# PYRAMIDAL OWNERSHIP IN ECUADORIAN BUSINESS GROUPS

A Dissertation

by

MARIA L. GRANDA KUFFO

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2009

Major Subject: Economics

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# ABSTRACT

Pyramidal Ownership in Ecuadorian Business Groups.

(May 2009)

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Chair of Advisory Committee: Dr. Steve Wiggins

The purpose of this research is to explore the motivation of business group firms to adopt pyramidal ownership structures. The traditional approach claims that pyramids are useful in tunneling resources to other affiliates by transferring value to firms with high cash flow rights of controlling shareholders. Using a unique dataset of 7,180 Ecuadorian firms, I analyze the transmission of profits' shocks among group firms to assess the existence and the amount of tunneling. The comprehensive ownership information allows me to identify pyramidal and horizontally owned group firms separately and better understand the nature of their ownership structure. The results provide support for the existence of tunneling in Ecuadorian business groups. About 70% of the profits of the average group firm are transferred to another affiliate, although only half of this money shows up on its books.

An alternative explanation for the flow of money among group firms is the existence of internal capital markets to substitute for imperfections in the external market. I test this hypothesis by comparing the impact of cash flow availability in the investment decision of group firms with that of stand-alone firms. Group firms' cash flow to investment sensitivity appears to be only half of the value for comparable stand-alone firms. Moreover, group liquidity is also a determinant of the average group firm's investment, especially for pyramidal firms.

The analysis sheds light on the nature of business groups in Latin America, their ownership patterns, and their resource allocation decisions.

# DEDICATION

This work is dedicated to my parents, Esther and Luis, who always encouraged me to pursue my dreams.

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# CHAPTER I

# INTRODUCTION

Business groups are corporate organizations common to many economies. They frequently adopt pyramidal ownership structures, which are complex networks of shareholding among firms that belong to the same family or related party. The question I will address in this research project regards the motivation of firms to organize as pyramids. Specifically, I will assess the extent to which firms in business groups use these structures to transfer value from minority to controlling shareholders, or to provide financing through an internal market.

The role that business groups play, particularly for the case of developing economies, has attracted many researchers to study these organizations. A wide range of questions have been addressed, including the origin of business groups, the differences in performance compared to stand-alone firms, the incentives that groups shareholders face, and the impact that they cause in the markets they operate. One particular question that arises from the empirical grounds concerns the commonly observed pyramidal ownership structure. Why are these complicated structures helpful to stockholders?

Several hypotheses have emerged to explain the existence of pyramids. Among the most commonly cited are the tunneling hypothesis and the internal capital markets hypothesis. They both predict the existence of money flows among pyramidal firms but

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This dissertation follows the style of *The Quarterly Journal of Economics*.

differ in the nature of the shareholders' motivation and hence, in the economic implications. Additionally, the co-insurance and the tax avoidance hypotheses are related explanations that are out of the scope of this study. Each of these theories has received attention in recent studies, which have provided theoretical, empirical, and anecdotal support for them.

The tunneling hypothesis has been widely studied under the argument of separation between ownership and control. According to this hypothesis, business groups use pyramids to gain control of numerous companies with a reduced level of ownership and cash flow rights. A pyramidal structure generates incentives for the controlling shareholders to redirect money from firms where their cash flow rights are low to those with higher ones. This practice is called tunneling and is considered illegal in many countries because of the agency problems it generates.

An alternative view of the existence of pyramids concerns the use of internal capital markets, originated by the severe limitations in developing economies, particularly in the access to external capital markets and the elevated costs of credit. Business groups are able to overcome these difficulties through the reallocation of resources among affiliated firms. That is, group firms may be providing funding to better projects, resulting in a more efficient use of resources while at the same time avoiding information problems that are present in the capital market. Stand-alone firms are not able to take advantage of this benefit.

The co-insurance hypothesis is somewhat related to the tunneling hypothesis, but in the former, the main motivation for the flow of resources through a pyramid is to

temporarily bail out firms by injecting capital to prevent them from going bankrupt. This practice is often referred as "propping out" and may be beneficial to minority shareholders, unlike tunneling, because controlling shareholders transfer value from presumably sound projects to bad prospects. The final theory, the tax avoidance hypothesis, has received little attention in the corporate governance literature. According to this hypothesis, the pyramidal structure allows groups to shift income or assets out of high tax jurisdictions into low tax jurisdictions, such as tax havens.

This paper focuses on the study of the tunneling hypothesis and the internal capital market hypothesis for the case of Ecuadorian business groups. While I do not reject the validity of the tunneling hypothesis and its implications, several facts point out the relevance of the internal capital markets hypothesis for this case. First, capital market imperfections affect the availability and costs of financing in this developing economy. Second, as a result of underdeveloped stock markets firms have to rely on alternatives sources of funding such as debt or internal resources to finance their projects. Finally the internal capital markets view is consistent with group ownership patterns and incentives in Ecuadorian firms.

This research contributes to the business groups' literature in two key aspects. First, the richness of the ownership data allows me to test several hypotheses with more accuracy than before. I am able to separate group firms that belong to pyramids from those that do not. Most of the previous work has assumed that all firms in groups were organized as pyramids, while this may not be the case.[1] Moreover, by identifying the

[1] In my data, about 50% of the set of group firms belong to pyramids.

exact position of firms in the pyramid I can test for the existence of tunneling with this observed ranking instead of using family cash flow rights to proxy for firm's level. Second, a direct test of the internal capital markets hypothesis is constructed by taking advantage of the variation in stand-alone, group, and pyramidal firms' liquidity and its impact in the decision to invest. Additionally, I evaluate whether or not business group and pyramidal ownership observed patterns are consistent with the theoretical predictions of Almeida and Wolfenzon (2006).

The economy under study is Ecuador. This small open economy has gone through recent major economical and political reforms. Following a financial crisis that resulted in hyperinflation, in 2000 the economy abandoned its domestic currency to officially adopt the US dollar as a mean of exchange. These changes have affected the environment where companies operate as well as the incentives they face. Additionally, political instability has not been helpful to the economic conditions, particularly in the financial market. Business group firms represent a large fraction of the economy[2] and have drawn attention, due to the allegedly close connections of financial institutions and politicians. These links have even been argued as a major cause of the banking sector crisis, making it crucial to understand the role groups play in this economy. Additionally, the Ecuadorian Internal Revenue Service developed a list of business groups and its associates with the goal of tracing tax avoidance among these firms.

[2] Morck and Yeung (2003) claim that most large firms in Ecuador and other countries are organized as business groups controlled by a few wealthy families. "Firms controlled by the Noboa family provide the incomes of about three million of Ecuador's eleven million people. The family's banana operations alone, which account for 40% of Ecuador's banana exports, generate about 5% of the country's GDP." From De Cordoba, J. Heirs battle over empire in Ecuador. Wall Street Journal, December 20, 1995.

Although this work does not study the tax avoidance hypothesis directly, the current analysis could shed some light on the issue, especially for policy design purposes.

While it is difficult to empirically distinguish among the different hypotheses that explain pyramids, their relevance is irrefutable. Understanding the motivation for the flow of resources within a business group is helpful to determine its economic implications. Tunneling is a major concern for minority shareholders who are exposed to losses in shares' value, reducing the incentives to invest and dampening the development of capital markets. Another consequence of pyramids is that they facilitate the entrenchment of families or controlling shareholders in the management. In contrast, business groups and pyramids may provide their affiliates with an internal capital market that is more efficient than the external. The main advantage of this implication is a reduction in information asymmetries and transaction costs for the firms. In each case the policy implications would be different.[3] Nevertheless, social welfare implications of pyramids are hard to assess.

I rely on the methodology of Bertrand et al. (2002), who track the flow of money through a pyramid by generating shocks and analyzing their transmission through a pyramid. The hypotheses are constructed in terms of certain flow patterns that should be observed if the motivation for the flow of resources was tunneling. Mainly, they argue that resources flow from the bottom to the top of the pyramid, under the assumption that controlling shareholders rank firms in the pyramid according to their level of cash flow

[3] Khanna and Yafeh (2007) discuss whether business groups should be considered paragons or parasites according to these two disputing hypotheses.

rights. I apply this method to test for the existence of tunneling using a dataset of Ecuadorian firms.

To provide some insights for the internal capital markets hypothesis I use the investment to cash flow relationship, which is a widely used empirical device in the field of corporate finance. The original purpose of this tool is to test for the existence of financial constraints as in Fazzari, Hubbard and Petersen (1987) and Kaplan and Zingales (1997). The application to business groups focuses on the assessment of the impact of the firm's own liquidity as well as the liquidity of group members in the investment decisions of this firm.

The results provide some support for the tunneling hypothesis. On average, the profits of group firms respond less to a shock than the profits of comparable stand-alone firms, resulting in about only 17% of the expected change in profits showing up in the books for group members. Moreover, group firms appear to significantly respond to the shock of other members of the same group, although some profits seem to be dissipated in the process. This result supports both hypotheses without being able to separately identify the effects. The results for the internal capital markets hypothesis provide support for a differential sensitivity of investment to cash flow between group and stand-alone firms. That is, financial constraints may exist in the case of the Ecuadorian economy encouraging the development of internal capital markets within business groups in search of a more efficient capital allocation.

The document is organized as follows. The next chapter presents a literature review on business groups and pyramidal ownership. Chapter III presents some

background information on Ecuadorian business groups and describes the dataset. Chapter IV discusses some methodological issues and the empirical strategy I follow to investigate the tunneling hypothesis, followed by the results with a special discussion of the endogeneity of group ownership. Chapter V provides support for the alternative explanation, the internal capital markets hypothesis followed by some concluding remarks.

# CHAPTER II

# LITERATURE REVIEW

In a seminal paper, Leff (1978) defines a business group as "a group of companies that does business in different markets under common administrative or financial control, whose members are linked by relations of interpersonal trust on the bases of similar personal, ethnic or commercial background". The importance of business groups around the world has been noticed under a different set of questions that arise, including agency problems (Jensen (1986), Claessens et al. (2000)); monopoly power and entry (Feenstra et al. (2003), Cestone and Fumagalli (2005)); macroeconomic implications and relation to financial crisis (Mitton (2002), Lemmon and Lins (2003), Morck, Wolfenzon, and Yeung (2005)); tax policy (Morck (2004)); political connections (Fisman (2001), Johnson and Mitton (2003)).

The ownership structure adopted by business groups is believed to play a key role on the performance of these organizations[4]. At the same time, there are different motivations for the complex ownership patterns and legal arrangements that groups follow, such as pyramids and cross holdings. For instance, Claessens and Tzioumis (2006) argue that the ownership structure is linked to the performance and development of business groups through the legal foundations and institutional framework of the country, and more specifically, of the corporate governance. They also discuss the importance of the high levels of ownership concentration leading to capital allocation

[4] Additionally, recent literature acknowledges and assesses the possibility that group firms' expected value maybe determining the ownership patterns of business groups. See for instance Almeida et al. (2008).

distortions that permit families to influence the development of public policy and institutions.

Morck et al. (2004) show the evolution of large pyramidal corporate groups controlled by wealthy families into widely held firms and the reversal to pyramidal and highly concentrated ownership in Canada along the 20th century. They suggest that institutional factors must have caused this phenomena and favor the literature that argues the ability of business groups to influence government policy design.

One of the most commonly argued implication of business groups ownership structure is the transfer of resources among group firms. This is the focus of this research, particularly under the case of pyramidal ownership structures. Specifically I address the two hypotheses that have led the discussion: the tunneling hypothesis and the internal capital market hypothesis.

The tunneling hypothesis is the more traditional view, based on the idea that pyramids are instruments for the separation of ownership and control. It poses an agency problem between controlling shareholders (usually a family[5]) and minority shareholders, since the former is able to control all the firms in the pyramid without being entitled to most of these firms' cash flow. In a weak legal and institutional system, there is a great

[5] There is an extensive literature on family firms. See for instance a compilation in the Handbook of Research on Family Business, like Westhead and Howorth (2006), and Poutziouris (2006), who empirically document the relation between family dynamics and family firms' performance. Particular attention has been put on the effects of founder's control versus heirs' control, the importance of succession issues, among others. Also on this issue, Villalonga and Amit (2006) claim that ownership structure determines firm performance and value. They find that family ownership creates value only when the founder serves as CEO of the family firm. When descendants serve as CEOs, firm value is destroyed. They derive several conclusions about the costs of different principal-agent relationships in these firms. These results apply to family business groups; although this is not the focus of this research.

risk of expropriation of minority shareholders, since the value of a firm is diminished by the transfer of income or assets towards firms in which families have more at stake. There is a growing stream of literature that supports this hypothesis.

Bertrand et al. (2002) develop a methodology to track the amount of tunneling through a pyramid. They find evidence that supports the existence of tunneling in Indian business groups, and describe certain flow patterns that profits follow. They assess the response of pyramidal firms' earnings to industry shocks, and conclude that business group firms' under-response is the amount of tunneling. On average, the increase in profits in response to a shock is much lower for group firms; in the case of the Indian economy about 30% of the profits placed into a group firm are dissipated. They argue that money flows from firms located in the base of the pyramid since these firms' earnings appear to be less sensitive to shocks in their industries. Also, tunneling appears to take place mostly through the non-operating components of profits. In conclusion, the article proposes a basic methodology that is used here as the test for tunneling in the Ecuadorian economy. It will be discussed in more detail in Chapter IV.

Following a different approach, Bae, Kang and Kim (2002) find evidence of tunneling in a sample of Korean business group firms. They analyze the changes in stock prices for *chaebol* affiliated firms at the time a group member makes an acquisition. They find that while the value of the acquiring firm drops, the group as a whole benefit from the merger, by an increase in the value of other group firms and the controlling shareholders' wealth. While the structure of Indian groups differs from that of Korean *chaebols*, they are still able to find support for the tunneling hypothesis.

In a similar fashion Baek, Kang and Lee (2006) examine in more detail the channels through which tunneling occurs. They focus on the financing decisions rather than on the investment decisions of group firms. They analyze the pricing and valuation effect of equity-linked private security offerings by Korean firms from 1989 to 2000, establishing a relation between firm's value and tunneling incentives. They conclude that inefficient financing decisions are made. For instance, *chaebols* could issue poor performing firms securities at inflated prices and have better performing firms in the same group acquire them.

Johnson, La Porta, Lopez de Silanes and Shleifer (2000) present anecdotal evidence of tunneling in Europe. They focus in the legal and financial development aspects of tunneling. According to their findings tunneling occurs not only in developing economies but also in economies with effective law enforcement. They conclude that groups make use of several mechanisms under legal arrangements in order to benefit the controlling party and destroying firm value for minority shareholders.

The alternative hypothesis under study suggests the existence of pyramids as a mechanism that facilitates the use of internal capital markets, in contrast with the traditional view. That is, while tunneling creates a serious friction that affects the efficient functioning of the capital market, the use of the internal capital market may lead to an efficiency improvement when the external capital market fails. This happens through the allocation of group resources to other members, adding value to the firm and the group. This possibility gives business group firms an advantage over stand-alone firms in terms of reduced transaction costs and information asymmetries.

The internal capital market hypothesis stresses the importance of certain organizations such as business groups' appearance as a response to a weak institutional environment; see for instance Khanna and Palepu (2000). They propose corporate groups as a second best solution in economies whose product, labor, and capital markets are underdeveloped and inefficient. Substantial evidence of this fact has been provided in the case of developing economies. It is often argued that this advantage is one of the sources of better performance of group firms when compared to stand-alone firms. However, critics of this assumption[6] claim that the use of internal capital markets may be even more harmful to the economy as a whole. According to this view, groups act in their own interest and, in some cases, their business decision making process fits family purposes more than business objectives. In such cases, they may damage minority shareholders, new entrepreneurs, and society in general.

To empirically test this hypothesis, a general tool is available from the corporate finance literature. The investment to cash flow sensitivity relationship has been widely used to assess the existence of financial constraints. The seminal paper by Fazzari, Hubbard, and Petersen (1987) tests the pecking order theory of financing costs[7], which states that liquidity is a determinant of a firm's investment in the absence of perfect capital markets. They argue that the investment decision of financially constrained firms[8] is sensitive to the availability of their own cash flow. In contrast, non-financially constrained firms show significantly lower or no sensitivity to cash flow changes. This

[6] See for example Morck et al. (2004).
[7] Originally introduced by Modigliani and Miller (1958).
[8] In the finance literature financially constrained firms are those with permanent higher costs of, and restricted access to external financing.

study highlights the implications of the differential costs of external vs. internal finance, such as the underinvestment of firms that have no access to internal finance.

Kaplan and Zingales (1997) develop a critique of Fazzari et al. arguing that their definition of financially constrained firms, which is based on dividend payment policy, is flawed. They claim that the criteria that Fazzari et al. use to define the subsamples are not adequate measures of financial constraint. They redefine the subsamples according to the availability and demand for funds of the firms and find results contradicting those of Fazzari.

Following these studies, several attempts have been made to assess the importance of financial constraints for real variables. For instance, Lamont (1997) analyzes the investment decision of non-oil subsidiaries of oil companies. He uses an exogenous shock that decreased oil price to take care of the potential endogeneity of liquidity in the investment equation. The results show that oil companies reduced the investment in non-oil division compared to the median industry investment, implying that before the shock they were financed by more profitable units of the company. These results support the existence of internal capital markets.

Similarly, Shin and Stulz (1998) assess the efficiency of internal capital markets with a sample of Compustat firms' segments[9]. They assume that if the internal capital market functions perfectly, then investment by a segment in a diversified firm should depend only on its investment opportunities, not on its cash flow, and only firm-level cash flow should matter. They find evidence that the internal capital market is active but

[9] This introduces a difficulty in computing Tobin's q to measure investment opportunities for segments, since this variable is usually available at the firm level.

imperfect. Basically, investment by a segment of a diversified firm depends on the cash flow of the firm's other segments, but less than on its own cash flow. The sensitivity of a segment's investment to the cash flow of other segments does not depend on whether its investment opportunities are better than those of the firm's other segments, suggesting that resource allocation is inefficient.

Business group firms permit an analysis of the existence of internal capital markets with an advantage over the use of firms' segments. Since business groups are related through ownership and control, they can be defined a priori as a less financially constrained segment than stand-alone firms in the economy, due to the access of group members to the cash flow and assets of other firms in the group. A few studies have been developed on the basis of this assumption.

Hoshi, Kashyap, and Scharfstein (1991) follow this strategy in an application to business groups in Japan. They define a business group as the set of firms that have close financial ties to banks, who are presumably better informed about these firms. They argue that in the absence of information problems, liquidity should not matter for corporate investment decisions. Their main finding is that investment of independent firms has a high and significant sensitivity to liquidity and production, whereas for group affiliated firms this coefficient is small and insignificant. They are able to control for Tobin's average q, as a proxy for investment opportunities, in the specified equation and find a small but significant effect on investment. This evidence provides support for the view that capital market imperfections affect real variables: for financially constrained

firms, an increase in current profits and liquidity has a positive impact on investment and output.

Shin and Park (2003) replicate this study for Korean *chaebols* and find evidence consistent with the internal capital markets hypothesis. They also find that investment for *chaebol* firms is related to growth opportunities, while this does not hold for non-*chaebol* firms. They conclude that the internal capital markets in *chaebol*s reduce the existing financing constraints of these group firms. However, the assessment of efficiency is not positive; that is, internal capital markets do not necessarily improve allocation efficiency.

A theoretical model that explains the emergence of pyramids and supports to some extent the internal capital markets hypothesis is developed in Almeida and Wolfenzon (2006). Their research contributes to the business groups literature in which most of the work has been empirical, providing a framework for a more formal analysis. At odds with the traditional argument that pyramids are a device to separate ownership and control, these authors argue that pyramids are used to allow the family to maximize its internal sources of financing and to share the security benefits of new firms. The model analyzes the joint decision to set up a new firm and whether to place it in a pyramid or to keep it as a direct holding. They claim that low performance in group firms is not driven by pyramidal ownership, but is due instead to a selection effect. That is, families choose to place firms that have lower expected returns and higher capital requirements in pyramids. They present several arguments on the role of business groups and pyramids and review the existing literature that supports them.

An empirical application of this model is Almeida et al. (2008). They analyze the evolution and determinants of Korean group ownership, instead of taking group ownership as exogenously given. They also propose new metrics of ownership structure, especially for the treatment of complex arrangements such as cross-holdings and central firms in a group. They conclude that ownership structure can not be considered exogenous as it is strategically chosen by the controlling family to match its objectives. Moreover, pyramids are formed when families set up firms that have low profitability and high capital requirements. In contrast, families decide to directly own firms (horizontal structure) when they are expected to be more profitable and have lower capital requirements. They also find that the selection of less profitable firms into pyramids causes the group's central firms to trade at a discount relative to other public group firms.

As just presented, the literature on pyramidal ownership has been mostly concentrated in the empirical study of Asian and European countries, while scarce evidence is available for the case of Latin American economies. This research contributes to the literature on business groups and their motivation to form corporate pyramids. I attempt to disentangle the relevance of two competing hypothesis with a new and more comprehensive dataset. The application to the case of a developing economy that recently faced a profound crisis and a significant switch in monetary regime sheds light on the role of capital market imperfections and their link to business groups in this context.

# CHAPTER III

# DATA AND BACKGROUND

## *Ecuadorian business groups*

Several stylized facts of business groups around the world apply to the case of Ecuadorian groups. One of the most remarkable is the predominance of family firms, which have high concentration in ownership[10] and extensive control and management of firms.[11] They usually form complex ownership structures such as crossholdings and pyramids in their groups. Some statistics that show these features are presented in the following section.

In addition, especially in the case of small countries, groups usually hold a major share of the economy and have significant connections to the government and policy makers. This is the most frequent issue that motivates the discussion of Ecuadorian groups, for which mostly anecdotal evidence has been presented. A common explanation that fits the phenomenon of business groups in Ecuador is described by Morck (2005). Different institutions in different countries are the product of customs, cultures and traditions. The absence of sound institutions that protect property rights, enforce

[10] According to Haber (2002) concentrated ownership is very common in Latin American economies as a byproduct of French law.

[11] Family in the management is an issue that has been widely analyzed in the literature. See for instance Claessens et al. (2000) for the case of 9 East Asian economies; Faccio and Lang (2002) for the case of 13 Western European economies. Also, there is a potential impact on the firm value due to the allocation of family members in the management as analyzed in Villalonga and Amit (2006).

agreements, and encourage the payment of taxes leads to the proliferation of oligarchic institutions.[12] This situation applies to the typical Latin American country.

For the case of Ecuador, Arosemena (2001) argues that economic uncertainty and instability dampen the ability of individuals and firms to trust institutions, resulting in the use of alternative means to protect their investments. Such alternative means include the formation of business groups and the use of complicated ownership schemes in search of legal protection.

A few years ago, the Ecuadorian Internal Revenue Service started a program to identify business groups and their affiliates, separating them from other corporate taxpayers. The purpose of this project is to optimize tax collection by fighting tax avoidance in business groups. They define 17 major business groups in 2003 and added 25 additional groups to the list in 2006. The research unit in charge of the identification made use of financial statements, as well as trade records for each of the firms (imports and exports) to establish the links among them. They apply the following definition of business groups: "a set of natural or legal persons such that, through any kind of connection direct or indirect, are able to exert control over the economic activity of related companies."[13]

The process of identifying the groups followed several stages. First, a root family name and the most representative firm(s) in the hands of that family were selected. In the first level, individuals and companies with ownership in this root company were

[12] Additionally Morck (2005) argues that "the governance of most economic activity is entrusted to wealthy oligarchs who use the state to protect their interests, and most of the population lives without meaningful property rights or extensive public goods".

[13] This definition fits the standard use of the tem in the literature. Source: IRS "Grupos Economicos" (2008).

identified, as well as other companies with the same family members as shareholders. In the second level, several individuals or companies with direct or indirect ownership greater than 50% in these and related companies were identified. Finally, other related parties such as individuals with strong family ties or companies with important economic interdependence (clients, suppliers, exports, imports) were identified. The final list of business group firms includes 1,163 companies.

The dataset I use for the analysis consists of financial and ownership information on Ecuadorian companies from 2000 to 2005. It is provided by *Superintendencia de Compañías*, which is a government supervision agency for private companies in Ecuador. The relevant sample includes 37,899 firm-year observations for 6,559 stand-alone and 621 group firms. Some details on data management are discussed in Appendix A.

Most of the analysis in the area of business groups and pyramids relies on the assumption that all firms in business groups are organized as pyramids. The evidence presented here shows that this is not necessarily the case for the Ecuadorian economy.

I first make the empirical distinction between a business group and a pyramid. In this paper I follow the definition made by the IRS and previous literature; a business group is a set of firms that are related by common ownership (and control). The family, which is considered the controlling shareholder, can own firms directly or indirectly, through other firms that belong to them. These ownership “connections” among group firms allow the formation of pyramids. That is, a pyramid is formed when two (or more) related firms have holdings on another. A horizontal structure is the case in which a

family member or several family members directly hold shares of the firm. A cross-holding is a situation in which two different firms own shares of each other at the same time.

Different ownership structures appear as a result; groups will have pyramidal ownership structures, others will use more horizontal structures, or a mix. A pair of simple examples of group structures is presented in Appendix B, along with an example of an actual pyramid in a certain Ecuadorian business group.

Because of the richness in ownership data I am able to distinguish pyramidal and non-pyramidal group firms.[14] That is, I constructed the actual pyramids and classified according to their observed position or ranking.[15] There is a wide range of ownership structures available in this case. Specifically, about 50% of the companies are pyramidal while the remainder is strictly horizontally owned by the family, as is discussed in the next section. The average number of firms per group is 15, while the average number of firms per pyramid is 6. In conclusion, a substantial amount of variation within each group in terms of ownership arrangements is observed.

***Data and statistics***

To better understand the differences that arise from the ownership structure I first compare group versus stand-alone companies. They are characterized in terms of key features that are relevant for the analysis. Later on, a similar comparison for group firms,

[14] Unfortunately the ownership information is only available at the moment for the last year of my panel observations. That is, no variation in ownership is observed. I could argue that no significant changes occurred in the relevant period.

[15] The classification of firms as pyramidal was made on the basis of the ownership information. The position or rank assigned to each firm is the directly observed to simplify the analysis.

pyramid and non-pyramid, is presented. This description allows me to identify key differences among each set of firms and gain better knowledge of their standing in the economy.

Table 1 presents the statistics for the relevant sample of group and non-group firms separately. There are important size differences between group and stand-alone firms. The average value of assets for group firms is about seven times the assets of an stand-alone firm. A similar relation is found in terms of firm sales. This is a common feature of business groups.

There is also a remarkable difference in capital expenditures. An average group firm seems to invest about six times more than a comparable non-group firm. On the other side, rates of return on assets reveal small but significant differences in profitability. The average rate of return for a group firm seems to be lower than the comparable stand-alone firm. This feature provides evidence for the existence of flows among group firms[16]. Additionally, group firms are on average 5 years older than stand-alone firms. Mean comparison tests between these two groups confirm significant differences for all of the variables, except for the average sales growth.

[16] This fact is more consistent with the tunneling hypothesis, since firms lose value when expropriation of minority shareholders takes place. On the other hand, internal capital markets should allocate resources to the most profitable projects. The related co-insurance hypothesis argues that poor performing group firms may also be subsidized by the group's "cash cows". Hence, on average returns on assets may be lower for the group affiliated.

**Table 1**

**Statistics for the relevant sample**

| | *All* | *Stand-alone* | *Group* |
|---|---|---|---|
| **Assets*** | 1,339 | 890 | 5,847 |
| | (6,642) | (4,249) | (16,800) |
| **EBIDTA*** | 99 | 66 | 426 |
| | (1,022) | (735) | (2,444) |
| **Sales*** | 1,757 | 1,223 | 7,575 |
| | (9,624) | 5,795) | (26,400) |
| **Investment*** | 352 | 237 | 1,394 |
| | (2,687) | (1,674) | (6,803) |
| **Cash Flow*** | 93 | 63 | 370 |
| | (1,192) | (796) | (2,927) |
| **ROA*** | 0.062 | 0.063 | 0.051 |
| | (0.162) | (0.164) | (0.142) |
| **Sales Growth** | 0.190 | 0.194 | 0.152 |
| | (0.982) | (0.994) | (0.859) |
| **Age*** | 16.240 | 15.740 | 21.254 |
| | (11.243) | (10.858) | (13.578) |
| **Capital intensity*** | 10.990 | 10.770 | 13.731 |
| | (15.076) | (14.897) | (16.920) |
| **Ownership Concentration*** | 6,502 | 6,487 | 6,660 |
| **(HHI)** | (2,995) | (2,985) | (3,086) |
| **Off-shore Dummy*** | 0.118 | 0.086 | 0.456 |
| | (0.323) | (0.281) | (0.498) |
| **Off-shore Shareholding*** | 0.079 | 0.054 | 0.342 |
| | (0.246) | (0.205) | (0.426) |
| **Observations** | 37,899 | 34,464 | 3,435 |
| **Firms** | 7,180 | 6,559 | 621 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005. All monetary variables are expressed in thousands of dollars.
b. Standard Deviations are in parentheses
c. * indicates Mean comparison test: Significant at 1%

I also include a measure of capital intensity that accounts for potential differences in industry operation and use of capital inputs for group and stand-alone firms. The ratio reveals a larger relative use of capital for business groups. One

interpretation for this difference could be the selection of groups firms into certain industries. Although this is not the focus of this research, there is one stream of literature that deals with diversification of business groups (Khanna and Ghemawat (1998), Khanna and Palepu(2000)). A related issue is an implication of the internal capital markets hypothesis. In the presence of imperfect capital markets, due to presumably higher cash flow availability and lower costs of capital, group firms may tend to overinvest. In any case, the capital intensity measure might play a bigger role in pyramid formation than in group formation.

To gain a rough idea of ownership concentration in Ecuadorian firms I compute the Herfindahl-Hirschman index that confirms a high level of ownership concentration in this economy with an average value of 6,500. It is worth noticing the small but significant difference in this measure for group and stand-alone firms.

Finally, I identify the presence of shareholders that are established in off-shore jurisdictions. This feature is summarized by two variables. The first is an indicator variable for the presence of off-shore shareholders in the firm and the second is the total share held by this type of holders in the firm. The observed presence of many off-shore locations among the firms' shareholders' declared nationality allows me to construct the variables[17]. About 46% of the group firms have at least one shareholder in an off-shore jurisdiction contrasting with the 9% that represents non-group firms. Their presence is also associated with search for legal protection and tax avoidance, but somehow groups firms are more involved in this type of ownership practice.

[17] The list of fiscal paradises was obtained from the Organization for Economic Cooperation and Development (OECD) cooperative and uncooperative tax havens.

In summary, there are significant differences between group-affiliated and stand-alone firms in this economy. As well financial performance and ownership patterns differ for these two groups of firms. However, the ownership structure may play a bigger role among group firms.

The next question to explore regards the determinants for pyramidal ownership within a group. Are the firms chosen by the family to be placed in a pyramid different than non-pyramidal group firms? Table 2 presents the statistics on horizontally owned and pyramidal firms. As mentioned earlier, the proportion of group firms in pyramids is similar to the proportion that is horizontally owned.

According to these figures, pyramidal firms are bigger on average; their assets more than double those of non-pyramidal firms. The rate of return on assets is not significantly different from that of non-pyramid firms, contrasting with the prediction of Almeida and Wolfenzon (2006) model in which families choose to place firms with lower expected returns in pyramids. Another prediction in Almeida and Wolfenzon's model is that pyramids develop over time; hence, younger firms are found in pyramids. However, in my dataset pyramidal firms are on average three years older than non-pyramidal firms.

**Table 2**

**Pyramidal firm's characterization**

| | *Non-pyramidal* | *Pyramid* |
|---|---|---|
| **Assets*** | 3,537 | 8,108 |
| | (13,600) | (19,200) |
| **EBIDTA*** | 195 | 651 |
| | (1,751) | (2,953) |
| **Sales*** | 4,171 | 10,800 |
| | (15,600) | (33,200) |
| **Investment*** | 648 | 2,033 |
| | (6,438) | (7,053) |
| **Cash Flow*** | 199 | 606 |
| | (2,069) | (3,056) |
| **ROA** | 0.047 | 0.056 |
| | (0.144) | (0.139) |
| **Investment Rate** | 0.961 | 1.075 |
| | (1.251) | (1.370) |
| **Sales Growth** | 0.135 | 0.152 |
| | (0.873) | (0.809) |
| **Age*** | 19.666 | 22.809 |
| | (11.751) | (14.997) |
| **Capital Intensity*** | 10.850 | 14.469 |
| | (14.999) | (16.524) |
| **Direct family share*** | 0.287 | 0.173 |
| | (0.396) | (0.314) |
| **Pyramid share*** | 0.000 | 0.440 |
| | (0.000) | (0.436) |
| **Total family share*** | 0.287 | 0.613 |
| | (0.396) | (0.400) |
| **Observations** | 1,699 | 1,736 |
| **Firms** | 311 | 310 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005. All monetary variables are expressed in thousands of dollars.
b. Standard Deviations are in parentheses
c. * indicates Mean comparison test: Significant at 1%

This model also predicts that firms with higher capital requirements are placed in pyramids, a fact supported in this case because pyramidal firms appear to be more capital intensive than horizontally owned firms and to invest significantly more. It seems

like the lower cost of investment, since it is shared with other external shareholders, generates an incentive to overinvest in pyramidal firms. This issue illustrates some negative efficiency implications of pyramids.

An additional feature that is worth noting is the difference in average family ownership[18] for the two categories. The direct family ownership for group firms is 23%, consistent with similar evidence for developed and developing economies. As expected the family share is larger for non-pyramidal firms. However, for the total family share, pyramidal group firms' holdings double the value of non-pyramidal firms' holdings. There is a significant difference between family shareholdings for pyramidal and non-pyramidal firms of about 32 percentage points.

This feature is not pertinent to Ecuadorian groups only. Morck (2004) recognizes different ownership patterns around the world. For instance, in a Japanese *keiretsu*, each member firm owns a small share of the others. Although each individual inter-corporate equity stake is small, a majority of the stock in each firm is held collectively by all other firms in that group. This is different from other countries in which groups have one major controlling shareholder, instead of having many dissipated members. In this case, the evidence shows a lot of variation in the ownership structure.

Another question that is worth exploring concerns the position in which a firm is placed inside a pyramid. As mentioned before, I organized the ownership data and put together the pyramids in each group. Firms at the top of the pyramids and directly owned

[18] Each business group in the sample is identified with a family name. Direct family shareholding is the total share of the company in the hands of individuals with the family name. Pyramid shareholding is the total share of the company owned by related companies, or indirectly by the family.

by family members were assigned a level of 1 in the pyramid. In the same fashion, firms owned by firms at level 1 were assigned level 2, and consequently with all other pyramidal firms. The last level was level 4 for firms at the bottom. Statistics for these groups are presented in Table 3.

**Table 3**

**Firm's characteristics by pyramid level**

| **Pyramid Level** | ***1*** | ***2*** | ***3*** | ***4*** |
|---|---|---|---|---|
| **Assets**** | 13,100 | 6,069 | 4,963 | 2,608 |
| | (28,200) | (12,600) | (10,200) | (2,739) |
| **EBIDTA** | 1,184 | 393 | 416 | 130 |
| | (4,553) | (1,803) | (1,109) | (211) |
| **Sales*** | 15,800 | 9,296 | 4,875 | 2,678 |
| | (47,000) | (25,600) | (8,644) | (2,760) |
| **Investment** | 3,205 | 1,499 | 1,379 | 545 |
| | (10,300) | (4,851) | (3,713) | (616) |
| **Cash Flow** | 1,172 | 338 | 311 | 100 |
| | (4,661) | (1,984) | (898) | (206) |
| **ROA** | 0.051 | 0.063 | 0.049 | 0.036 |
| | (0.139) | (0.147) | (0.126) | (0.054) |
| **Sales Growth** | 0.157 | 0.173 | 0.099 | -0.026 |
| | (0.825) | (0.876) | (0.562) | (0.288) |
| **Age**** | 27.436 | 21.080 | 18.845 | 21.667 |
| | (16.460) | (14.639) | (9.519) | (17.348) |
| **Capital intensity** | 15.037 | 14.302 | 13.890 | 14.054 |
| | (15.434) | (17.494) | (16.204) | (11.970) |
| **Direct Family share*** | 0.340 | 0.121 | 0.021 | 0.000 |
| | (0.404) | (0.246) | (0.077) | (0.000) |
| **Pyramid share*** | 0.035 | 0.573 | 0.812 | 0.594 |
| | (0.151) | (0.394) | (0.319) | (0.401) |
| **Total Family Share*** | 0.375 | 0.694 | 0.833 | 0.594 |
| | (0.405) | (0.342) | (0.305) | (0.401) |
| **Observations** | 571 | 835 | 291 | 39 |
| **Firms** | 100 | 151 | 51 | 8 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005. All monetary variables are expressed in thousands of dollars.
b. Standard Deviations are in parentheses
c. * indicates Mean comparison test between levels 1 and 4: * Significant at 1%, ** Significant at 5%

Bertrand et al. (2002) assume that firm's level in a pyramid is correlated to cash flow rights of controlling shareholders. The following statistics show that this assumption holds for the case of Ecuadorian business groups. Direct family shares decrease as the level in the pyramid declines. Moreover the magnitude of total family holdings – over 60% for firms that are not at the top - support the idea that the family keeps control rights without large entitlement to the firms' cash flow.[19]

The financial indicators of these firms, such as assets, profits, and sales, seem to decrease as the level in the pyramid declines. Although the average values for some of the variables vary erratically across pyramid levels, there is a consistent differential pattern in size and profitability between firms at the top (level 1) and firms at the bottom (level 4).

Group affiliation and pyramidal ownership raise an important endogeneity issue. It is not clear how the expected performance of a new project determines whether a family associated with a business group will set up the new firm. At the same time within a group, firms can be placed into a pyramid and given a certain position within the pyramid because they are expected to be bigger or more profitable, but the ownership structure and the position can determine its performance as well. To support the comparison between group and stand-alone firms, I need to make the assumption that group affiliation is exogenously determined. A detailed discussion on this issue is presented in the following section.

[19] A standard benchmark for the control of the firm is 50% of the ownership.

# CHAPTER IV

# THE TUNNELING HYPOTHESIS

## *Methodology*

Bertrand, Mehta, and Mullainathan (2002) provide a framework to measure the existence and the extent of tunneling in pyramidal business groups. The flow of cash through a pyramid is tracked by analyzing the propagation of exogenous industry shocks to profits according to the firm's rank in the pyramid. These shocks allow the construction of a predicted performance measure that is compared to the observed performance of the firm.

Since only group firms are able to transfer profits among affiliates, in the presence of tunneling, a difference between actual performance and predicted performance arises. That is, following a shock to profits, group firms respond less than one-for-one to a shock in contrast to non-group firms. The proposed specification is

$$perf_{jtI} = a + b\,pred_{jtI} + c\,group_j\ pred_{jtI} + d\ controls_{jtI} + Firm_j + Time_t + u_{jtI} \quad (1)$$

where

$perf_{jtI}$ is profits for firm j at time t in industry I,

$pred_{jtI}$ is the shock,

$group_j$ is the dummy variable with value equal to one for group affiliated firms, and

$u_{jtI}$ is the error term.

The shock represents the predicted profits for the firm in the absence of tunneling,[20] and its coefficient is expected to have a value close to one. The interaction term captures the differential sensitivity of group firms to the shock; a negative sign on the coefficient provides evidence that supports the diversion of profits. Some controls for age and size are included, based on the differences in these characteristics of group and stand-alone firms as presented in the sample statistics.

Additional predictions are tested by modifying the preceding basic specification. To test the view that within a group the aggregate shock of other firms affects the profits of the firm, the following specification is used:

$$perf_{jtI} = a + b\,pred_{jtI} + c\ opred_{jtI} + d\ controls_{jtI} + Firm_j + Time_t + u_{jtI} \quad (2)$$

where

$opred_{jtI}$ is the summation of the shocks of all other firms in the group, except for firm j.

The key to separating the tunneling hypothesis from other motivations to form pyramids is the direction that resources follow in such a structure. To preliminarily assess this idea, I separate the aggregate shock of other group members according to their position in the pyramid. According to the tunneling hypothesis, the impact of lower level firms' aggregate shocks on an average firm's profits should be greater than the shocks of firms at the top. Bertrand uses cash flow rights as a proxy for rank of the firm in the pyramid. I am able to test this hypothesis using observed position in the next section. The estimated specification is:

$$perf_{jtI} = a + b\,pred_{jtI} + c\ Lopred_{jtI} + d\ Hopred_{jtI} + e\,controls_{jtI} + Firm_j + Time_t + u_{jtI} \quad (3)$$

[20] The shock is computed as the product of the firm's total assets and an asset-weighted average of the return for all firms in the industry, excluding the firm itself. For details see Bertrand et al. (2002).

where $Hopred_{jtI} = \sum_{position > P_{crit}} pred_{jtI}$

$Lopred_{jtI} = \sum_{position < P_{crit}} pred_{jtI}$

and $P_{crit}$ is a critical position level that separates top firms from bottom firms in a pyramid.

The prediction that money flows from the bottom to the top of the pyramid is tested by separately estimating equation (3) for firms at the top and firms at the bottom, which is the cross effect of shocks. A bigger and significant impact of the shock of firms at the bottom on the profits of firms at the top supports the flow of resources in this direction.

Hence, for firms at the bottom,

$$perf_{jtI} = a + b\,pred_{jtI} + c_L\ Lopred_{jtI} + d_L\ Hopred_{jtI} + e\ controls_{jtI} + Firm_j + Time_t + u_{jtI} \quad (4)$$

For firms at the top:

$$perf_{jtI} = a + b\,pred_{jtI} + c_H\ Lopred_{jtI} + d_H\ Hopred_{jtI} + e\ controls_{jtI} + Firm_j + Time_t + u_{jtI} \quad (5)$$

The main predictions of tunneling in this context are summarized as

- $c_H > c_L$,
- $c_H > d_H$, and
- $d_L$ is very small or insignificant.

Briefly, these are relatively simple tests to assess the existence of tunneling in any economy when information on assets, profits, group affiliation, and pyramidal ownership are available at the firm level.

As discussed earlier, a common assumption in the literature is the exogeneity of group ownership. Its adequacy is discussed in detail on the next section.

***Exogeneity of business group affiliation***

The assumption that business group affiliation is exogenous has been widely used in empirical literature. Khanna and Yafeh (2007) provide a fair discussion on the issue and emphasize the need to include endogenous group formation in the future research agenda. The analysis here extends the literature by considering both exogenous and endogenous group formation.

Pyramidal placement (within a group) and the position of a firm in a pyramid are a related issue that deals with endogeneity as well. Almeida et al. (2008) present a formal attempt to assess the exogeneity assumption using a sample of Korean *chaebol* firms. They observe the addition of new firms to groups and conclude that their ex-ante profitability and capital requirements determine the decision of the family to place them in a pyramid. This is at odds with the traditional argument that pyramids are created to separate ownership and control and that agency problems cause low profitability of these firms. Their work focuses on the determination of pyramidal vs. horizontal ownership, as well as on the level of the pyramid where the firm is placed. That is, they analyze the specific ownership structure adopted by a firm, once it is owned by a family group.

In this work, I first present some anecdotal evidence to support the assumption of exogenous group affiliation and then proceed to carry out a more formal analysis. A limitation of my dataset is that I observe full ownership information at certain a period in

time, but no changes in the structure over the years. However, given the short period of analysis I will maintain the assumption of no ownership or group affiliation changes in time.

For the case of the Ecuadorian economy, the presence of family business group contributes to support the exogeneity assumption. Since family business practices are related to family dynamics, values and traditions are passed along with businesses. Issues like succession planning to guarantee the firm survival and continuation in the family hands are the frequent concern of founders[21]. That is, family members usually work to keep the group together and growing. Moreover, as Poutziouris (2006) argues family managers tend to favor internally generated funds as a source of additional capital followed by external debt and finally by external equity.[22] The combination of these factors has lead to group formation and survival.

Despite this anecdotal evidence I acknowledge the potential existence of endogeneity in group affiliation. That is, in the performance equation the correlation between the independent variable and the error term introduces a bias in the estimation of the coefficient of interest. Specifically in this case the problem is the presence of

[21] As Westhead and Howorth (2006) claim: Important objectives cited by owners of family firms include: survival of the family business as a going concern; continued independent ownership of the firm; transfer of ownership to the next generation; maintaining financial independence, and employment of family members.

[22] The reluctance to use external financing can be associated to the lack of legal guarantees and investor protection La Porta el al. (2002) explains how the legal system shapes ownership structures. This has also contributed to the lack of active stock markets. Just recently, in 1994, the stock market law established the "Corporacion Civil Bolsa de Valores" of Quito and Guayaquil, creating the only two existing Stock Exchange in the country. The great volume that is traded there corresponds mostly to government, banks, and other financial institutions products. There are about 100 companies (non-government and non-financial) that are actively listed in these two main stock markets, which is a very limited share of the total productive firms in the economy.

unobservable factors related to the probability of group ownership (for instance, managerial ability of the family).

To account for the validity of comparison between business group and stand-alone firms, I first intend to assess the impact of some observables on the probability of group ownership as described in equation (6):

$$group\ affiliation_j = a + b\ age_j + d\ offshore_j + e\ size_j + u_j \quad (6)$$

The results for this estimation are presented in Table D.1 in Appendix D. They show that firm characteristics such as age, size, and off-shore ownership have a significant impact on the probability of group affiliation.

Indeed the most important explanatory variable in the model is off-shore ownership. In the statistics previously presented, I find significant differences in the mean value of this indicator for group and non-group firms. Anecdotal evidence attributes this pattern to the ability of controlling families to set up companies in off-shore jurisdictions to take advantage of the legal benefits they provide. Business groups receive greater returns of establishing an off-shore firm and indirectly owning their companies through it because of the flexibility of the institutional system, the avoidance of constraints of bureaucracy, and the confidentiality that their shareholders benefit from. These motives are presumably not affecting the financial performance of the firm.

Table D.2 presents the Spearman rank correlation matrix for key variables in the analysis. Group affiliation is highly correlated with the presence of off-shore shareholders in a firm, as well as with the share of equity holders established in fiscal paradises.

To summarize I argue that off-shore shareholding, while significantly explaining group affiliation, is presumably uncorrelated with the ex-ante firm profitability. Hence I will use this feature as an instrument for group affiliation.

I use an instrumental variables model, estimated by limited information maximum likelihood for a more robust approach, using firm's age and off-shore holdings as instruments. Table D.3 in appendix D presents the results for these estimations and the corresponding endogeneity tests, which do not reject the null hypothesis of an exogenous regressor.

Finally, I estimate the basic model assuming endogenous determination of profits and group affiliation. The main equation specifies the relationship between firm's profits and the firm's shock that potentially differs among group affiliates and stand-alone firms. Hence, it is estimated as an endogenous switching regression model, where equation (1)' is separately estimated for group and non-group firms

$$perf_{jtI} = a + b\, pred_{jtI} + d\ controls_{jtI} + Firm_j + Time_t + u_{jtI} \qquad (1)'$$

and a selection equation for group affiliation as equation (6) specified as a function of age, size and off-shore holdings. The system of three equations is simultaneously estimated by the full information maximum likelihood approach[23].

The results for the estimates of group and non-group equations are presented in Table D.4 in Appendix D. The response to the shock is close to one as expected, for both sets of firms. Moreover, it is significantly smaller for group firms as suggested by the

[23] The MLE is consistent and asymptotically efficient yielding more reliable estimates.

tunneling story. The variables included in the selection equation have significant coefficients, similar to the previous probit estimation.

The additional parameters results show rho0 and rho1, the correlation coefficients between the main and the selection equations for stand-alone and group firms, respectively. Since they are not significantly different from zero, this suggests the lack of unobserved factors that jointly affect the firm's likelihood of group affiliation and its performance. Although the evaluation of rho=0 is not a formal test of endogeneity, it provides partial support for the exogeneity of group affiliation. Additionally, the Wald test does not reject the null hypothesis of independent equations.

In conclusion, all the previous tests results question the endogenous affiliation of firms to Ecuadorian business groups allowing for the comparison of group and non-group firms in the next section.

***Results***

The test for tunneling is based on Bertrand et al. (2002) methodology. I estimate a panel data fixed effects model for specification (1). Firm fixed effects and year dummies are included in every specification and standard errors are clustered to account for serial correlation. The panel includes 37,899 firm-year observations on Ecuadorian companies.

Estimates for equation (1) are shown in Table 4. The shock coefficient illustrates the average response of a firm to a shock in earnings. That is, in response to a one dollar shock to earnings, an increase of 0.87 dollars is expected for the average firm as

presented in column (a). It is assumed to be close to 1 in absence of any diversion, tunneling, or dissipation of profits. The interaction variable between the shock and group dummy distinguishes the impact of group and non-group firms in response to the shock. The tunneling hypothesis argues that group firms should show a smaller sensitivity to shocks due to the diversion of profits to affiliates. Hence this coefficient is expected to be negative. In this case, a significant and negative value of -0.698 confirms a smaller increase in profits in response to a shock for a group firm. These figures suggest a very modest response of 0.17 dollars to a one dollar shock for group affiliated firms and a significant amount of tunneling.

**Table 4**

**Differential sensitivity of group shock**

| | ***(1)*** | ***(2)*** |
|---|---|---|
| **Shock** | 0.87 | 0.456 |
| | (8.84)** | (1.83) |
| **Affiliate * Shock** | -0.698 | -0.912 |
| | (2.45)* | (3.23)** |
| **Log(Assets)** | -298 | 5,087 |
| | (0.05) | (0.65) |
| **Age * Shock** | | 0.018 |
| | | (2.33)* |
| **Constant** | 52,503 | -16,991 |
| | (0.66) | (0.18) |
| **Observations** | 37,899 | 37,899 |
| **Number of firms** | 7,180 | 7,180 |
| **R-squared** | 0.07 | 0.09 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust t statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

The statistics in Table 1 suggest that group firms are older and bigger than stand-alone firms. Accordingly, some controls for size and age are included in the estimation to capture the impact that these differences between group and non-group companies could have on the effect of the shock. When these controls are introduced, the shock coefficient is smaller, suggesting that profits are somehow dissipated. However, the differential and smaller impact of the shock for group firms is very robust and supports the existence of tunneling.

To test the second prediction – equation (2) - that firms respond to shocks of other firms in their group, a similar specification is estimated with the sample of group firms only. In this case the variable 'shock of other firms in the group' is included. In the presence of tunneling, a positive effect of others' shocks in the firm's earnings is expected.

The results in Table 5 show an important effect of the aggregate shock of related firms that adds to the firm's own shock to support the tunneling of resources. Basically, a one dollar shock to related firms' earnings increases the firm's profits by 2.3 cents. With an average of 15 firms in a group and the typical firm tunneling away 70 cents, the estimate of diverted money that is showing up somewhere else is about 50%. The major economic implication of this measure lies in the potential inefficiencies that arise with tunneling[24].

[24] Again, there is evidence that profits are somehow dissipated. Roughly speaking, this could be interpreted as an additional cost of tunneling in terms of firm value.

**Table 5**

**Sensitivity to shock of others in the group**

| | *(1)* | *(2)* |
|---|---|---|
| **Shock** | 0.871 | 0.457 |
| | (8.87)** | (1.84) |
| **Affiliate * Shock** | -0.704 | -0.919 |
| | (2.48)* | (3.27)** |
| **Others' Shock** | 0.023 | 0.023 |
| | (2.23)* | (2.32)* |
| **Log(Assets)** | -780 | 4,605 |
| | (0.12) | (0.60) |
| **Age * Shock** | | 0.018 |
| | | (2.34)* |
| **Constant** | 41,824 | -27,642 |
| | (0.53) | (0.30) |
| **Observations** | 37,899 | 37,899 |
| **Number of firms** | 7,180 | 7,180 |
| **R-squared** | 0.07 | 0.1 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust t statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

The positive impact of group affiliates' shocks to earnings of the average firm is not only consistent with the tunneling hypothesis. Since it only provides evidence that resources are flowing within the group but not indicating the direction, it could also support the existence of internal capital markets to some extent. Additional analyses are performed later on the effect of a group's liquidity on the firm's investment decision to further explore this issue.

The next step is the assessment of the direction that money follows in a pyramid. The effects of the shocks of bottom and top firms in a pyramid are separately computed

for this purpose. The criterion to classify firms at the top is ranking in the pyramid equal to 1. Firms at a position 2, 3 or 4 are bottom firms.

**Table 6**

**Are firms sensitive to shocks of others at the bottom?**

| | ***(1)*** | ***(2)*** |
|---|---|---|
| **Shock** | 0.87 | 0.456 |
| | (8.85)** | (1.84) |
| **Affiliate * Shock** | -0.704 | -0.919 |
| | (2.47)* | (3.27)** |
| **Shock of Firms at Bottom** | 0.028 | 0.028 |
| | (1.94) | (2.11)* |
| **Shock of Firms at Top** | 0.013 | 0.014 |
| | (0.61) | (0.65) |
| **Log(Assets)** | -562 | 4,821 |
| | (0.09) | (0.62) |
| **Age * Shock** | | 0.018 |
| | | (2.34)* |
| **Constant** | 45,882 | -23,941 |
| | (0.58) | (0.26) |
| **Observations** | 37,899 | 37,899 |
| **Number of firms** | 7,180 | 7,180 |
| **R-squared** | 0.07 | 0.1 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust t statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

The results presented in Table 6 show that the aggregate shock of firms at the bottom has a bigger (and significant) impact on the profits of the average firm than the shock of firms at the top. Moreover, for the latter group the coefficient is not significant. That is, firms respond on average to shocks of firms further down in the pyramid and show no response to those of higher level firms. In conclusion, these outcomes suggest that money flows from the bottom of pyramids as the tunneling hypothesis argues.

Finally, I analyze the cross effect of shocks, using separate samples for firms at the top and firms at the bottom of the pyramid. These models correspond to specifications (4) and (5). This is basically the same model as in the previous estimation, but I split the sample according to the pyramidal position of firms.

The estimation is based on the sample of pyramidal firms only. Table 7 shows a bigger impact of the shock of firms at the bottom on the profits of firms at the top and supports the flow of resources in this direction. Although barely significant, the coefficient that measures this impact is much larger than the case where the full sample is used, suggesting that money flows to firms at the top of the pyramid.

**Table 7**

**Are higher up firms more sensitive to shocks of lower down?**

| | ***Bottom*** | | ***Top*** | |
|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** |
| **Shock** | 0.316 | 0.207 | 0.322 | 0.521 |
| | (1.34) | (0.88) | (1.13) | (0.59) |
| **Shock of Firms** | 0.011 | 0.011 | 0.045 | 0.046 |
| **at Bottom** | (0.69) | (0.71) | (1.34) | (1.44) |
| **Shock of Firms** | -0.02 | -0.021 | 0.034 | 0.034 |
| **at Top** | (0.83) | (0.83) | (0.65) | (0.65) |
| **Log(Assets)** | -79,454 | -73,015 | 498,915 | 488,116 |
| | (0.91) | (0.85) | (1.63) | (1.60) |
| **Age * Shock** | | 0.003 | | -0.005 |
| | | (0.30) | | (0.31) |
| **Constant** | 1,231,761 | 1,145,040 | -6,788,023 | -6,640,034 |
| | (0.99) | (0.92) | (1.50) | (1.47) |
| **Observations** | 1,165 | 1,165 | 571 | 571 |
| **Number of firms** | 210 | 210 | 100 | 100 |
| **R-squared** | 0.02 | 0.03 | 0.06 | 0.06 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust t statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

In the case of other coefficients (separate impact of shocks to bottom firms) the reduced significance of coefficients is still consistent with the presence of tunneling. That is, money does not flow from the top to the bottom.

In conclusion, there is significant support for the tunneling hypothesis. The patterns for the flow of resources are consistent with the reallocation of profits. However, the incentives that controlling shareholders have when deciding the ownership structure cannot be anticipated only on the grounds of these results.

There are several issues that could limit the reliability of these results. First, the possibility of a mismeasurement of firm industry would bias the results. In my data, only one SIC code is self-reported by the firm. This is presumably the one that best describes the company's activities. However, in the ideal setup a more detailed list of products and activities would be convenient, since industry classification is the key for the construction of the shocks. Second, the lack of market valuation information makes the study totally dependent on accounting information, which is potentially less reliable. On the other hand, the lack of market information is compensated with the availability of information for all the firms in the economy and not only those non-listed, which is the standard in this type of studies.

The next chapter presents some results on alternative tests for the motivation of pyramids.

# CHAPTER V

# THE INTERNAL CAPITAL MARKETS HYPOTHESIS

## *Methodology*

The evidence presented in the previous chapter vastly supported the tunneling hypothesis. This chapter provides some elements to assess an alternative view on the existence of pyramids: the use of internal capital markets. The economic justification for this hypothesis relies on classic theoretical work on financial economics by Modigliani and Miller (1958). Under the assumption of perfect capital markets, the financial policy of the firm should not affect the firm value. But when certain market failures appear[25], firms may decide to use their own funds to finance investment.

In a seminal paper, Fazzari, Hubbard, and Petersen (1987) argue that the investment to cash flow sensitivity provides a good test for the existence of financial constraints. They claim that a firm's investment will be more sensitive to its liquidity when the firm faces severe financing constraints. Hence, a common econometric exercise in the corporate finance literature is to estimate the investment equation for two or more groups that differ in the degree of financial constraints.

I will assume that group-affiliated firms are less financially constrained following Hoshi, et al. (1991) who apply a similar methodology in the study of Japanese keiretsu. This assumption is particularly valid in the case of a developing economy, where capital market imperfections abound. When certain institutions such as business

[25] The capital market is plagued by severe information asymmetries, especially in developing economies. Also, taxes and transaction costs, including bankruptcy costs challenge this assumption in practice.

groups arise, they bring about some financial advantages to the affiliates that stand-alone firms cannot obtain.

There are different mechanisms through which the reallocation of resources inside a group takes place. First, the potential existence of highly liquid firms allows controlling shareholders to reassign profits among group firms with better investment opportunities.[26] Second, several groups participate not only in productive sectors of the economy, but also in the financial sector. That is, they are able to act as financial intermediaries and presumably offer better credit arrangements to their affiliates. Third, the reputation of the business group may be beneficial to its members in terms of access and costs of credit in the external capital market. This chapter focuses on the use of pyramids to facilitate the functioning of the first above mentioned mechanism. That is, while every firm has access its own resources, a business group member is also able to use other members' resources to finance investment.

The baseline investment to cash flow equation is modified to include an interaction dummy of business group affiliation and cash flow to test for the differential sensitivity of investment to cash flow between the two sets of firms. The expected results imply a lower (or insignificant) coefficient on the cash flow for group members than for stand-alone firms, since they do not have to rely solely on their own liquidity to fund investment. The following specification is then estimated as

[26] These resources are not limited to cash, but can also extend to labor, management, and equipment, among others.

$$\frac{I_{j,t}}{K_{j,t-1}} = \alpha + \beta_1 \frac{CF_{j,t}}{K_{j,t-1}} + \beta_2 \frac{CF_{j,t}}{K_{j,t-1}} group_j + \gamma\ Controls_{j,t} + \varepsilon_{j,t} \quad (7)$$

where $I_{jt}$ is investment for firm j at time t, $K_{jt}$ is total assets, $CF_{jt}$ is cash flow, and controls usually include average Tobin's q for the firm. To avoid the effects of scale, the key variables are normalized dividing by firms' assets in the previous period.

Additionally, given the arrangement of firms into business groups I am able to construct an aggregate measure of liquidity for group affiliates and determine how the joint availability of resources matters for the investment decision of the average group firm. Hence the alternative specification to be estimated using only the sample of group firms is

$$\frac{I_{j,t}}{K_{j,t-1}} = \alpha + \beta_1 \frac{CF_{j,t}}{K_{j,t-1}} + \beta_2 \frac{OthersCF_{j,t}}{K_{j,t-1}} + \gamma\ Controls_{j,t} + \varepsilon_{j,t} \quad (8)$$

where not only the firm's own cash flow but group cash flow is included as an explanatory variable. If business groups make use of internal capital markets, affiliated firms will presumably be sensitive to the cash flow of other group firms as well as to its own.

In the study of the investment to cash flow relationship, it is often argued that the endogeneity of the cash flow variable introduces a significant difficulty, because the estimated coefficient will overstate the impact of cash flow on investment.[27] The quality of investment opportunities is an omitted variable that affects both liquidity and

[27] However, when looking at different equations for two different groups of firms, if the bias is similar for the two groups' coefficients, analyzing the difference between them may alleviate this problem. See Hoshi et al. (1991).

investment. That is, successful projects usually generate large amounts of cash, and their investment opportunities are better, requiring higher investment levels.

The most common approaches followed to address this problem are the use of exogenous shocks to cash flow, the inclusion of proxies to control for investment opportunities and the use of instrumental variables for cash flow. In the first case, for instance Lamont (1997) uses a negative shock to oil prices to assess the impact of oil companies in non-oil divisions' investment decisions. He finds a significant decrease in investment of non-oil segments due to the decrease in profits of related oil segments and argues the existence of internal capital markets. Also, he presents evidence of cross-subsidies among these divisions in the years previous to the shock.

As a proxy for investment opportunities Tobin's q is generally the choice when stock market data is available. This is defined as the ratio of the market value of the firm to the replacement cost value of its assets. Although the use of these estimates for the market value of the firm is controversial, due to the potential existence of measurement and specification error in this variable. Also different effects of q in firms with different costs of external finance have been documented. Hayashi (1982) demonstrates that under certain conditions[28] average Tobin's q is sufficient to measure investment opportunities. However, in the vast related financial literature, the performance of Tobin's q is very

[28] Firms must operate in perfect capital markets and should have constant returns to scale technology and no market power.

modest overall. Finally, this information is often not available at the firm level, due to missing data or different methodological requirements.[29]

In this case, stock market information is not available because of the reduced fraction of public firms in the economy. The advantage of having a sample with the majority of non-listed firms is to focus on the relevance of the internal vis-à-vis bank lending and the isolation of the impact of the stock market[30].

In the absence of Tobin's q as a control for investment opportunities, I use the firm's lagged sales growth and lagged industry ROA to capture expected profitability. Since accounting information is usually available, other studies have used these variables to substitute for stock market data, with a relatively reasonable performance.

***Results***

As mentioned in the preceding section, the study of the investment to cash flow sensitivity yields a better understanding of the relevance of financial constraints for firms' capital expenditure decisions. Given the differences in ownership structure between business group and stand-alone firms, a differential response of these two groups is expected. The following results correspond to the test for internal capital markets in Ecuadorian business groups.

[29] This might include the case in which the observation unit in the research design is the firm segment but the market value required to compute Tobin's q is only available at the firm level. This is very common in the study of American conglomerates.

[30] Additionally, I am avoiding the selection issue that other studies face when using only listed companies and stock market data, because families or large shareholders may decide intentionally not to list key group companies.

One of the major difficulties when implementing this test is identifying criteria to classify a firm as financially constrained. The most common criterion used in the literature is dividend payout ratio, although endogeneity of this variable has been widely argued. In this case, I will make use of business group affiliation as an indicator of better access to internal capital markets to proxy for fewer financial constraints.

A variation of Equation (7) is estimated as a panel data model with firm and year fixed effects in the same way as the previous tunneling tests. Better estimates are obtained in a dynamic panel model setup to account for assets persistence across time.

To control for investment opportunities, several proxies are included. As mentioned before, these proxies are constructed based on an accounting measure due to the lack of stock market information. In related studies comparisons of the relative performance of accounting measures versus market measures (usually the market to book ratio), show consistent results for both types of measures. I will use the firm's lagged sales growth and the lagged industry ROA separately to control for investment opportunities. The results follow in Table 8.

**Table 8**

**Investment to Cash Flow sensitivity differential group vs. non-group**

| | OLS | Dynamic Panel | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Cash Flow** | 0.138 | 0.144 | 0.15 | 0.14 |
| | (15.68)** | (11.26)** | (10.92)** | (10.96)** |
| **Group* Cash Flow** | -0.041 | -0.076 | -0.066 | -0.071 |
| | (1.65) | (2.47)* | (1.97)* | (2.27)* |
| **Age** | 0.014 | 0.023 | 0.03 | 0.03 |
| | (2.79)** | (19.14)** | (2.95)** | (3.28)** |
| **Lag(Sales Growth)** | | | -0.011 | |
| | | | (0.77) | |
| **Lag(ROA)** | 0.975 | | | 1.39 |
| | (3.06)** | | | (2.47)* |
| **Lag (I/K)** | | 0.014 | 0.01 | 0.01 |
| | | (1.44) | (0.92) | (1.36) |
| **Observations** | 23,394 | 12,323 | 10,605 | 12,107 |
| **Number of firms** | 5,432 | 5,172 | 4,541 | 5,087 |
| **R-squared** | 0.04 | | | |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. (1) Robust t statistics in parentheses; (2), (3), (4) Robust z statistics in parentheses. * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

According to the results, liquidity is a significant determinant of investment. As indicated in column (4), the average investment sensitivity is about 0.14, indicating that for each dollar of cash available to the firm, 14 cents are likely to become investment for any stand-alone firm. There is a significant difference between group and stand-alone firms in this measure. The estimate for the sensitivity is about 0.07 for group affiliated members.

These results support the hypothesis of less financially constrained group firms and the potential existence of internal capital markets in Ecuadorian business groups. As

for the controls, lagged industry ROA seems to have a positive impact on investment although its inclusion has a very small effect on the key coefficients. In addition, the performance of lagged sales growth as a control for investment opportunities is fair[31]. I need to acknowledge that if these variables are poor controls for investment opportunities, I might be overstating the impact of a firm's cash flows on investment if cash flow proxies for investment opportunities.

In conclusion, these results provide evidence on differential responses to liquidity between group and non-group firms. Next, the inclusion of the aggregate cash flow of the group, following equation (8), is used to test the existence of internal capital markets. The purpose of this addition is to separately identify the effect of liquidity of a firm's own cash flow and its affiliated members' cash flows on investment.

As shown in Table 9, for the sample of group firms, the reduction in the magnitude and significance of the own cash flow coefficient from 0.07 to 0.05 when group cash flow is included is worth noting. The aggregate liquidity of the business group is relatively small but a significant determinant of the average firm investment. Table E.2 in the appendix allows the comparison with the estimates before this variable is added.

[31] Table E.1 in the appendix presents these additional results.

**Table 9**

**Investment to cash flow sensitivity including the cash flow of others in the group**

| | Group | Pyramid | Horizontal |
|---|---|---|---|
| **Cash Flow** | 0.052 | 0.091 | 0.026 |
| | (1.66) | (2.45)* | (0.68) |
| **Others Cash Flow** | 0.0002 | 0.0003 | 0.0001 |
| | (1.91)*** | (4.48)** | (0.88) |
| **Lag(ROA)** | 2.99 | -1.391 | 6.996 |
| | (2.08)* | (1.02) | (2.83)** |
| **Age** | 0.042 | 0.08 | 0.043 |
| | (2.58)* | (1.99)* | (2.11)* |
| **Lag(I/K)** | -0.027 | -0.015 | -0.107 |
| | (0.78) | (0.34) | (3.63)** |
| **Observations** | 1,168 | 639 | 529 |
| **Number of firms** | 467 | 254 | 213 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust z statistics in parentheses; * significant at 5%; ** significant at 1%; ***significant at 10%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

Next the relevant sample, the set of group-affiliated firms, is split into pyramidal and horizontally owned firms to investigate differences in the ownership structure and investment sources. In the case of pyramidal firms, a very significant effect of the cash flow of other group members shows consistency with the internal capital markets hypothesis. This result provides support for the idea that groups' liquidity matters to the determination of the firm's investment and that the transfer of resources takes place mostly through pyramids.

Also, the own cash flow coefficient is affected by the introduction of group liquidity even more in the case of pyramidal firms. The investment to cash flow sensitivity is about twice as large as the value for the average group firm. It appears that

pyramidal firms rely more on their own liquidity and the liquidity of affiliates than directly owned group firms which probably have to search for external sources of financing for their projects. This result is consistent with ownership patterns of horizontally owned group firms, whose family share is significantly lower than for comparable pyramidal firms.

The reliability of these results is challenged by the selection of firms into pyramidal and horizontal ownership. For instance, if investment requirements are different between these two groups, the controlling family may be intentionally placing firms in pyramidal structure. A more adequate approach would be to account for this selection effect. Almeida and Wolfenzon (2006) argue that capital intensive firms, larger and younger firms and firms with lower expected return are more likely to be placed in a pyramid. Hence, these variables could be used to model the choice of ownership.

Briefly, the existence of internal capital markets is supported by the evidence provided here, especially in the case of business group pyramidal firms.

# CHAPTER VI

# CONCLUSIONS

The practice of tunneling and the use of internal capital markets argue the existence of resources transfers among group affiliated firms. However, they differ in terms of the shareholders' incentives and the patterns they show in the flow of money. I rely on this difference to construct the tests of the motivation to form a pyramid.

I have contrasted two different hypotheses on the existence of pyramidal ownership structures within a business group. The results provide evidence that support both of them to some extent. For the tunneling story, there is evidence that a significant transfer of resources takes place among affiliates of Ecuadorian business groups. For the alternative hypothesis, the impact of aggregate group cash flow on a pyramidal firm's investment suggests the existence of internal capital markets within these organizations. As a byproduct of the tunneling estimations, some evidence of dissipation of profits may imply that certain inefficiencies occur during the reallocation process.

Most of the studies of business groups have focused in the analysis of these institutions role in countries as India, Korea, and Japan, as well as certain European economies. The application of this methodology to Latin American economies increases the knowledge of business groups and their implications in this specific region.

This research points out additional room for research in several related areas. The most straightforward is probably the analysis of internal capital markets that can be extended to account for the choice that controlling families make on direct (horizontal)

versus indirect (pyramidal) ownership and its implication on the optimal resource allocation.

Another extension of the current research should explore the role of links between productive firms and financial institutions inside the group for the development of internal capital markets. The formation of groups and pyramids with tax evasion incentives can also be explored in the case of this economy. Finally, the impact of the dollarization of the economy as an exogenous shock to the firms could be used to assess additional questions.

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# APPENDIX A

# DATA MANAGEMENT

My sample consists of 7,180 Ecuadorian firms between the years 2000 and 2005[32]. I identify group-affiliation of firms through a definition made by the Ecuadorian Internal Revenue Service, which links group firms to each other by family ownership and close ties to financial institutions. There are 621 group firms in the relevant sample. This information is matched with the financial and ownership data obtained from *Superintendencia de Compañías*, a government supervision agency that collects the information on all existing companies on a yearly basis.

The key financial variables for the analysis are earnings before interest, depreciation, taxes and amortization (EBIDTA), cash flow (defined as operating profit plus depreciation), total assets, investment (defined as depreciation adjusted change in fixed assets), group affiliation, and industry, which is defined as firms with the same 3-digit SIC code.

As is standard in this literature, I drop firms that belong to the services sector and firms with over 50% foreign or state ownership. I use medium sized and large firms, with average assets over US 50,000 dollars, since small firms are not comparable to the group of interest, and their information is potentially less reliable. The sample includes both listed and non-listed firms. However, most of them are non-listed due to the emerging

[32] The original dataset contains information from 1995 through 2005. However I decided to use the period after the Ecuadorian economy was dollarized, which is 2000, due to the difficulty of dealing with currency conversion in the former period in which the economy went through an economic crisis and a hyperinflation episode.

conditions of the stock market in Ecuador. Since these two groups are similar in terms of corporate control, I do not exclude listed firms from the analysis.

Firms with incomplete information in more than three periods were excluded, including firms younger than three years. Several observations had typographical errors, and they were detected as having extremely small or big ROAs - over |1|, as well as big and inconsistent assets differences over time for a single firm. Firms with many typos were excluded from the sample. Additionally, I winsorized the investment variable at the top and bottom 1% to avoid the use of abnormal investment rates.

The ownership section contains information on all the shareholders for each firm and the corresponding characteristics (type, nationality) and value of their holding. This information is required to organize the ownership structure within each group, both horizontal and pyramidal affiliation, including the firm's ranking in the pyramid. To compute the share owned by each type of stockholder (family, off-shore), the information is matched with the corresponding family name and off-shore jurisdiction in each case.

# APPENDIX B

# GROUP OWNERSHIP STRUCTURES

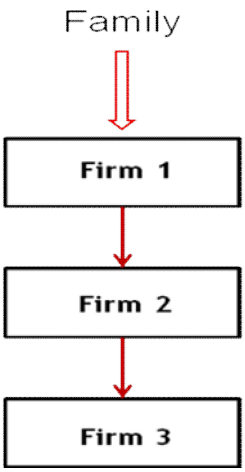


**Figure 1. Pyramidal structure**

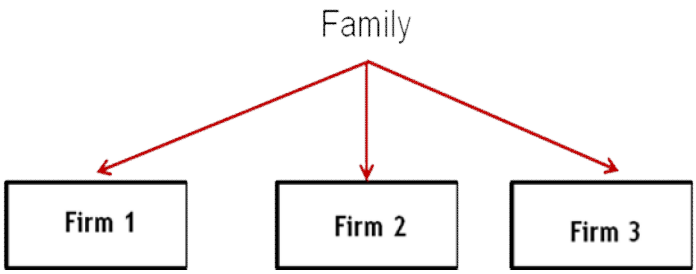


**Figure 2. Horizontal structure**

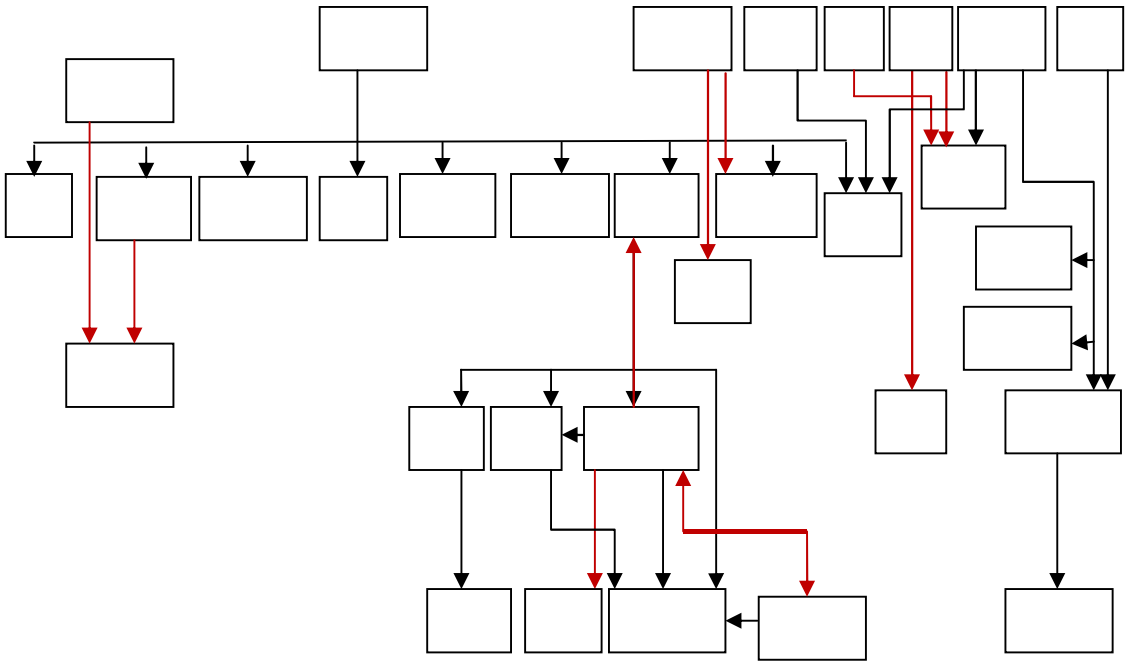

**Figure 3. An actual pyramid in Ecuadorian business groups**

# APPENDIX C

## DEFINITION OF VARIABLES

Assets: Total Assets

Ebidta: Earnings before interest depreciation taxes and amortization.

Investment: Fixed Assets (t) – Fixed Assets (t-1) + Depreciation (t)

Sales: Total sales

Cash Flow: Operating profits + Depreciation

ROA: Assets /Ebidta

Sales Growth: Sales (t) – Sales (t-1) / Sales (t-1)

Age: 2005 - Year of incorporation

Capital Intensity: Fixed Assets/Wages

Industry Cash Richness: Lag Average (ROA) for the industry – 3 digit SIC

Direct Family share: Percentage of family ownership (Given a family name for each group, a shareholder is a family shareholders if she has the family name)

Pyramid share: Percentage of other firms in the same business group's ownership.

Total family share: Direct family share + indirect family share (pyramid share)

Off-shore share: Percentage of ownership by shareholders located in off-shore jurisdictions.

# APPENDIX D

# ENDOGENEITY TESTS

## Table D.1

## Probability of group affiliation

| ***Variable*** | *Group dummy* |
|---|---|
| Age | 0.023 |
| | (4.31)** |
| Age Squared | -0.0003 |
| | (3.22)** |
| Dummy off-shore holding | 0.924 |
| | (16.08)** |
| Log(Assets) | 0.211 |
| | (12.96)** |
| Constant | -4.537 |
| | (21.79)** |
| Observations | 37,899 |
| Pseudo $R^2$ | 0.179 |
| Wald Chi2(4) | 703.44 |
| Prob > chi2 | 0.00 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust z statistics in parentheses; * significant at 5%; ** significant at 1%.
c. Standard errors are clustered at the firm level.

## Table D.2

## Spearman rank correlation matrix

| | **Group indicator** | **Share off-shore** | **Dummy off-shore** | **Age** | **EBIDTA** | **Assets** |
|---|---|---|---|---|---|---|
| **Group indicator** | 1.000 | | | | | |
| **Share off-shore** | 0.333 | 1.000 | | | | |
| **Dummy off-shore** | 0.324 | 0.997 | 1.000 | | | |
| **Age** | 0.130 | 0.115 | 0.117 | 1.000 | | |
| **EBIDTA** | 0.051 | 0.067 | 0.070 | 0.096 | 1.000 | |
| **Assets** | 0.224 | 0.241 | 0.243 | 0.216 | 0.392 | 1.000 |

Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.

## Table D.3

## Instrumental variables estimation results

| *Instrument for Group Affiliation* | *Share off-shore holding* |
|---|---|
| **Shock** | 0.871 |
| | (1.10) |
| **Group*Shock** | -0.699 |
| | (0.43) |
| **Log(Assets)** | -314.256 |
| | (0.02) |
| **Underidentification test** | |
| Kleibergen-Paap rk LM statistic | 843.89 |
| Chi-sq(3) P-val | (0.00) |
| **Weak identification test** | |
| Kleibergen-Paap rk Wald F statistic | 867.532 |
| **Endogeneity test** | |
| C statistic | 0.000 |
| Chi-sq(1) P-val | (0.992) |
| **Observations** | 37,899 |
| **Number of firms** | 7,180 |
| **R-squared** | 0.0718 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust z statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

## Table D.4

## Endogenous switching regression model

| Endogenous Switching Regression Model | | Number of obs = 37,899 | | |
|---|---|---|---|---|
| Wald chi2(2) = 39.37 | | | | |
| Log pseudolikelihood = -570477.45 | | | Prob> chi2 = 0 | |
| | **Coef.** | **Robust Std. Err.** | **Z** | **P>z** |
| **Non-group** | | | | |
| Shock | 1.678 | 0.467 | 3.59 | 0 |
| Log(Assets) | -25,492 | 24,217 | -1.05 | 0.29 |
| Constant | 287,396 | 280,957 | 1.02 | 0.31 |
| **Group** | | | | |
| Shock | 1.043 | 0.244 | 4.27 | 0 |
| Log(Assets) | -8,505 | 59,712 | -0.14 | 0.89 |
| Constant | 255,646 | 833,917 | 0.31 | 0.76 |
| **Selection equation** | | | | |
| Dummy Off-shore | 1.120 | 0.053 | 21.11 | 0 |
| Age | 0.014 | 0.002 | 7.72 | 0 |
| Constant | -1.82 | 0.041 | -44.89 | 0 |
| **Other parameters** | | | | |
| sigma0 | 575,506 | 3,843 | | |
| sigma1 | 1,878,407 | 782 | | |
| rho0 | 0.002 | 0.009 | 0.17 | 0.865 |
| rho1 | -0.055 | 0.102 | -0.53 | 0.595 |
| Wald test of indep. eqns. : chi2(2) = 0.31 | | | Prob. > chi2 = 0.8556 | |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust z statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

# APPENDIX E

# ADDITIONAL RESULTS ON THE INTERNAL CAPITAL MARKETS HYPOTHESIS

**Table E.1**

**Investment to cash flow sensitivity by category group-affiliation (dynamic panel) with lagged sales growth as control**

| | Non group | Group | Pyramid | Non-pyramid |
|---|---|---|---|---|
| Cash Flow | 0.145 | 0.078 | 0.097 | 0.05 |
| | (10.91)** | (2.54)* | (2.44)* | (1.17) |
| Age | 0.028 | 0.034 | 0.067 | 0.031 |
| | (2.72)** | (1.73) | (1.43) | (1.43) |
| Lag(Sales Growth) | -0.007 | -0.084 | -0.147 | 0.006 |
| | (0.49) | (1.30) | (1.43) | (0.18) |
| Lag (I/K) | 0.006 | 0.048 | 0.17 | -0.085 |
| | (0.60) | (0.66) | (1.34) | (3.01)** |
| Observations | 9626 | 979 | 542 | 437 |
| Number of firms | 4154 | 387 | 212 | 175 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust z statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

**Table E.2**

**Investment to cash flow sensitivity by category group-affiliation (dynamic panel) with lagged ROA as control**

| | Non group | Group | Pyramid | Horizontal |
|---|---|---|---|---|
| Cash Flow | 0.142 | 0.068 | 0.098 | 0.037 |
| | (10.96)** | (2.38)* | (2.47)* | (0.98) |
| Age | -0.002 | 0.045 | 0.044 | 0.047 |
| | (0.25) | (2.59)** | (1.70) | (2.29)* |
| Lag(ROA) | 1.215 | 2.797 | -1.723 | 6.887 |
| | (2.01)* | (1.94) | (1.16) | (2.83)** |
| Lag (I/K) | 0.013 | 0.005 | 0.08 | -0.104 |
| | (1.32) | (0.08) | (0.80) | (3.59)** |
| Observations | 10,939 | 1,168 | 639 | 529 |
| Number of firms | 4,620 | 467 | 254 | 213 |

a. Data Source: Superintendencia de Compañías, Ecuador for the years 2000-2005.
b. Robust z statistics in parentheses; * significant at 5%; ** significant at 1%.
c. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

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