350	0.237	0.228	0.380
$Observations$	1,195			1,207		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.010	0.323	0.158	0.072	0.483	0.190	0.107	0.409	0.219	0.081	0.390	0.171
σ^{idi}	0.123	0.189	0.055	0.125	0.132	0.102	0.090	0.145	0.040	0.079	0.087	0.063
σ^{sys}	0.026	0.026	0.021	0.028	0.031	0.023	0.015	0.014	0.009	0.013	0.013	0.008
Q	0.552	0.422	0.420	0.830	0.702	0.646	0.865	0.487	0.563	1.040	0.731	0.718
CF_t/K_{t-1}	-0.152	1.128	0.394	-0.038	1.224	0.524	0.382	0.618	0.285	0.352	0.583	0.314
LEV	0.276	0.241	0.286	0.254	0.232	0.299	0.297	0.163	0.231	0.269	0.151	0.198
$Size$	11.571	1.127	1.495	11.841	1.290	1.658	14.837	1.049	1.648	14.802	1.145	1.507
NEG	0.030	0.061	0.035	0.053	0.122	0.037	0.330	0.475	0.489	0.334	0.542	0.475
DIV	0.486	0.136	0.194	0.046	0.051	0.087	0.476	0.153	0.226	0.025	0.039	0.050
$Observations$	478			478			482			483		

This table reports summary statistics for financially constrained and unconstrained firms, considering distinct levels of ownership-control divergence. $Unconstrained$ and $Constrained$ are dummies for the first two and last two WW index quintiles, respectively. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within $Unconstrained$ and $Constrained$ groups). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.3 − Descriptive statistics for non-family-controlled and family-controlled firms

Group	Non-Family-Controlled			Family-Controlled		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.059	0.390	0.176	0.072	0.394	0.198
σ^{idi}	0.103	0.141	0.076	0.107	0.148	0.066
σ^{sys}	0.018	0.021	0.011	0.021	0.023	0.016
Q	0.928	0.639	0.616	0.722	0.577	0.537
CF_t/K_{t-1}	0.185	0.886	0.322	0.196	0.959	0.388
LEV	0.277	0.195	0.247	0.266	0.203	0.263
$Size$	13.897	1.666	1.932	12.642	1.697	2.400
NEG	0.239	0.462	0.250	0.100	0.265	0.045
DIV	0.195	0.215	0.324	0.289	0.223	0.347
$Observations$	1,467			1,536		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.042	0.320	0.172	0.082	0.421	0.187	0.057	0.354	0.191	0.088	0.426	0.212
σ^{idi}	0.107	0.165	0.057	0.098	0.113	0.079	0.107	0.168	0.054	0.103	0.112	0.082
σ^{sys}	0.018	0.019	0.012	0.017	0.022	0.010	0.022	0.024	0.017	0.021	0.025	0.016
Q	0.793	0.481	0.532	1.080	0.733	0.734	0.650	0.452	0.481	0.798	0.672	0.606
CF_t/K_{t-1}	0.159	0.817	0.282	0.284	0.866	0.387	0.102	0.985	0.343	0.295	0.935	0.420
LEV	0.271	0.202	0.266	0.267	0.185	0.248	0.284	0.196	0.247	0.237	0.195	0.269
$Size$	13.975	1.677	2.173	13.750	1.474	1.644	12.733	1.797	2.655	12.717	1.684	2.282
NEG	0.277	0.497	0.325	0.171	0.302	0.165	0.109	0.259	0.064	0.114	0.306	0.048
DIV	0.419	0.164	0.225	0.007	0.019	0.011	0.519	0.133	0.183	0.067	0.067	0.121
$Observations$	586			587			607			615		

This table reports summary statistics for non-family controlled and family controlled firms, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within Non-Family-Controlled and Family-Controlled groups). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.4 − Descriptive statistics for firms without and with pyramid structure

Group	Without pyramid structure			With pyramid structure		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.059	0.398	0.179	0.070	0.389	0.191
σ^{idi}	0.107	0.141	0.078	0.104	0.146	0.066
σ^{sys}	0.020	0.023	0.014	0.019	0.022	0.014
Q	0.758	0.595	0.504	0.857	0.626	0.616
CF_t/K_{t-1}	0.183	0.955	0.407	0.194	0.907	0.322
LEV	0.251	0.207	0.271	0.282	0.195	0.248
$Size$	13.017	1.876	2.424	13.381	1.737	2.296
NEG	0.179	0.404	0.088	0.161	0.368	0.083
DIV	0.194	0.198	0.328	0.269	0.233	0.371
$Observations$	1,041			1,962		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.028	0.302	0.173	0.084	0.441	0.201	0.062	0.356	0.195	0.082	0.414	0.191
σ^{idi}	0.104	0.164	0.060	0.100	0.106	0.083	0.113	0.177	0.053	0.096	0.112	0.077
σ^{sys}	0.021	0.024	0.015	0.019	0.022	0.012	0.020	0.022	0.015	0.019	0.024	0.012
Q	0.650	0.421	0.486	0.950	0.719	0.640	0.718	0.473	0.522	0.990	0.703	0.702
CF_t/K_{t-1}	0.158	0.879	0.325	0.274	0.988	0.556	0.146	0.863	0.313	0.295	0.846	0.336
LEV	0.271	0.220	0.246	0.229	0.189	0.289	0.283	0.188	0.256	0.275	0.186	0.230
$Size$	12.803	1.939	2.588	13.197	1.619	2.026	13.300	1.774	2.671	13.536	1.670	2.015
NEG	0.205	0.483	0.074	0.148	0.260	0.105	0.153	0.319	0.103	0.177	0.409	0.088
DIV	0.405	0.127	0.204	0.008	0.024	0.012	0.513	0.147	0.199	0.046	0.052	0.091
$Observations$	416			418			782			785		

This table reports summary statistics for firms without and with pyramid structure, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within each opposite group regarding pyramid structure presence). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.5 − Descriptive statistics for firms without and with dual class shares

Group	Without dual class shares			With dual class shares		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.112	0.456	0.253	0.055	0.375	0.177
σ^{idi}	0.091	0.118	0.067	0.108	0.150	0.074
σ^{sys}	0.018	0.021	0.012	0.020	0.023	0.014
Q	0.992	0.789	0.750	0.783	0.562	0.563
CF_t/K_{t-1}	0.269	1.250	0.436	0.172	0.829	0.325
LEV	0.268	0.192	0.266	0.272	0.201	0.253
$Size$	13.382	1.458	1.758	13.225	1.863	2.526
NEG	0.178	0.318	0.189	0.165	0.394	0.073
DIV	0.127	0.206	0.218	0.270	0.220	0.346
$Observations$	566			2,437		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.050	0.388	0.226	0.169	0.512	0.266	0.059	0.361	0.185	0.059	0.404	0.173
σ^{idi}	0.107	0.153	0.054	0.075	0.073	0.071	0.112	0.179	0.054	0.107	0.121	0.086
σ^{sys}	0.022	0.024	0.017	0.014	0.017	0.008	0.020	0.022	0.014	0.020	0.025	0.015
Q	0.688	0.518	0.503	1.246	0.897	0.912	0.723	0.474	0.521	0.833	0.601	0.604
CF_t/K_{t-1}	0.000	1.312	0.418	0.444	1.134	0.648	0.209	0.742	0.326	0.172	0.800	0.347
LEV	0.264	0.210	0.311	0.276	0.174	0.227	0.282	0.199	0.253	0.249	0.193	0.250
$Size$	13.027	1.471	1.999	13.620	1.397	1.689	13.111	1.804	2.625	13.313	1.878	2.351
NEG	0.093	0.173	0.079	0.242	0.386	0.333	0.155	0.337	0.098	0.152	0.389	0.059
DIF	0.319	0.214	0.378	-0.001	0.004	0.000	0.497	0.139	0.194	0.058	0.058	0.105
$Observations$	224			294			974			976		

This table reports summary statistics for firms without and with dual class shares, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within each opposite group regarding issuance of dual class shares). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.6 − Descriptive statistics for firms without and with CEO board membership

Group	CEO is not director			CEO is director		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.081	0.418	0.201	0.056	0.375	0.180
σ^{idi}	0.107	0.151	0.072	0.103	0.140	0.069
σ^{sys}	0.019	0.022	0.012	0.020	0.023	0.015
Q	0.946	0.658	0.669	0.745	0.576	0.506
CF_t/K_{t-1}	0.152	0.980	0.354	0.214	0.886	0.344
LEV	0.291	0.200	0.257	0.258	0.198	0.260
$Size$	13.505	1.709	2.048	13.097	1.830	2.485
NEG	0.173	0.361	0.116	0.164	0.393	0.072
DIV	0.244	0.229	0.371	0.242	0.221	0.376
$Observations$	1,159			1,844		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.073	0.370	0.205	0.114	0.465	0.209	0.040	0.345	0.174	0.071	0.424	0.182
σ^{idi}	0.116	0.185	0.060	0.098	0.113	0.079	0.108	0.168	0.052	0.101	0.114	0.080
σ^{sys}	0.019	0.020	0.013	0.018	0.024	0.011	0.021	0.023	0.015	0.020	0.023	0.014
Q	0.843	0.496	0.612	1.084	0.743	0.802	0.617	0.429	0.413	0.864	0.664	0.621
CF_t/K_{t-1}	0.180	0.952	0.336	0.196	1.003	0.418	0.106	0.897	0.312	0.306	0.909	0.394
LEV	0.298	0.195	0.265	0.282	0.195	0.247	0.265	0.209	0.270	0.235	0.181	0.249
$Size$	13.601	1.648	2.182	13.496	1.642	1.813	12.765	1.806	2.631	13.372	1.791	2.278
NEG	0.164	0.323	0.134	0.192	0.409	0.107	0.141	0.341	0.068	0.169	0.381	0.078
DIV	0.485	0.152	0.227	0.030	0.039	0.066	0.475	0.140	0.200	0.030	0.044	0.067
$Observations$	463			465			729			738		

This table reports summary statistics for firms without and with CEO board membership, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within each opposite group regarding CEO board membership). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.7 − Descriptive statistics for firms without and with CEO duality

Group	CEO is not Chairman			CEO is Chairman		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.079	0.418	0.195	0.052	0.365	0.182
σ^{idi}	0.104	0.147	0.070	0.106	0.142	0.072
σ^{sys}	0.019	0.021	0.013	0.020	0.023	0.015
Q	0.896	0.641	0.653	0.750	0.583	0.503
CF_t/K_{t-1}	0.191	0.903	0.345	0.189	0.944	0.353
LEV	0.278	0.198	0.255	0.264	0.201	0.253
$Size$	13.486	1.757	2.124	13.027	1.803	2.497
NEG	0.189	0.390	0.146	0.146	0.370	0.059
DIV	0.241	0.228	0.369	0.245	0.220	0.380
$Observations$	1,490			1,513		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.069	0.377	0.196	0.106	0.453	0.204	0.037	0.326	0.178	0.066	0.415	0.180
σ^{idi}	0.115	0.183	0.058	0.094	0.108	0.077	0.107	0.166	0.052	0.107	0.119	0.086
σ^{sys}	0.019	0.020	0.013	0.018	0.023	0.011	0.021	0.023	0.015	0.020	0.024	0.014
Q	0.784	0.479	0.610	1.031	0.731	0.767	0.624	0.434	0.441	0.868	0.675	0.618
CF_t/K_{t-1}	0.182	0.859	0.314	0.257	0.947	0.409	0.082	0.963	0.340	0.267	0.949	0.398
LEV	0.284	0.190	0.261	0.265	0.197	0.265	0.271	0.216	0.279	0.241	0.178	0.231
$Size$	13.537	1.662	2.182	13.533	1.726	1.967	12.668	1.816	2.684	13.277	1.750	2.271
NEG	0.172	0.338	0.148	0.218	0.450	0.152	0.128	0.323	0.061	0.136	0.317	0.064
DIV	0.481	0.153	0.230	0.027	0.039	0.059	0.475	0.138	0.191	0.032	0.045	0.071
$Observations$	595			596			605			606		

This table reports summary statistics for firms without and with CEO duality, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within each opposite group regarding CEO duality). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.8 − Descriptive statistics for firms with low and high percentage of outside directors

Group	Low percentage of outside directors (≤ 66.7%)			High percentage of outside directors (> 66.7%)		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.027	0.329	0.166	0.078	0.410	0.191
σ^{idi}	0.108	0.137	0.074	0.104	0.147	0.070
σ^{sys}	0.024	0.027	0.020	0.018	0.021	0.012
Q	0.634	0.514	0.468	0.883	0.635	0.589
CF_t/K_{t-1}	0.091	1.092	0.417	0.222	0.861	0.331
LEV	0.235	0.222	0.289	0.283	0.190	0.238
$Size$	12.290	1.716	2.366	13.565	1.707	2.163
NEG	0.066	0.231	0.033	0.200	0.413	0.153
DIV	0.262	0.219	0.333	0.237	0.225	0.382
$Observations$	731			2,272		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.022	0.331	0.153	0.039	0.356	0.188	0.068	0.368	0.200	0.101	0.449	0.193
σ^{idi}	0.108	0.161	0.055	0.109	0.118	0.083	0.111	0.179	0.055	0.098	0.111	0.081
σ^{sys}	0.027	0.027	0.022	0.024	0.028	0.022	0.018	0.019	0.013	0.018	0.022	0.011
Q	0.522	0.384	0.433	0.746	0.607	0.588	0.769	0.488	0.500	1.014	0.725	0.683
CF_t/K_{t-1}	-0.007	1.101	0.418	0.197	0.999	0.425	0.184	0.840	0.300	0.277	0.956	0.396
LEV	0.251	0.225	0.279	0.210	0.226	0.289	0.290	0.195	0.256	0.267	0.171	0.221
$Size$	12.121	1.705	2.433	12.386	1.786	2.477	13.472	1.722	2.452	13.649	1.584	1.852
NEG	0.058	0.219	0.034	0.081	0.277	0.037	0.194	0.374	0.171	0.199	0.408	0.152
DIV	0.484	0.149	0.212	0.051	0.059	0.100	0.476	0.145	0.212	0.024	0.037	0.051
$Observations$	292			293			908			909		

This table reports summary statistics for firms with low and high percentage of outside directors, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within groups of low and high percentage of outside directors). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.9 − Descriptive statistics for firms without and with LUS board of directors' membership

Group	LUS is not director			LUS is director		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.077	0.410	0.190	0.056	0.375	0.187
σ^{idi}	0.103	0.142	0.075	0.106	0.147	0.067
σ^{sys}	0.018	0.021	0.012	0.021	0.023	0.016
Q	0.910	0.646	0.616	0.741	0.577	0.542
CF_t/K_{t-1}	0.243	0.901	0.339	0.141	0.942	0.368
LEV	0.263	0.191	0.234	0.279	0.207	0.274
$Size$	13.766	1.665	1.976	12.779	1.780	2.447
NEG	0.223	0.453	0.189	0.116	0.289	0.054
DIV	0.194	0.222	0.318	0.288	0.216	0.339
$Observations$	1,499			1,504		

Group	$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$			$\boldsymbol{DIV_H}$			$\boldsymbol{DIV_L}$		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.061	0.371	0.186	0.093	0.410	0.200	0.046	0.316	0.191	0.067	0.425	0.188
σ^{idi}	0.115	0.174	0.066	0.094	0.109	0.077	0.099	0.160	0.048	0.109	0.120	0.087
σ^{sys}	0.019	0.020	0.012	0.016	0.020	0.010	0.021	0.024	0.016	0.021	0.025	0.016
Q	0.769	0.494	0.526	1.082	0.745	0.752	0.693	0.483	0.522	0.822	0.677	0.591
CF_t/K_{t-1}	0.191	0.831	0.273	0.380	0.855	0.434	0.129	0.925	0.372	0.189	0.918	0.379
LEV	0.258	0.193	0.249	0.256	0.181	0.239	0.292	0.203	0.263	0.259	0.197	0.282
$Size$	13.857	1.697	2.140	13.657	1.434	1.745	12.815	1.817	2.714	12.896	1.793	2.300
NEG	0.259	0.488	0.268	0.158	0.284	0.165	0.114	0.252	0.081	0.133	0.330	0.053
DIV	0.424	0.174	0.246	0.004	0.016	0.006	0.510	0.129	0.185	0.073	0.067	0.125
$Observations$	599			601			600			603		

This table reports summary statistics for firms without and with LUS board of directors' membership, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within each opposite group regarding LUS board of directors' membership). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

Table A.10 − Descriptive statistics for firms without and with LUS executive board membership

Group	LUS is not executive			LUS is executive		
Variable	Mean	Standard Deviation	Interquartile Range	Mean	Standard Deviation	Interquartile Range
I_t/K_{t-1}	0.077	0.413	0.186	0.046	0.352	0.189
σ^{idi}	0.104	0.143	0.072	0.106	0.147	0.067
σ^{sys}	0.019	0.022	0.012	0.021	0.023	0.017
Q	0.920	0.653	0.622	0.652	0.504	0.488
CF_t/K_{t-1}	0.201	0.948	0.337	0.172	0.880	0.375
LEV	0.277	0.195	0.247	0.261	0.207	0.273
$Size$	13.737	1.655	2.005	12.411	1.717	2.223
NEG	0.212	0.426	0.194	0.090	0.267	0.040
DIV	0.208	0.226	0.352	0.303	0.208	0.330
$Observations$	1,911			1,092		

Group	DIV_H			DIV_L			DIV_H			DIV_L		
Variable	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range	Mean	Std. Dev.	Interq. Range
I_t/K_{t-1}	0.065	0.380	0.185	0.102	0.441	0.198	0.045	0.320	0.180	0.057	0.403	0.195
σ^{idi}	0.112	0.170	0.058	0.096	0.107	0.077	0.102	0.158	0.053	0.103	0.104	0.087
σ^{sys}	0.018	0.020	0.013	0.018	0.022	0.011	0.022	0.025	0.018	0.020	0.023	0.017
Q	0.828	0.536	0.551	1.058	0.743	0.733	0.575	0.374	0.428	0.743	0.628	0.557
CF_t/K_{t-1}	0.142	1.028	0.299	0.336	0.832	0.435	0.151	0.718	0.343	0.224	0.987	0.423
LEV	0.283	0.196	0.262	0.263	0.188	0.250	0.264	0.190	0.245	0.244	0.201	0.278
$Size$	13.859	1.721	2.206	13.600	1.420	1.690	12.389	1.684	2.268	12.546	1.876	2.457
NEG	0.248	0.459	0.271	0.157	0.289	0.127	0.096	0.261	0.045	0.112	0.320	0.046
DIV	0.443	0.171	0.238	0.010	0.023	0.016	0.512	0.118	0.172	0.095	0.079	0.144
$Observations$	764			765			436			437		

This table reports summary statistics for firms without and with LUS executive board membership, considering distinct levels of ownership-control divergence. DIV_L and DIV_H are dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within each opposite group regarding LUS executive board membership). Subscript t indexes the year; I_t/K_{t-1} is the investment-capital ratio; σ^{idi} is idiosyncratic risk; σ^{sys} is systematic risk; Q is Tobin's Q; CF_t/K_{t-1} is the cash flow ratio; LEV is leverage ratio; $Size$ is firm size (natural log of total assets); NEG is the stock negotiability index; and DIV is ownership-control divergence of the largest ultimate shareholder.

APPENDIX B − Models results after controlling for industry dummies

Table B.1 − Effect of ownership-control divergence, controlling for financial constraints

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times Unconstrained$	-0.367***	-0.311***		
	(0.098)	(0.070)		
$\sigma_{t-1}^{idi} \times Constrained$	-0.346***	-0.374***		
	(0.059)	(0.071)		
$\sigma_{t-1}^{idi} \times DIV_L \times Unconstrained$			-0.967***	-0.575***
			(0.211)	(0.174)
$\sigma_{t-1}^{idi} \times DIV_H \times Unconstrained$			-0.270***	-0.194***
			(0.068)	(0.059)
$\sigma_{t-1}^{idi} \times DIV_L \times Constrained$			-0.546***	-0.805***
			(0.148)	(0.146)
$\sigma_{t-1}^{idi} \times DIV_H \times Constrained$			-0.268***	-0.298***
			(0.057)	(0.059)
Wald test:				
$Constrained - Unconstrained$	0.021	-0.063		
p-value	0.813	0.505		
$DIV_H \times Unconstrained - DIV_L \times Unconstrained$			0.697	0.381
p-value			0.001	0.027
$DIV_H \times Constrained - DIV_L \times Constrained$			0.278	0.507
p-value			0.066	0.000
Index of financial constraints	KZ	WW	KZ	WW
Observations	1,971	1,964	1,562	1,565
AR(1) (p-value)	0.000	0.000	0.001	0.000
AR(2) (p-value)	0.497	0.554	0.553	0.807
Hansen's J (p-value)	0.983	0.995	1.000	1.000
Hansen's C (p-value)	0.649	0.672	0.818	0.953

This table reports the SYS-GMM estimation results of Table 5 models after including NAICS Level 1 industry dummies in all specification. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is lagged idiosyncratic risk. $Unconstrained$ and $Constrained$ indicate the dummies for the first two and last two financial constraint indexes quintiles, respectively. We use two measures of financial constraints: the Lamont, Polk and Saá-Requejo (2001) index (KZ); and the Whited and Wu (2006) index (WW). DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within $Unconstrained$ and $Constrained$ groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%).

Table B.2 − Effect of ownership-control divergence, controlling for type of CEM

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times CEM\_No$	-0.440***	-0.623***		
	(0.069)	(0.154)		
$\sigma_{t-1}^{idi} \times CEM\_Yes$	-0.381***	-0.365***		
	(0.049)	(0.043)		
$\sigma_{t-1}^{idi} \times DIV_L \times CEM\_No$			-0.639***	-1.430***
			(0.180)	(0.350)
$\sigma_{t-1}^{idi} \times DIV_H \times CEM\_No$			-0.291***	-0.441***
			(0.059)	(0.108)
$\sigma_{t-1}^{idi} \times DIV_L \times CEM\_Yes$			-0.636***	-0.591***
			(0.119)	(0.110)
$\sigma_{t-1}^{idi} \times DIV_H \times CEM\_Yes$			-0.240***	-0.284***
			(0.043)	(0.040)
Wald test:				
$CEM\_Yes - CEM\_No$	0.059	0.258		
p-value	0.392	0.084		
$DIV_H \times CEM\_No - DIV_L \times CEM\_No$			0.348	0.989
p-value			0.052	0.004
$DIV_H \times CEM\_Yes - DIV_L \times CEM\_Yes$			0.396	0.307
p-value			0.001	0.006
Mechanism	Pyramid	Dual class	Pyramid	Dual class
Observations	2,470	2,470	1,958	2,027
AR(1) (*p*-value)	0.000	0.000	0.000	0.000
AR(2) (*p*-value)	0.564	0.530	0.285	0.516
Hansen's J (*p*-value)	0.898	0.830	1.000	1.000
Hansen's C (*p*-value)	0.628	0.438	0.549	0.405

This table reports the SYS-GMM estimation results of Table 7 models after including NAICS Level 1 industry dummies in all specification. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is idiosyncratic risk. CEM_No and CEM_Yes indicate the dummies for CEM non-usage and CEM usage, respectively. We consider two control-enhancing mechanisms: pyramid structures; and dual class shares. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within CEM_No and CEM_Yes groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test *p*-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%).

Table B.3 − Effect of ownership-control divergence, controlling for board independence

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)	(5)	(6)
$\sigma^{idi}_{t-1} \times BI_L$	-0.436***	-0.393***	-0.459***			
	(0.059)	(0.065)	(0.089)			
$\sigma^{idi}_{t-1} \times BI_H$	-0.341***	-0.380***	-0.375***			
	(0.051)	(0.051)	(0.050)			
$\sigma^{idi}_{t-1} \times DIV_L \times BI_L$				-0.820***	-0.871***	-0.629***
				(0.157)	(0.167)	(0.172)
$\sigma^{idi}_{t-1} \times DIV_H \times BI_L$				-0.307***	-0.281***	-0.301***
				(0.049)	(0.052)	(0.058)
$\sigma^{idi}_{t-1} \times DIV_L \times BI_H$				-0.499***	-0.564***	-0.658***
				(0.142)	(0.118)	(0.160)
$\sigma^{idi}_{t-1} \times DIV_H \times BI_H$				-0.245***	-0.257***	-0.244***
				(0.047)	(0.046)	(0.047)
Wald test:						
$BI_H - BI_L$	0.095	0.013	0.084			
p-value	0.144	0.856	0.364			
$DIV_H \times BI_L - DIV_L \times BI_L$				0.513	0.590	0.328
p-value				0.001	0.000	0.051
$DIV_H \times BI_H - DIV_L \times BI_H$				0.254	0.307	0.414
p-value				0.077	0.007	0.010
Proxy for board independence	CEO on board	CEO is Chairman	Outside direct.(%)	CEO on board	CEO is Chairman	Outside direct.(%)
Observations	2,470	2,470	2,470	1,952	1,967	1,973
AR(1) (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.517	0.537	0.535	0.761	0.795	0.934
Hansen's J (p-value)	0.959	0.912	0.915	1.000	1.000	1.000
Hansen's C (p-value)	0.742	0.660	0.499	0.379	0.486	0.581

This table reports the SYS-GMM estimation results of Table 8 models after including NAICS Level 1 industry dummies in all specification. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ^{idi}_{t-1} is idiosyncratic risk. BI_L and BI_H indicate the dummies for low and high board independence, respectively. We use three proxies for board independence: CEO board membership; CEO duality; and percentage of outside directors. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within BI_L and BI_H groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ^{idi}_{t-1} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%).

Table B.4 − Effect of ownership-control divergence, controlling for LUS presence on corporate governance bodies

$(I_t/K_{t-1})_t$	(1)	(2)	(3)	(4)
$\sigma_{t-1}^{idi} \times LUS\_on$	-0.395***	-0.383***		
	(0.059)	(0.058)		
$\sigma_{t-1}^{idi} \times LUS\_out$	-0.387***	-0.391***		
	(0.052)	(0.058)		
$\sigma_{t-1}^{idi} \times DIV_L \times LUS\_on$			-0.568***	-0.929***
			(0.174)	(0.193)
$\sigma_{t-1}^{idi} \times DIV_H \times LUS\_on$			-0.274***	-0.333***
			(0.049)	(0.051)
$\sigma_{t-1}^{idi} \times DIV_L \times LUS\_out$			-0.660***	-0.659***
			(0.142)	(0.157)
$\sigma_{t-1}^{idi} \times DIV_H \times LUS\_out$			-0.274***	-0.321***
			(0.061)	(0.058)
Wald test:				
$LUS\_out - LUS\_on$	0.008	-0.008		
p-value	0.917	0.909		
$DIV_H \times LUS\_on - DIV_L \times LUS\_on$			0.294	0.596
p-value			0.088	0.001
$DIV_H \times LUS\_out - DIV_L \times LUS\_out$			0.386	0.338
p-value			0.009	0.041
Governance body	Board of Directors	Executive Board	Board of Directors	Executive Board
Observations	2,470	2,470	1,959	1,950
AR(1) (p-value)	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.540	0.530	0.747	0.573
Hansen's J (p-value)	0.920	0.921	1.000	1.000
Hansen's C (p-value)	0.432	0.563	0.569	0.514

This table reports the SYS-GMM estimation results of Table 9 models after including NAICS Level 1 industry dummies in all specification. The dependent variable is the firm's investment rate $[(I_t/K_{t-1})_t]$. σ_{t-1}^{idi} is idiosyncratic risk. LUS_out and LUS_on indicate the dummies for LUS absence and LUS presence on body, respectively. We consider two corporate governance bodies: Board of Directors; and Executive Board. DIV_L and DIV_H indicate the dummies for the first two and last two ownership-control divergence quintiles, respectively (constructed within LUS_out and LUS_on groups). The set of controls includes the following lagged variables: firm's investment rate; systematic risk; Tobin's Q; cash flow ratio; leverage ratio; firm size; stock negotiability; dummies for Bovespa's premium listing segments; and year dummies (all control variables are not reported due to space constraints). See Table 2 for variable definitions. We present the difference in coefficients on σ_{t-1}^{idi} across distinct firm groups, and Wald test p-values under the null hypothesis of coefficients equality. The SYS-GMM instruments are described in Subsection 3.4. AR(1) and AR(2) check for first-order and second-order autocorrelation in transformed residuals, respectively. Hansen's J and Hansen's C check for over-identification regarding all instruments and a subset excluding instruments in differences. The Windmeijer (2005) corrected standard errors are reported in parentheses. Significance: ***(1%); **(5%); and *(10%).