Corporate Governance and Pyramidal Ownership: The Role of Novo Mercado

(Governança Corporativa e Propriedade Piramidal: O Papel do Novo Mercado)

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Abstract

The literature has not reached a consensus on the motivation and implications of pyramidal ownership schemes. For some, such arrangements make it easier for controlling shareholders to expropriate outside investors. More recently, some studies have challenged this view and emphasized that their rationale lies in overcoming financial constraints. This paper focuses on whether firms owned through pyramidal schemes are more likely to be listed on the "Novo Mercado," the Brazilian stock exchange's premium listing segment created in 2000, which prohibits firms from issuing non-voting shares. We built a dataset of ownership data with annual observations for a panel of firms over the period 2003-2010 by hand-collecting data drawn from reports that firms submit periodically to the Brazilian securities regulator (CVM). Estimating fixed effects non-linear panel data models of a binary dependent variable, we find that firms listed on the Novo Mercado are less likely to be owned through a pyramid arrangement, result which appears to be consistent with the expropriation view.

Keywords: Pyramidal ownership structures, corporate governance, Novo Mercado, nonlinear panel, fixed effects.

JEL Codes: D22, G32, C23.

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Resumo

A literatura não chegou a um consenso sobre a motivação e implicações dos esquemas de propriedade piramidal. Para alguns, tais acordos facilitam para os acionistas controladores expropriarem os investidores externos. Mais recentemente, alguns estudos desafiaram essa visão e enfatizaram que sua justificativa está na superação das restrições financeiras. Este artigo enfatiza se as empresas pertencentes a esquemas piramidais têm maior probabilidade de serem listadas no Novo Mercado, o segmento de listagem superior da bolsa de valores criada em 2000, que proíbe as empresas de emitir ações sem direito a voto. Construímos um conjunto de dados de propriedade com observações anuais para um painel de empresas no período 2003-2010, coletando dados extraídos de relatórios que as empresas submetem periodicamente ao regulador brasileiro de valores mobiliários (CVM). Estimando modelos de dados de painel não-lineares com efeitos fixos para variáveis dependentes binárias, verificamos que as empresas listadas no Novo Mercado são menos propensas a pertencerem a um arranjo de pirâmide, resultado que parece ser consistente com a visão de expropriação.

Keywords: Estruturas de propriedade piramidal, governança corporativa, Novo Mercado, painel não linear, efeitos fixos.

1. Introduction

For Berle and Means (1932), the distinguishing feature of the modern corporation lies in the separation of control from ownership, which gives rise to potential conflicts of interests between management and the dispersed shareholders. Some decades later, La Porta, Lopez-de-Silanes and Shleifer (1999) brought evidence that the great majority of a sample comprising the 20 largest companies from each of 27 OECD countries did not fit Berle and Means' characterization: firms controlled by a few shareholders were prevalent around the world, except in a couple of countries with strong legal protection of outside shareholders' rights. As they pointed out, these controlling shareholders generally have disproportionate power over the firm vis-à-vis their capital stake because they rely on enhancing-control devices, such as dual-class shares, pyramidal ownership structures, and cross-shareholding. Besides power, the separation of control rights from cash-flow rights provides them with incentives to expropriate minority shareholders, as their low capital investment in the firm allows them to externalize most of the costs of corporate value-destroying decisions, such as tunneling, which yield however high private benefits. La Porta, Lopez-de-Silanes and Shleifer

(1999) triggered a copious theoretical and empirical literature on the motivations and implications of firms' capital ownership and control structures, notably of pyramidal ownership structures.

A firm has a pyramidal ownership structure if it is ultimately owned by a shareholder through at least one intermediate publicly traded firm. The literature on business groups in the 1970s did not discriminate between horizontal and pyramidal ownership structures and, as a rule, assigned the predominance of this type of organization in developing countries to shortcomings in financial and/or labor market, coordination problems, and/or high transaction costs.[1] Starting a new strand of empirical research that would predominate in the literature over the following years, La Porta, Lopez-de-Silanes and Shleifer (1999) focus on pyramidal business groups, whose main motivation for them resides in expropriating minority shareholders. They argue that pyramidal ownership schemes allow the separation of controlling shareholders' control rights from capital stake, implying that most of the burden of value-destroying decisions is externalized to outside shareholders. In a similar vein, Bebchuk, Kraakman and Triantis (2000) claim that "controlling minority structures" (such as pyramidal ownership, dual-class shares and cross-ownership) create strong incentives for self-dealing and tunneling, as the shareholder who manages to gain control by holding a small fraction of the firm's cash flow rights is likely to profit more by extracting private benefits from the firm at the expense of minority shareholders rather than maximizing its value.[2]

Indeed, a great number of empirical studies find evidence consistent with the expropriation view. As a rule, these findings result from regressing firms' performance, measured either by profitability rates or market-to-book value ratio or other proxies for marginal Tobin's *Q*, on ownership and control variables. Three studies are representative of the methodological approach prevailing in the literature at the beginning of the 2000s. With data of Asian companies, Claessens, Djankov, Fan and Lang (2002) documented that companies' valuation increases with the largest ultimate shareholder's fraction of cash flow rights and decreases with her fraction of voting rights and the difference between voting rights and cash flow rights. La Porta, Lopez-de-Silanes, Shleifer and Vishny (2002) show

[1] Among other analyses, see Leff (1978), Khanna and Yafeh (2007) and Colpan, Hikino and Lincoln (2010).

[2] Similar works are Bertrand, Mehta and Mullainathan (2002) and Johnson et al. (2000).

that the Tobin's *Q* of a sample of companies from OECD countries grow with the participation of the controlling shareholder in the company's capital and decrease with the difference between control rights and cash flow rights. Attig, Fischer and Gadhoum (2004) provide evidence that the likelihood of a firm being owned through a pyramidal arrangement increases with its largest ultimate shareholder's voting rights, free cash flow, capital expenditure, size and when it is controlled by a family. Also, they find that pyramidal firms tend to have lower Tobin's *Q*.[3]

In the mid-2000s, some studies on pyramidal ownership resumed the interpretation that assigned the rationale for business groups to their ability of overcoming financial market failures. By allowing intra-group fund transfers, a pyramidal scheme could ensure the funding of new ventures that would not take place should they depend on external funding. In a seminal paper, Almeida and Wolfenzon (2006) develop a theoretical model whereby pyramidal business groups are an efficient response to financial market failures. In countries with weak legal protection of investors, so they contend, families controlling such type of groups could use the cash flows of firms they already control to finance new firms with low asset pledgeability or whose investment requirements far exceed the expected cash flows. Hence, there prevails a selection effect, as firms with those characteristics are added to the group through a pyramidal ownership arrangement. Unlike the expropriation view, according to which pyramids lead to tunneling and consequently to low or negative profitability, the financing advantage hypothesis claims that the firm's prior or expected performance determines how it is incorporated into the group.

The paper of Almeida and Wolfenzon (2006) set in motion an extensive literature about the motivations for and effects from pyramidal arrangements, most of which confirming their thesis. Almeida, Park, Subrahmanyam and Wolfenzon (2011) show that families in a sample of Korean stand-alone and chaebol-affiliated firms tended to own low pledgeability firms through pyramidal arrangements, evidence which is consistent with both the expropriation and the financing advantage hypotheses. Nonetheless, they also find that, among firms acquired by chaebols over the sample period, those with low past profitability were

[3] For the effect of separation of controlling shareholders' voting rights from their cash flow rights on the controlling families' incentive to expropriate minority shareholders, see among others: Bertrand, Mehta and Mullainathan (2002), Joh (2003), and Johnson et al. (2000).

more likely to be incorporated lower down the pyramidal structure. Moreover, in disagreement with the expropriation view, theu do not observe downward trend in the profitability of firms acquired by chaebols that subsequently are owned through pyramidal structures. Jin and Park (2015) also bring supportive evidence of the financing advantage hypothesis for Korean business groups by documenting that their affiliated firms' accounting performance increases with the separation between controlling shareholders' cash flow and voting rights. They assign this positive effect to the business groups' minority stake controlling families' transgenerational succession purpose, which inhibits them from opportunistic behavior.

Relying on a large dataset comprising more than 28 thousand listed firms across 45 countries, Masulis, Pham, and Zein (2014) endorse empirically the view that family pyramidal business groups provide financing advantages to specific types of their affiliated firms. They find that firms at the bottom of a pyramid, which in their sample tend to be younger and to have higher idiosyncratic risk, present nonetheless higher investment intensity, valuation, internal-equity and debt funding, and larger size than firms at the same pyramid's apex and those owned through a horizontal structure. Hence, they conclude that pyramidal arrangements are driven not only by control perpetuation but also by financing motivations, that is, these ownership schemes exploit internal capital markets to reallocate funds to high-risk, capital-intensive affiliates, which otherwise would face financial constraints from external capital markets. However, these findings are not observed in non-family groups, such as those controlled by financial institutions, governments, or widely-held corporations, suggesting that a family controlling a business group is crucial for its financing advantage, possibly because a group's controlling family has, while controlling non-families have not, enough incentives to control and monitor the "internal capital market", bearing the costs of raising external funding and benefiting from the ownership group structure. The authors also show that pyramidal business groups' firms using other control-enhancing devices without delivering financing advantages, such as dual-class shares, undergo a valuation discount.

Many other studies provide similar findings for different countries and time periods. Using data from nearly 57 thousand newly created private manufacturing firms in 19 European countries, Bena and Ortiz-Molina (2013) show that pyramidal ownership was widespread among the sample firms and that they self-selected their ownership structure according to their financing needs. Fan, Jin, and Zheng (2016) produce evidence for

Chinese firms consistent with the view of the higher efficiency of business groups' internal financing transfers, provided their firms' financial constraint is strong and the potential for conflicts of interest between controlling and outside shareholders is limited. There is also evidence of pyramidal business group affiliation related: to lower negative impact of the discrepancy between control and ownership on firms' value, as shown by Torres, Bertína, and López-Iturriaga (2017), who analyse Chilean non-financial quoted firms controlled by families; to higher fraction in capital-intensive industries in countries where financial markets are less developed, notably for young and small firms and for affiliates of large and diversified groups, as documented by Belenzon, Berkovitz, and Rios (2013) with data of a sample of firms from 15 developed European countries; and to investment opportunities financed by other affiliates' dividends, as presented by Gopalan, Nanda and Seru (2007), who explore exogenous variations in firms' investment opportunities arising from import tariff changes in a number of countries.

There is abundant empirical evidence sustaining a debt financing version of the pyramidal business groups' financing advantage, which supports the view that these groups reduce their affiliates' default risk and debt costs by providing risk sharing and intra-group cash-flow reallocation (Gopalan et al., 2007; Khanna and Yafeh, 2005, 2007; Ferris, Kim and Kitsabunnarat, 2003; Friedman, Johnson and Mitton, 2003). With Korean firms' data from 2001 to 2007, Byun et al. (2013) find that the chaebol-affiliated firms' cost of bonds is lower than that for independent firms, being even lower when controlling for the wedge between cash-flow and voting rights, indicating that the debt cost-reducing co-insurance effect dominates the debt cost-increasing ownership structure effect coming from the expropriation. Analogously, for a sample comprising Chilean business groups over the period 1990–2009, Buchuk et al. (2014) show that intragroup loans' receivers have higher leverage and increase investment, dividends and return on equity, while their providers invest less and have higher external leverage. They emphasize that this benign effect results from adequate regulatory oversight and intra-group lending disclosure requirements, which refrain pyramidal business groups from expropriating minority shareholders through the use of internal capital markets.

Besides Masulis, Pham, and Zein (2014), other studies bring evidence of the opposing effects of pyramidal schemes and dual class shares, with the former usually tending to affect positively firms' performance or valuation. Villalonga and Amit (2009) find that for the period 1994-2000 dual-class shares and disproportionate board representation reduce large U.S. firms'

value, while voting agreements and pyramids increase it. Bennedsen and Nielsen (2010) show evidence for European firms of lower value discount for pyramidal firms than for those issuing dual class shares (in a 2007 paper, Bennedsen and Nielsen had found that, among disproportionate ownership devices, dual-class shares was the most harmful to market-to-book value, followed by pyramids). Nonetheless, there is also significant evidence of the pyramidal business groups' dark side. As documented by Tian, Zhao, and Zhu (2010) for China and Yurtoglu (2000) for Turkey, business groups can underperform owing to earnings management. Paligorova and Xu (2012) provide evidence with G7 countries' data that pyramidal firms rely more on debt financing than non-pyramidal firms due to expropriation from ultimate shareholders who have excess control rights – they induce lower down pyramidal firms to contract debt with a view to tunneling the borrowed funds to private purposes, sharing a small amount of the affiliates' increasing financial distress costs.

As regards pyramidal ownership structures in Brazil's corporate landscape, Aldrighi and Postali (2011) present supportive evidence of their relevance and, by estimating a probit model to assess the rival interpretations about the rationale of these structures with data of publicly traded companies over the period 1997-2002, find results that are starkly at odds with the expropriation hypothesis. They speculate that pyramidal ownership schemes in Brazil could serve different purposes: some companies' controlling shareholders could use such arrangement with a view to expropriating minority shareholders, while others might be interested in preserving family control, financing new companies with low expected profitability and low pledgeability assets, or profiting from regulatory or tax arbitrage. Contrariwise, using data of Brazilian publicly traded companies for the years 2004 and 2006, Bortolon (2013) rebut expropriation as a key driver for pyramidal ownership formation based on the evidence that the sample pyramidal firms were more likely to pay dividends than to retain free cash flow. With Brazilian publicly-traded companies' panel data for the period 2000-2012, de Andrade, Bressan, and Iquiapaza (2014) document that financial performance is higher for pyramidal firms issuing only voting shares and with few ownership layers, while it is lower for firms issuing dual-class shares, regardless whether they are owned or not through pyramidal ownership schemes. This brief literature review reveals that the motivations for pyramidal ownership schemes remain an unsettled issue, with two dominating, opposing views: one arguing that they are a device to facilitate the expropriation of minority shareholders, the other claiming that they constitute an efficient response

to capital market failures.

According to the methodology adopted in this paper, nearly 20% of all the publicly traded companies in Brazil in 2010 were owned through pyramidal schemes. One singularity in Brazil's stock exchange (BM&FBovespa) is the existence since December 2000 of three listing segments (Level 1, Level 2 and Novo Mercado), which differ from the traditional segment by firms' contractual commitment to higher governance standards than those legally required. Over the period 2003-2010, firms listed on Level 1 were required to disclose more detailed financial information, to have free float shares at a minimum of 25% of the stock outstanding, to be committed to disperse the ownership of shares, to provide annual schedules of corporate events and to have at least one annual shareholders' meeting. Besides of Level 1 requirements, firms listed on Level 2 had to have boards composed at least of five directors and of 20% of independent directors, with an unified directorship of up two years; to make available English-translated financial statements; to make a public offer, in the case of a transfer of control, to acquire shares from minority common shareholders at the same price that the new controlling shareholder paid for, and from preferred shareholders, at 80% of such price (tag along rights); to make a public offer in the case of delisting or exiting from the segment; and submission to arbitration from a referees' panel to settle disputes among insiders and outsider shareholders. To join the Novo Mercado (NM), on top of Level 2 requirements, firms cannot issue nonvoting shares, indicating strong commitment to high-level governance practices. Ownership pyramidal schemes represented in 2010 around 14% of the firms listed on the NM, against 12%, 17% and 18% of those listed on the Level 2, Level 1 and the traditional segment, respectively.

There are pieces of evidence suggesting that firms listed on the NM are actually committed to good governance practices and outperform other firms in terms of valuation. De Carvalho and Pennacchi (2013) show that firms' migration to NM and Level 2 caused positive abnormal returns, suggesting that shareholders perceive these premium segments as effectively enhancing corporate governance. Based on surveys of Brazilian firms' governance practices in 2004, 2006, and 2009, Black, de Carvalho and Sampaio (2014) conclude that companies listed on NM or on Level 2 adopt investors' high-valued governance practices that are associated with higher Tobin's Q. In addition, they argue that the quality of the governance practices was boosted over that period due mainly to the sharp increase in listings on the NM and Level 2, notably through IPOs, and to the positive mimetic influence that these listing segments' governance standards

exerted on firms listed on other segments. Srour (2005) also finds evidence that firms listed on the NM are committed to minority shareholders' interests, exhibit higher than average returns during turmoil periods, and pay dividends more frequently than matched firms listed on other segments. Braga-Alves and Shastri (2011) provide evidence that firms with higher scores of an index composed of proxies for the NM's main goals present higher valuation.

Against the backdrop of the literature above reviewed, we use data from the whole set of non-financial publicly traded companies listed on the Brazilian Stock Exchange over the period 2003-2010 to examine the relationship between pyramidal ownership structures and the quality of corporate governance practices, proxied here by the particular segment where the firm is listed. As firms listed on the NM cannot issue nonvoting shares, one could expected that their controlling shareholders might resort to pyramidal ownership arrangements as a way to reach control by economizing on capital investment, regardless of their ultimate purpose (expropriation, financing, tax advantages …). However, if the NM effectively selects good governance-practice firms, there would lack rationale for pyramidal structures directed at expropriating minority shareholders. Given NM listed firms' purported commitment to better governance practices, we investigate whether, as the expropriation view suggests, they are less likely to be owned through pyramidal ownership structures. As far as we know, this issue remains an uncharted territory in the literature on pyramidal ownership schemes in Brazilian firms. Bortolon and Câmara Leal (2014) study firms that unified dual class shares over the period 2000-2008 and find specific characteristics for firms that subsequently listed on the NM when compared with those that did not: before unification they had higher profitability and investment opportunities as well as lower leverage and ownership concentration; and after unification, in 2013, all of them remained listed on the NM while those that did not listed on it either no longer existed as independent firms or were in dire financial straits.

Regarding institutional changes aimed at improving corporate governance and terminating dual class shares promoted in other countries, there are two studies closely related to our objective, both of which providing evidence that dual-class share unifications are not followed by formation of pyramid schemes. Lauterbach and Yafeh (2011) find that firms induced by a regulatory change carried out in Israel in the 1990s to unify dual-class shares did not move to pyramidal arrangements, while Maury and Pajusteb (2011), focusing on a sample of European firms, document that

governance-enhancing institutional changes fostered dual-class share unifications, notably in firms presenting low potential for private benefits of control and higher growth opportunities, but did not drive share-unifying firms to form pyramids.

On top of addressing the unexplored question of the relationship between firms' listing on the NM and pyramidal ownership, this paper contributes to the existent literature by utilizing an unique, comprehensive ownership dataset of non-financial publicly-traded companies, which was built with hand-collected primary data from firms' reports, data which was compiled and organized following a specific methodology. Also, our findings may shed some light to a key practical question for investors, that is, whether the NM can effectively curb potential moral hazard behaviour supposedly instigated by ownership arrangements.

The remainder of the paper is structured as follows. Section 2 describes the database and the empirical strategy. Section 3 discusses descriptive statistics. Section 4 focuses on the firm's characteristics that may be associated with pyramidal ownership and estimates a binary dependent panel model to investigate whether listing on the NM is related to the likelihood of the firm being owned through a pyramidal scheme. The last section concludes.

2. Data and Empirical Strategy

2.1 Data

We built a novel dataset by compiling primary data from mandatory reports that publicly traded companies have to submit to the Comissão de Valores Mobiliários (CVM, Brazil's capital market regulator): *Informações Anuais* (IAN, Annual Information) and *Formulário de Referência* (FR). The former was discontinued in 2010, and since then has been substituted for the latter, which is continually updated and much more comprehensive and detailed. From the data collected from these sources, we managed to reconstruct the ownership chain connecting the sample publicly traded company through intermediate firms to its largest ultimate shareholder (henceforth, LUS). Identified the LUS for every sample company, we then calculated the participation it held in the company's total cash-flow rights and total voting rights, and checked for the existence of shareholders' agreements. On top of IAN and FR, we collected data from: a) Demonstrações Financeiras Padronizadas (Standardized Financial Statements), which is the accounting and financial report that publicly traded companies must annually submit to CVM; b) Economatica, a dataset with Latin American and US firms' financial and accounting data; and c)

websites of firms and of the Brazil's stock exchange (BM&FBovespa), from which we extracted companies' founding year and segment listing.

To reconstruct the ownership chains for every sample firm for every year over the period 2003-2010, we began by investigating its largest direct shareholders; if they themselves were firms, we searched for their direct shareholders, that is, the sample firm's indirect shareholders; in the case of the shareholders in this second ownership layer also being firms, we proceeded to identify their respective direct shareholders and so successively up to reach the ultimate shareholder for every ownership chain. Afterwards, we represented in a figure the ownership structure for every sample company-year, calculating the main shareholders' voting rights and cash-flow rights for every intermediate firm throughout the ownership chains. For this procedure, we adopted the following definitions:

a) The company's LUS is the shareholder who holds the largest sum of direct and indirect voting rights. She may be, for example, a family, a shareholders' agreement, any governmental entity, a mutual fund, a pension fund, or a foreign company;

b) Indirect ownership happens when a shareholder owns a stake in the company's capital by means of at least one intermediate company;

c) Pyramidal ownership is an indirect ownership where at least one intermediate firm is publicly traded;[4]

d) Controlling shareholder is the shareholder who owns, directly or indirectly, at least 50% of the company's voting rights;

e) The shareholder's cash-flow rights represent her stake in the company's total capital (the sum of ordinary and preferred shares). When ownership is indirect, cash-flow rights are calculated as the product of the stakes in the intermediate companies' total capital along the ownership chain. If

[4] Most of the literature associates pyramidal business groups with firms that are indirectly owned through another listed firm(s), all of them under the same shareholder's control, as do La Porta et al. (1999). In contrast, Almeida et al. (2011), Aldrighi and Postali (2011) and a few other studies refer to pyramidal ownership scheme as firms that are owned by an ultimate shareholder through at least one intermediate firm, regardless of the latter being listed or not. Thus, they understand pyramidal ownership as indirect ownership while the literature predominantly circumscribes the meaning of pyramidal ownership to indirect ownership wherein at least one intermediate company is listed. In this paper, we follow the usual definition.

there are multiple ownership chains, cash-flow rights are the sum of all the products of the capital stakes in the companies along the respective chains;

f) The shareholder's voting rights are calculated as her stake in the company's voting capital (ordinary shares). When ownership is indirect, the calculation of the voting rights depends on whether there exists at least one voting capital stake along the ownership chain below 50%. If so, voting rights are calculated in the same way as that for cash-flow rights, that is, by multiplying the capital stakes along the indirect chain and adding the corresponding products. For example, if *C* holds 20% of firm *B*'s voting capital, which in turn holds 80% of firm *A*'s voting capital, then *C* owns 16% (20% x 80%) of firm *A*'s voting rights, implying that C is not a controlling shareholder. Contrariwise, if the ultimate shareholder holds at least a 50% voting capital stake in all firms along the ownership chain, then her stake in the sample company's voting capital is the direct voting capital stake that the first layer intermediate company holds in the sample firm. Therefore, if *C* controls 60% of the voting rights in company *B*, which in turn has 80% of firm *A*'s overall voting rights, then *C* commands 80% of firm *A*'s voting rights and is firm *A*'s ultimate as well as controlling shareholder.

2.2 Empirical Strategy

To examine whether the firm's decision to list on the NM is related to pyramidal ownership, we cannot take for granted that firms are randomly listed on that segment, since firms' unobservable characteristics, such as managerial ability, may be correlated with the choice of listing segment. The estimation of a fixed effects model contributes to mitigate the potential endogeneity bias, but nonetheless, as noted by Cameron and Trivedi (2010), it only copes with within-individual heterogeneity. When between variation accounts for most of the regressors' total variation, fixed effects estimators are unlikely to be efficient. In light of this, we use nonlinear fixed effects models (logit) to estimate the likelihood of a company being owned through a pyramidal structure. The dependent variable is a binary variable that values 1 if this happens (pyramid = 1), and zero otherwise (pyramid = 0).[5] We compare the results yielded under different constraints

[5] Fixed effects estimation can be run through panel logit models by using the conditional maximum likelihood approach, while it cannot for other binary panel models, such as panel probit (Cameron and Trivedi, 2005).

as a way to check robustness. More formally, we extend the binary dependent to fixed effects model as follows:

$$Prob[y_{it} = 1 \,|\boldsymbol{x}_{it}, \beta, \alpha_i] = \begin{cases} \Lambda(\alpha_i + \mathbf{x}'_{it}\beta) \; (logit) \end{cases}$$

where $\Lambda(.)$ is the cumulative logistic function, α_i corresponds to the time-invariant individual specific effect, $\mathbf{x}_{it}$ is a vector containing the explanatory variables, and β is the parameter vector (Cameron and Trivedi, 2005). The estimated probabilities allow the calculation of the odds ratio (OR), which expresses the relative impact of the covariate on the likelihood of pyramid. The OR for the binary variable is given by the following expression:

$OR = (\frac{p_1}{1-p_1})/(\frac{p_0}{1-p_0})$,

where $p_1 = P\{y_i = 1|x_i\}$ and $p_0 = P\{y_i = 0|x_i\}$are the conditional probabilities of, given x_i, observing ($y_i = 1$) and not observing ($y_i = 0$) a pyramidal structure.

2.3 Descriptive Statistics

The sample comprises around 2,400 observations (company-years) with data on ownership and control characteristics – as the identity of the largest ultimate shareholders, their stakes in the firms' cash-flow rights and voting rights, the existence and length of pyramidal ownership, the fraction of non-voting shares in the firm's outstanding shares, and the segment where the company is listed – as well as financial and accounting data, such as return on assets and on equity, total assets, leverage, and asset tangibility. Table 1 shows that the sample is reasonably evenly distributed along the eight years.

Table 1: Distribution of the Sample Companies by Year

Year	Freq.	Percentage	Cum. (%)
2003	295	12.2	12.2
2004	290	12.0	24.2
2005	286	11.8	36.0
2006	295	12.2	48.1
2007	326	13.5	61.6
2008	330	13.6	75.2
2009	306	12.6	87.9
2010	294	12.1	100.0
Total	2,422	100.0	

Source: Own elaboration with data from the CVM

Table **2** summarizes the variables of the model. The dependent variable (*Pyramid*) is a dummy that values one if the firm is owned through a pyramidal scheme, that is, if there is at least one publicly traded intermediate firm linking the largest ultimate shareholder to the sample firm, and zero otherwise. The explanatory variable (*d_novo_merc*) is a dummy that assumes value one if the firm is listed on the NM, and zero otherwise. According to the expropriation hypothesis (EH), one could be expected that NM listed firms' high-level governance practices inhibit them from forming pyramidal ownership structures, which is supposedly prone to moral hazard behaviour. The financing advantage hypothesis (FAH), however, entails no determinant prediction related to the likelihood of a pyramid affiliation.

The remaining variables are used to control for observable characteristics that may affect the ownership structure. As several studies emphasize families' control motivations as a key driver for the existence of pyramidal business groups, which allow them to reach control with a disproportionately small capital stake (among others, Almeida and Wolfenzon, 2006; Almeida et al., 2011; and Masulis et al., 2011), we

introduce a dummy variable (*d_family*) valuing one if the LUS (as defined in section 2.1) is a family, and zero otherwise. The LUS' voting rights (*vot_right*), the dummy for the LUS' cash-flow rights exceeding 50% (*d_cash_flow_50*) and the dummy for firms issuing at least 50% of the capital through nonvoting shares are used because the EH claims that, as put forward by Bebchuk, Kraakman, and Triantis (2000) and La Porta, Lopez-de-Silanes, and Shleifer (1999), the pyramidal structures' primary aim lies in economizing on capital investment and separating voting rights from cash-flow rights. Thus, according to this view, the likelihood of observing pyramidal arrangements is correlated with higher voting rights and lower cash-flow rights for the LUS and also with the firms' issuance of nonvoting shares close to the regulatory limit (2/3 of the outstanding shares) – otherwise it would be cheaper to issue nonvoting shares.

Table 2: Description of the Variables

Variable	Type of variable	Description
Pyramid	Dependent	A variable dummy that values 1 if the firm is owned through a pyramidal structure and 0 otherwise
d_novo_merc	Explanatory	A variable dummy that values 1 if the firm is listed on the Novo Mercado
vot_right	Control	The fraction of the largest ultimate shareholder (LUS) in the firm's voting rights
leverage	Control	The leverage ratio measured as the value of total liabilities over the value of total assets (%)
age	Control	Firm age in years
roa_adj	Control	Adjusted return on assets*
size	Control	The logarithm of the value of total assets in reais
tangib	Control	The asset tangibility ratio measured as the value of the firm's property, plant and equipment over the value of total assets (%)
d_cash_flow_50	Control	A variable dummy that assumes value 1 if the LUS has a stake in the firm's cash-flow rights of at least 50% and 0 otherwise
d_family	Control	A variable dummy that values 1 if the LUS is a family and 0 otherwise
d_non_vot	Control	A variable dummy that values 1 if the firm issues non-voting shares exceeding 50% of its total capital

* We use the adjusted return on assets as a profitability measure because it excludes the influence of the specific way the company is financed by defining the operating income as the net income plus financial expenditures less the tax shields on interest payments.

As usual in the estimation of empirical models of capital structure and ownership, firms' size, age, asset tangibility (*tangib*), leverage and financial performance (adjusted return on assets, *roa_adj*) are employed as control variables. Attig, Fischer and Gadhoum (2004) argue that pyramidal ownership structures are expected to be positively correlated with firm size (as overinvestment and empire building are easier to pursue in large firms, which in addition provide greater scope for extracting private benefits), while their relation with leverage and profitability are ex ante ambiguous. The risk of expropriation and the LUS' aversion to external control in pyramidal firms might inhibit debt financing, which in turn could be pursued for reputation building. As discussed above (Ferris, Kim and Kitsabunnarat, 2003; Friedman, Johnson and Mitton, 2003; Gopalan et al., 2007; Khanna and Yafeh, 2005, 2007; Byun et al., 2013; Buchuk et al., 2014), the debt financing version of the FAH are sustained by evidence showing that debt financing in pyramidal business groups is facilitated by the risk-sharing and co-insurance effects, which reduce their affiliates' default risk and debt costs. All these studies, however, acknowledge the relevance of the expropriation effect. For the EH, while pyramidal firms' large earnings may mean higher opportunities for cash-flow tunneling, their LUS can also exploit underperforming firms as a vehicle to extract large private benefits from the group. Relying on a FAH's possible implication, however, larger firms could raise funds more easily to finance the establishment of other ventures. Asset tangibility, which proxies for firms' collateral value, possibly reduces financial constraints and thus, according to the FAH, would have a negative relationship with pyramidal affiliation. The same effect may be envisaged from the EH's viewpoint, as tangible assets are more difficult to be diverted than intangibles and cash-flows. As regards age, the FAH predicts a negative correlation, with young firms being more prone to financial constraint and thus more likely to be owned through a pyramid. Contrariwise, the EH implies that pyramids correlate with old, mature, cash-cow firms.

Table 3 presents summary statistics for the independent variables used in the empirical model. We split variations into two components: inter-group, between variations and intra-group, within variations. As told above, fixed effects estimators may fail to be efficient if variation in a given variable stems mostly from variation between companies rather than from variation within companies. This is the case for the variables *d_non_vot*, *tangib*, *age* and *size*.

Table 3: Summary Statistics for the Control and Explanatory Variables

Variable		Mean	St. Dev.	Min	Max	Obs.	
pyramid	overall	0.1883	0.3910	0	1	N=	2422
	between		0.3644	0	1	n=	433
	within		0.1347	-0.6867	1.0633	T-bar=	5.5935
d_cash_flow_50	overall	0.4298	0.4952	0	1	N=	2422
	between		0.4486	0	1	n=	433
	within		0.2182	-0.4452	1.3048	T-bar=	5.5935
vot_right	overall	0.6887	0.2626	0.0510	1	N=	2422
	between		0.2464	0.0513	1	n=	433
	within		0.1168	0.1098	1.4551	T-bar=	5.5935
d_non_vot	overall	0.4414	0.4967	0	1	N=	2422
	between		0.4685	0	1	n=	433
	within		0.1492	-0.4336	1.3164	T-bar=	5.5935
d_novo_merc	overall	0.1742	0.3794	0	1	N=	2422
	between		0.4226	0	1	n=	433
	within		0.0990	-0.6829	0.7992	T-bar=	5.5935
d_family	overall	0.5186	0.4998	0	1	N	2422
	between		0.4692	0	1	n	433
	within		0.1791	-0.3564	1.3936	T-bar	5.5935
tangib	overall	0.3439	0.2328	6.75E-06	0.9903	N	2422
	between		0.2220	0.0001	0.9043	n	433
	within		0.0894	-0.3537	0.6832	T-bar	5.5935

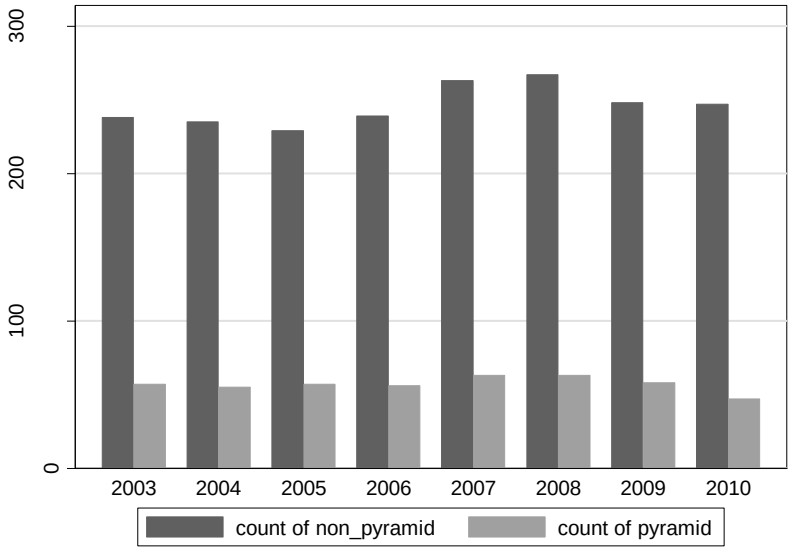
Variable		Mean	St. Dev.	Min	Max	Obs.	
age	overall	39.5735	28.0391	0	153	N	2422
	between		28.4886	1	153	n	433
	within		1.9883	35.4068	43.9735	T-bar	5.5935
size	overall	13.7150	2.0026	3.1781	20.2750	N	2422
	between		2.0071	6.5043	19.3561	n	433
	within		0.3832	10.1247	17.3053	T-bar	5.5935
roa_aj	overall	0.0432	0.8374	-17.323	23.4859	N	2422
	between		1.0820	-8.5182	18.6708	n	433
	within		0.4113	-11.002	7.8147	T-bar	5.5935
leverage	overall	5.5372	169.6461	0	8,555.286	N	2,564
	between		199.5055	0.0025	4,277.645	n	461
	within		119.9408	- 4,272	4,283.18	T-bar	5.5618

Statistics for the independent variables broken down between inter-group/between variations and intra-group/within variations. *d_novo_merc* is a variable dummy for being listed on the Novo Mercado; *d_cash_flow_50* is a variable dummy for the case when the largest ultimate shareholder's cash-flow rights is at least 50%; *vot_right* is the largest ultimate shareholder's participation in the firm's total voting rights; *d_non_vot* is the share of nonvoting shares in the total number of shares issued by the firm; *d_family* is a dummy variable for the firm having or not a family as the largest ultimate shareholder; *Tangib* is the ratio between fixed assets and total assets; *Age* is the firm's age in years; *Size* is the log of assets; *roa_aj* is the adjusted return on assets, measured as the net income plus financial expenditures less the tax shields on interest payments normalized by total assets; *leverage* is total liabilities over total assets.

Figures 1 and 2 display the evolution throughout the sample period of the number of firms owned through pyramidal ownership and non-pyramidal companies for all the sample firms and for firms listed on the NM,

respectively. Non-pyramidal firms predominate among both the whole set of listed firms and those listed on the NM.[6]

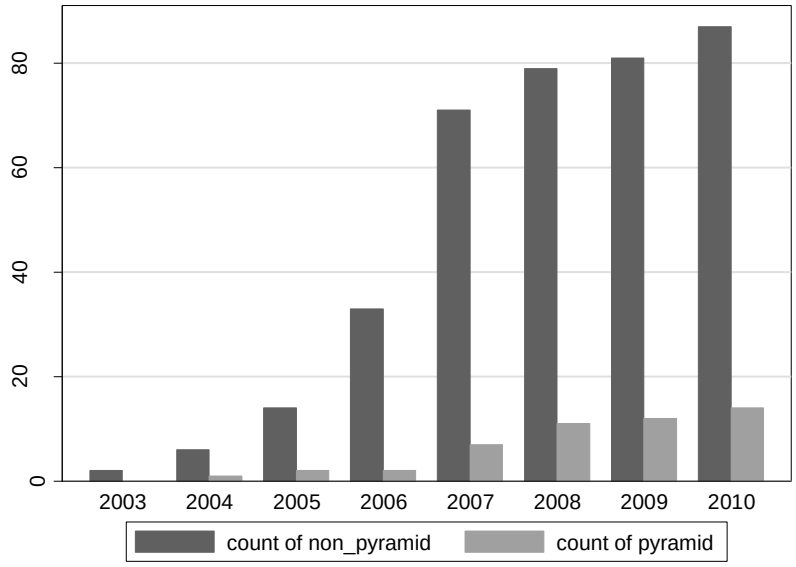
Figure 1: Evolution of the Number of Pyramidal and Non-Pyramidal Companies



Own calculation with data drawn from IAN and FR (CVM)

[6] The estimated fixed effects model takes into consideration only the observations related to firms that experienced at least one change from pyramidal to non-pyramidal ownership or vice versa.

Figure 2: Evolution of the Number of Pyramidal and Non-Pyramidal Companies Listed on the Novo Mercado



Own calculation with data drawn from IAN and FR (CVM)

Table 4 reports the distribution of the panel data observations according to the presence or absence of pyramidal ownership structures. For 1,966 (81.2%) of the 2,422 observations (firms-year), the LUS does not own the company via a pyramid, while for 456 (18.8%) the LUS does. The column "Between" does the same regarding firms: out of 433 sample companies over the period, 372 were never owned by pyramidal arrangements over the period, 95 were at least in one year, and 467 were or were not owned through pyramidal schemes. Thus, some companies were owned through a pyramidal arrangement in some but not all years. The "Within" column provides the percentage of the years in which a firm has a specified value for the variable "*pyramid*." This means that, conditional on a company having ever had "*pyramid*" valuing 0, 95.4% of its observations do not have pyramidal ownership schemes, while conditional on a firm ever having "*pyramid*" valuing 1, 82.4% of its observations keep such ownership scheme. Therefore, non-pyramidal companies appear to be relatively more stable. Total within measures the stability of the "*Pyramid*"

and represents the normalized weighted between average of the within percentages, that is, (372 × 95.36 + 95 × 82.39)/467 = 92.7%.

Table 4: Pyramidal Structure (%)

Pyramid	Overall		Between		Within
	Freq.	%	Freq.	%	%
No	1966	81.2	372	85.9	95.4
Yes	456	18.8	95	21.9	82.4
Total	2422	100	467	107.9	92.7

Own calculation with data drawn from IAN and FR (CVM); 433 firms

Table 5 shows that of the nearly 19% of the observations comprising pyramidal schemes around 33% (152 in 456) had a family as the LUS. Also noteworthy is the widespread prevalence, for both pyramidal and non-pyramidal companies, of largest ultimate shareholders holding more than 50% of total capital (

Table 6). Among the 456 observations in which the company is owned through a pyramidal scheme, 146 (32%) are companies where the LUS is entitled to more than 50% of the cash flow rights.

Table 5: Pyramidal Ownership Schemes when the LUS is a Family

Pyramidal structure	Family LUS		Total
	No	Yes	
No	862	1,104	1,966
Yes	304	152	456
Total	1,166	1,256	2,422

Own calculation with data drawn from IAN and FR (CVM)

Table 6: Pyramidal Ownership and LUS' Cash Flow Rights Above 50%

	Cash flow right above 50%		
Pyramidal structure	**No**	**Yes**	**Total**
No	1,071	895	1,966
Yes	310	146	456
Total	1,381	1,041	2,422

Own calculation with data drawn from IAN and FR (CVM);

If a controlling shareholder chooses to own a firm through a pyramidal scheme with the sole purpose of expropriating minority shareholders, one could expect that she would rely on this device only if the company would have reached the legal cap for issuing nonvoting shares. Table 7 presents data on pyramidal and non-pyramidal companies whose issuance of nonvoting shares is close to the legal cap (66.66%). Among the 456 observations representing companies with pyramidal ownership, 191 (41%) refer to companies that issued more than 50% of their corresponding capital as nonvoting shares. As shown in, the 49 companies listed on the Novo Mercado represent only 10.7% of the 456 observations referring to companies owned through pyramidal schemes, what may suggest that commitment to good governance practices refrains the building of supposedly expropriating pyramidal ownership structures.

Table 7: Pyramidal Companies and Nonvoting Share Issues over 50% of Total Capital

	Non voting shares above 50%		
Pyramidal structure	**No**	**Yes**	**Total**
No	1,088	878	1,966
Yes	265	191	456
Total	1,353	1,069	2,422

Own calculation with data drawn from IAN and FR (CVM)

Table 8: Pyramidal Ownership Schemes and Listing on the Novo Mercado

	Listed on the Novo Mercado		
Pyramidal structure	**No**	**Yes**	**Total**
No	1,593	373	1,966
Yes	407	49	456
Total	2,000	422	2,422

Own calculation with data drawn from IAN and FR (CVM)

As regards the composition of the sample pyramidal firms according to the categories of the largest ultimate shareholders, shareholders' agreements (39.3%) and families (32.4%) stand out, followed by foreign entities (12.9%) and government entities (6.9%), with the share for pension and mutual funds being less than 5%.

Table 9: Percentage Share in Pyramidal Firms of Firms' LUS Categories

Category	Share (%)
Shareholder agréments	39,3
Families	32,4
Foreign investors	12,9
Government	6,9
Pension funds	2,9
Mutual funds	1,3

3. RESULTS

Table 10 presents the results from the panel data estimation of the logit model using the fixed effects. The estimated odds ratio for the NM listing dummy variable of 0.04 indicates a much lower likelihood of a pyramidal structure for companies listed on the NM. This finding is consistent with those studies showing that institutional reforms promoting the improvement in corporate governance, in particular the suppression of dual-class shares, do not induce firms to build pyramidal arrangements (Lauterbach and Yafeh, 2011; Maury and Pajusteb, 2011). With respect to the influence of family control, the estimation of the odds ratio for its dummy (*d_family*) indicates that it is statistically non-significant, result which may stem from the relatively small number of Brazilian listed firms that both are family-controlled and, given our definition of pyramidal structure, have a publicly traded intermediate company in the indirect ownership chain. This finding is at odds with most of the literature on pyramidal ownership structures, which emphasizes their strong reliance on family control (e.g., Almeida et al., 2011; Attig, Fischer, and Gadhoum, 2004; Masulis et al., 2011). A host of studies underscore the specificities of family firms and the influence of family values on shaping businesses' organization and efficiency. More specifically, family firms tend to have long-term orientation, since families' intertemporal choices and actions are committed to maintain firms' control and continuity (Bertrand and Schoar, 2006; Lumpkin and Brigham, 2011). Villalonga and Amit (2010) provide evidence that both tunneling and propping are more likely to happen in family firms than in non-family firms, but while founding families provide a competitive edge to the firms where they retain control (characterized by smaller efficient scale and capital intensity, higher employee monitoring requirements, and longer investment horizons), non-founding family firms are prone to the use of dual-class shares and opportunistic behavior. In the same vein, Lien, Teng, and Li (2016) show that institutional reforms in Taiwan reduced the importance and the benefits of family control in firms' governance over the period 1996-2009, inducing governance-enhancing activism from domestic institutional investors and leading therefore to better corporate governance and performance. In particular, these reforms rendered positive the prior negative effect of controlling family's pyramidal ownership arrangements on firms' performance, probably due to the efficient external corporate governance brought to bear by domestic institutional investors.

Table 10: Estimation Results of the Fixed Effects Logit Model

Variable	*odds ratio*
d_novo_merc	0.0412**
d_cash_flow_50	0.1419**
vot_right	3.2294
d_non_vot	78.6355**
d_family	0.7358
Tangib	0.0913
Age	0.6203
Size	6.6472*
roa_aj	0.0086*
leverage	0.7401
dummy_year_1	0.0078
dummy_year_2	0.0050
dummy_year_3	0.0308
dummy_year_4	0.0810
dummy_year_5	0.2152
dummy_year_6	0.5106
N	222
Log likelihood	-55

Note: *d_novo_merc* is a variable dummy for being listed on the Novo Mercado; *d_cash_flow_50* is a variable dummy for the case when the largest ultimate shareholder's cash-flow rights is at least 50%; *vot_right* is the largest ultimate shareholder's participation in the firm's total voting rights; *d_non_vot* is the share of nonvoting shares in the total number of shares issued by the firm; *d_family* is a dummy variable for the firm having or not a family as the largest ultimate shareholder; *Tangib* is the ratio between fixed assets and total assets; *Age* is the firm's age in years; *Size* is the log of assets; *roa_aj* is the adjusted return on assets, measured as the net income plus financial expenditures less the tax shields on interest payments normalized by total assets; *leverage* is total liabilities over total assets; and *dummy_year_1* to *dummy_year_6* are dummy for the years 2003 to 2008, the reference years being 2009 and 2010.

The dummy for the LUS' cash-flow right exceeding 50% presents an odds ratio statistically significant and lower than 1, indicating that this variable is negatively correlated with the probability of being owned through a pyramid arrangement. This is in accordance with the EH, which argues that pyramids aim at achieving control without a commensurate capital stake. Also consistent with the EH, the dummy for companies issuing nonvoting shares over 50% of their total capital shows a very high OR, what means that controlling shareholders attempt to reach control with a low amount of investment in the firms' capital by primarily leading the company to issue nonvoting shares up to close the 66% legal cap, only when they resort to pyramidal schemes. The variables size and roa_aj are marginally statistically significant and the estimation suggests that large firms are much more likely to be owned through pyramids, as Attig, Fischer, and Gadhoum (2004) point out, while more profitable firms are much less likely to rely on them, perhaps as a result of tunnelling, as claimed by Bebchuk, Kraakman and Triantis (2000). LUS' voting rights and firms' asset tangibility, age and leverage turn out to be statistically non-significant.

4. Concluding Remarks

Until the mid-2000s, the view assigning the rationale for pyramidal ownership structures to the expropriation of minority shareholders predominated in the literature. The path-breaking work of Almeida and Wolfenzon (2006) gave rise to a new strand of research emphasizing the alternative interpretation that pyramids may be an efficient-enhancing reaction to financial market failures. According to this view, controlling families use cash flows from companies they already own to finance the purchase of a company or the establishment of a new one, investments which otherwise would not happen, as external financing would fall short.

Taking into account evidence pointing out that firms listed on the Novo Mercado, a premium segment of the São Paulo Stock Exchange that imposes governance requirements higher than those legally established, are indeed committed to better governance practices, this paper focused on the relation between listing on that segment and being affiliated to pyramidal business groups. We relied on hand-collected data from reports that public-traded companies are required to submit to the Brazilian capital market regulator (CVM) to build a novel ownership dataset. Since firms listed on the Novo Mercado are forbidden to issue nonvoting shares, controlling

shareholders might build pyramidal ownership arrangements as a strategy to leveraging voting power out of a modest capital stake. If firms listed on the Novo Mercado are forced to follow better governance practices and if pyramidal ownership structures are driven by expropriation, as the expropriation hypothesis advocates, those firms would not tend to adopt these type of ownership.

We do find that being listed on the Novo Mercado reduces the likelihood of the company being owned though a pyramidal arrangement, suggesting that this type of ownership structure may be associated to poor governance practices and large potential for expropriation of minority shareholders. Thus, our results are in accordance with the expropriation hypothesis, which Bebchuk, Kraakman, and Triantis (2000) and La Porta et al. (2002) propose, and for which Aldrighi and Postali (2011) provide some evidence.

These findings should evidently be viewed in the context of the limitations coming from the dataset and the methodology employed. Some potential endogeneity problems posed by reverse causality, omitted variable and measurement errors may bias and make inconsistent parameter estimates, throwing doubts on the inferences. For example, the decision to join the Novo Mercado may be correlated to unobservable characteristics that affect both that and the decision to create a pyramid. Given the dataset constraints, this issue could not be properly addressed in this paper. Finding good instruments to control for such endogeneity problems is a challenge left for future research. Also, while this paper, in accordance with the literature, has focused on pyramidal firms controlled by families, the role of other categories of LUS in pyramidal structures is an underexplored topic that deserves be addressed in future research.

Notwithstanding these limitations, we believe that our findings shed some light on the rationale underlying pyramidal ownership structures in the Brazilian corporate context, which seems to be different from other countries', such as South Korea and Chile, for which the evidence suggests that the financing advantages appear to be the primary motivation for these ownership schemes. Pointing out a possible relevant cost underlying pyramidal ownership arrangements, the results here presented have regulatory implications that inevitably raise the question of whether some type of regulation to rein them might be warranted.

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