Corporate governance, market competition and investment decisions in Mexican manufacturing firms

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27 January 2011

CORPORATE GOVERNANCE, MARKET COMPETITION AND INVESTMENT DECISIONS IN MEXICAN MANUFACTURING FIRMS

(This version: January 27th, 2011)

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Abstract

We study how competition and corporate governance may explain investment decisions of Mexican manufacturing firms. We develop the study with indexes of market concentration and agency costs and OLS regressions. The analysis uses longitudinal census data. Our results suggest that investment is better explained by the Dominance Index, a Mexican measure of concentration, than by the Herfindahl-Hirschman one. They also suggest that agency costs (proxy for the degree of separation of ownership and control), and market competition may encourage investment decisions. Furthermore they suggest an inverse relationship between market competition and agency costs. We believe that our findings support the hypothesis that competition may be an alternative mechanism to encourage corporate practices in emerging economies.

Keywords: Corporate governance, competition, investment, Mexico, manufacturing, economic development

JEL Classification: G34, L22, L60, 016

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1. Introduction

Traditional microeconomic theory explains firms` behavior and their decisions assuming that firms and their managers pursue the goal of maximizing profits. Such assumption is plausible because firm owners usually aim at making their firms as valuable as possible; and because competitive markets may punish firms that do not maximize profits. However, in practice, owners and managers do not necessarily agree on the strategic direction and performance of firms. Indeed the failure to maximize the value of firms has been explained as a consequence of the differences between ownership and management [Jensen and Meckling (1976)].

Financial management theory accepts that firms´ behavior also depends on corporate governance practices. One main determinant of how stakeholders take and execute decisions is the degree of separation between ownership and control. Such separation occurs due to the asymmetric interests of managers and owners and because of the way that costs and rewards are allocated among the stakeholders. In practice such separation usually materializes into agency costs [Ang, Cole and Lin (2000)]. Paradoxically, studies that measure these costs only exist since the late 1980`s [McKnight and Weir, (2009)].

Corporate governance theory contributes to explain firms´ behavior and their decisions, like investment ones. Particularly, Grabowski and Mueller (1972) suggest that the degree of the separation between ownership and control explains investment decisions. Indeed, they predict a positive relationship between cash flows and investment for firms that experience agency problems. Their argument is supported by the empirical findings of Gugler, Mueller and

Yurtoglu (2007). They indicate that legal systems, accounting standards, and ownership structures systematically affect investment decisions in European economies.

However, the effectiveness of the corporate governance mechanisms has been questioned by Allen and Gale (2000). In fact, they suggest that other factors are important to explain firms´ behavior. Concretely they argue that competition may provide a substitute for governance mechanisms. They arrive to such conclusion after examining evidence from Germany, Japan, US and UK. Particularly, Allen (2005) suggests that market competition may be useful to ensure good corporate governance practices in emerging economies. His suggestion is argued on the basis that the markets of such economies are imperfect and incomplete.

Here we study how corporate governance, market competition and investment relate in an emerging economy. Concretely we analyze the effects of market concentration and agency cost determinants on investment decisions in Mexican manufacturing firms. We use several concentration and agency cost indexes as measures of competition and corporate governance. Particularly, we focus on manufacturing firms because their activities have been considered essential to encourage economic development [Nurkse, (1953); Lewis, (1954)]. We study them with longitudinal data of the last census available for the Mexican economy.

Here we aim at suggesting answers to the following questions: How are related corporate governance, market competition and economic development? How market competition may affect the relationships between corporate governance and investment in emerging economies? What measures exists to assess agency costs and market concentration? Are they statistically adequate to assess the determinants of investment? What firms´ characteristics

may be important to understand investment decisions? Does firms` size matters? Which type of implications may be derived from these findings?

Methodologically, we study the effects of the separation between ownership and control on investment decisions with two agency cost indexes. We use the ones proposed by Bøhren et al. (2007) and Danielson and Scott (2007). Concretely, we use the ratio of operating expenses to annual sales and the ratio of annual sales to total assets. We assume that the larger the ratios, the more asymmetric the interests of managers and owners. We consider both financial measures as complementary ones of how the stakeholders determine and control the strategic direction and performance of firms.

We study the effects of market competition on investment decisions with two concentration indexes. Concretely, we use the well-known Herfindahl-Hirschman Index (HHI) and the Dominance Index (DI) proposed by Garcia-Alba (1990). The HHI one is the traditional measure of market concentration. The DI is a measure used by Mexican regulators to assess market competition. The main difference between both measures is that the DI explicitly accounts the size of firms to measure market concentration. We use both indexes as alternative measures of the degree of market competition.

Our study has some distinctive features that differentiate it with respect to other studies. The first one is that it focuses on an emerging economy. A second feature is that it analyzes jointly the effects of corporate governance and market competition determinants on investment. Such feature is consistent with the proposals of Allen (2005) to encourage development. The third one is that it focuses on manufacturing firms. Most corporate

governance studies for Mexican firms focus on financial ones. The last feature is that we use an alternative measure of concentration for empirical purposes.

We follow several steps to develop this study. First, we build the market concentration indexes and agency cost measures with longitudinal census data for the 182 industries that include the Mexican manufacturing sector according to the last census available (INEGI, 2008), Then we estimate several OLS regression sets to analyze the determinants of investment of micro, small, medium and large size firms. In such assessments, we control for the effects of certain firms characteristics (cash flow and investment opportunities). Finally, we use several statistical tests to check the robustness of our results.

The econometric evidence suggests that the separation of ownership and control and market competition may encourage investment decisions among manufacturing firms. Our findings show that increases in agency costs or decreases in market concentration may increase investment. The estimations also show that the effects of firms´ size, cash flow and investment opportunities are mostly significant and positive on investment decisions. Furthermore, the statistical tests suggest that the regression models explain adequately investment decisions mainly for medium and large firms.

The paper is organized as follows. Section 2 reviews the literature focusing on the relationships among economic development, corporate governance and market competition in emerging economies. Section 3 describes the methodological design of the research. It focuses on the data sources, variables, modeling specification and econometric techniques. Section 4 shows the econometric outcomes and its interpretation. It also shows the results of

the statistical estimators and tests that support the empirical assessment. Section 5 concludes and discusses the main findings.

2. Economic development, corporate governance, market competition and investment

Economic theory shows that long-run growth relies on investment decisions. Particularly, classical development economics support the view that investments in the manufacturing industry are essential to encourage the industrialization of underdeveloped economies. Indeed, many economists like Nurkse (1953) and Lewis (1954) argue in favor of investments in the manufacturing industry to take advantage of the supply of labor existing in such economies. According to them, the "vicious circle of poverty" could be broken by investing in the manufacturing sector. Thus their policy recommendations focus on the promotion of manufacturing activities.

Currently some economists believe that corporate governance practices may contribute to foster growth [Mayer (2001), Claessens (2006)]. They argue that good practices contribute to reduce capital costs, to increase returns on equity, to promote efficiency and favorable treatments of all stakeholders. Moreover, they argue that such practices are useful to allocate capital and to manage risks properly. Good corporate governance leads to economic growth by enhancing corporate decisions and firms´ performance. Thus, according to their arguments, the study of the relationships between corporate governance and investment decisions should be a natural research field for development studies.

Paradoxically, empirical studies regarding the effects of corporate governance on investment decisions do not focus on emerging economies. Most of them focus in developed ones [see Gugler, Mueller and Yurtoglu (2007)]. Several problems explain such situation. Some relate

to the lack of institutional mechanisms to collect reliable and verifiable data. Others relate to stakeholders, who usually cannot recognize and understand their roles, rights and responsibilities. Studies that have analyzed these relationships for emerging and transition economies are Estrin (2002), Claessens (2006) and Mueller and Peev (2007).

Emerging economies are characterized by weak institutions that cannot always enforce good corporate governance practices. Traditionally, laws have been used to enforce these practices. However, some studies suggest that it may not be optimal to use the law in emerging economies. Indeed, Allen (2005:175) claims that "ensuring that emerging economies have effective legal systems and institutions is neither necessary nor sufficient for ensuring good economic performance". Such considerations explain why he proposes competition, trust, and reputation as alternative mechanisms to promote good corporate practices among these economies.

We believe that competition is an important and feasible mechanism to encourage good corporate governance practices. This belief derives from the theoretical work of Allen and Gale (2000). There, they show that competition in product markets may ensure good corporate governance practices by disciplining management. Their conclusion is supported by Singh (2003). Indeed he argues that agency costs, induced by the separation of ownership and control, must be inversely related with the intensity of oligopolistic competition in the product markets. He reaches this conclusion on the basis of a review of several studies for emerging economies.

However, evidence on the relationships between corporate governance and market competition is relatively scarce. Nickell (1996) supports the hypothesis that competition

improves corporate performance and productivity growth among UK firms. Januszewski, Koke and Winter (2002) find that competition and tight controls seem to be complements among German firms. They also find that firms experience high productivity growth when markets are competitive. For emerging economies, the only study that we know is the one of Pattanayak and Pant (2010). They find a positive relationship between ownership and competition variables among Indian firms.

We conclude this review by indicating that the analysis of the relationships among corporate governance, market competition and investment decisions seems a promissory research field. Here we analyze such relationships in the context of an emerging economy and its manufacturing sector. Concretely, we study the effects of the separation of ownership and control and market concentration on firms´ investments to complement existing corporate finance, industrial organization and economic development studies. In the following section, we show how we develop such analysis for the Mexican manufacturing firms.

3. Methodology

In this section we describe the methodological design of our investigation. Specifically, we describe the sources of data and the indexes used in the assessment of the determinants of investment. Furthermore we describe the econometric modeling and testing procedures. Here we should emphasize that we focus on the issues related to the separation between ownership and control and market concentration. We focus on such issues because they are the most commonly studied in the corporate governance and industrial organization literatures. Such issues define the scope and limitations of our study.

3.1 Data sources

We use data of the Mexican manufacturing firms obtained from the "Economic Census 2003" reported by the Bureau of Statistics (known as INEGI). Methodologically, the census is constructed accordingly to the North-American-Industry-Classification-System (NAICS). It includes 12 classificatory groups of firms for each of the 182 industries. We use this longitudinal data set because previous censuses are built with non-comparable methodologies. In Mexico, census data are collected every five years. Currently, the definitive data for the census collected in 2008 are not available.

In Mexico, firm-level data are not available due to confidentiality reasons. We deal with such constraint by constructing a set of four groups of representative firms for the 182 industries included in the census. We build the representative firms accordingly to the number of employees. A micro firm has no more than 10 employees. A small firm has between 11 and 50. A medium firm has between 51 and 250. A large firm has at least 251 employees. This simplified system follows the one of the Mexican Economics Ministry (known as SE). For comparative purposes, Table 1 shows the relationships between the INEGI and SE systems.

Table 1: The census and the Mexican Economics Ministry classification for manufacturing firms

INEGI Census´ Classification of Firms in the Industry i (t)	Employees in the Firms that Belong to Group t	Mean of Employees in the Firms that Belong to Group t (M_{jt})	Type of Firm According to the SE classification
1	0-2	1	Micro
2	3-5	4	Micro
3	6-10	8	Micro
4	11-15	13	Small
5	16-20	18	Small
6	21-30	25	Small
7	31-50	40	Small
8	51-100	75	Medium
9	101-250	175	Medium
10	251-500	375	Large
11	501-1000	750	Large
12	1000+		Large

The table shows the relationships between the INEGI Economic Census´ classification and the one of the Mexican Economics Ministry (SE). The census classifies firms of each industry into groups according to the number of employees. The census has 12 classificatory groups for each of the 182 industries. The SE classification considers four types of firms. A micro firm has no more than 10 employees. A small firm has between 11 and 50. A medium firm has between 51 and 250. A large firm has at least 251 employees. The mean of employees for the firms of the twelfth group is the average of employees with respect to the total of firms in the twelfth group.

We build each representative firm in order to describe the behavior for the representative firm of size "j" of industry "i". We estimate a weighted variable to assess the effects of the size of the firms according to the SE classification system. We use as weight the mean of the number of employees by each type of firm. The representative firm variable is calculated as follows:

$$P_{ijt} = \frac{n_{ijt} M_{jt}}{\sum_{t} n_{ijt} M_{jt}}$$

$i = 1, ..., 182$
$j = 1, 2, 3, 4$
$t = 1, ..., 12$

(1)

where P_{ijt} is the weighted indicator of the industry "i", size "j", group "t"; n_{ijt} is the number of firms of the industry "i", size "j", group "t"; M_{jt} is the mean of the number of employees of size "j" in group "t"; the subindex "i" refers to the i-th industry; the subindex "j" refers to the firm of size "j" (micro, small, medium and large firms); the subindex "t" refers to the t-th groups included in the size-j classification.

We build representative indicator variables for all the independent and dependent variables. We use the weighted indicator of each one of the four representative firms of industry i to estimate each variable. We multiply P_{ijt} by each variable included in the census classification for each one of the twelve groups of firms V_{ijt}. Such multiplications added accordingly to each subindex "t" provide us with a variable each representative firm of size "j" of the industry "i".

$$RF_{ij} = \sum_t P_{ijt} V_{ijt}$$
$$i = 1, ..., 182$$
$$j = 1, 2, 3, 4$$
$$t = 1, ..., 12$$

(2)

where RF_{ij} is a variable associated to the representative firm of the industry "i", size "j"; P_{ijt} is the weighted indicator of the industry "i", size "j", group "t".

3.2 Variables

Here we describe the variables used to analyze the relationships among corporate governance, market competition and investment. Given the multifaceted nature of corporate governance and competition, we use several measures to capture their main characteristics. Concretely, we use two agency cost proxies to assess the degree of separation between ownership and control. We also use two market concentration indexes to assess the degree of

competition. The control variables include cash flows, investment opportunities and firms´ size. The set of dependent, independent and control variables is summarized in Table 2.

Table 2: Investment and its determinants

Variables (Indexes)	Measures	Indicator
Dependent variable		
Investment	Fixed capital expenditures	Gross fixed capital formation (Value of the fixed assets bought minus the value of the fixed assets sold)
Independent Variables		
HHI	Market concentration 1	Herfindhal-Hirschman
DI	Market concentration 2	Dominance Index
Operating expenses ratio	Separation of ownership and control 1	Ratio of operating expenses to annual sales
Asset utilization ratio	Separation of ownership and control 2	Ratio of annual sales to total assets
Econometric control variables		
Investment opportunities	Ratio of output to capital	Ratio of production value to fixed capital stock
Cash flow	Earnings	Net earnings
Firm size	Fixed assets	Total value of fixed assets

The table shows the variables and indicators used in the econometric assessments. The dependent variable is investment. The independent variables aim to capture the main features of the separation of ownership and control and of market competition. The table includes the definitions of the variables according to the Economic Census of INEGI (Mexican Bureau of Statistics).

We choose the independent variables under theoretical and empirical considerations. We choose the corporate governance ones assuming the existence of a separation between ownership and control (agency problem). Empirically, such separation is usually measured with agency costs proxies. Here we use the two *complementary* measures of agency costs proposed by Ang, Cole and Lin (2000) and Danielson and Scott (2007). These measures are

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the operating-expenses and the asset-utilization ratios. Both are measures that indicate how effectively the firm's management controls operating costs and deploys its assets. [1]

We use two *alternative* measures of concentration to measure market competition[2]: The Herfindahl-Hirschman Index (HHI) and the Dominance Index (DI). The HHI is the traditional measure of market concentration. It is considered an adequate measure as long as big differences do not exist among the firms of an industry. However, we should recognize that this may not be the case for many industries. We use an alternative measure, the DI index, proposed by Garcia-Alba (1990), to take into account this fact. Such measure is used by Mexican regulators to assess how differences in firms´ size may affect the strategic interactions in a market.[3]

We should point out that we do not build the HHI and DI indexes for each of the 182 industries that integrate the manufacturing sector. Certain groups of manufacturing industries are, for practical purposes, competitors in the same market. We group the industries into 21 subsectors to take into account this fact. Each concentration measure assumes that all the firms in a subsector belong to the same market. We use the total number of firms that belong to each group of industries to build the concentration measure that corresponds to each subsector. Thus, we estimate a total of 42 subsector measures of the HHI and DI types.

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[1] When the operating expenses ratio increases, there is a decrease in efficiency. When the asset utilization ratio increases there is an increase of resources controlled by the management.
[2] Traditional industrial organization studies analyze firms under the guidelines of the Structure-Conduct-Performance (SCP) paradigm. Particularly, the studies associated to the "Structure-Performance hypothesis" assume that the degree of market concentration is inversely related to the degree of competition.
[3] The DI index is different from the Kwoka's dominance index used to analyze firm size inequality and the number of firms. See Garcia-Alba (1990) and Kwoka (1977).

Methodologically, the HHI and DI variables are built in different ways. Concretely, assuming that m_{ks} represents the share of the firm k in the total product of the subsector s; n is the number of firms in the subsector s, the HHI index is built as:

$$HHI_s = \sum_{k=1}^{n} m_{ks}^2 \tag{3}$$

The DI is built with an index for grouped data proposed by Garcia-Alba (1990). In such index, M_{ts} is the share of the firm average production of the group t in the production of the subsector s, and N_t is the number of firms in group t. [4]

$$DI_s = \sum_{t} N_t \left(\frac{M_{ts}^2}{HHI_s} \right)^2 \tag{4}$$

We use firm size, cash flow and investment opportunities as control variables following some recent studies. Concretely, Adelegen and Ariyo (2008) use them to explain investments in Nigeria. Bokpin and Onumah (2009) also use them to analyze investments of manufacturing firms in several emerging markets. Here we should mention that the opportunities-investment variable that we use is the one proposed by Bøhren, Cooper and Priestley (2007) (the capital-to-output ratio). We use it because it includes the same information as the Tobin's marginal q variable, the traditional measure of investment opportunities, without including market values.

3.3 Modeling specification and econometric techniques

We use a log-linear functional form specification to describe the relationships among corporate governance, market competition and investment decisions. Such specification

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[4] When firm-level data are available Garcia-Alba (1990) defines the DI as:

$$DI_s = \sum_{k=1}^{n} \left(\frac{m_{ks}^2}{HHI_s} \right)^2$$

explicitly assumes a Cobb-Douglas function. Such function allows marginal investment of each independent variable to depend of the amount of the independent available. Econometrically, the log-linear specification allows the regression coefficients to measure the elasticity of investment with respect to each independent variable (determinant). Moreover, the log transformation reduces the possibility of heteroscedasticity problems.

The assessment approach uses two sets of regressions for comparison purposes. The first set includes estimations that use the HHI as measure of market concentration. The second one uses estimations with the DI. We use two sets because both measures can be substitutes and linearly related. Each set also includes the two complementary measures of agency costs for consistency and completeness. Each set is integrated by four regressions that focus on a specific type of firm (micro, small, medium and large). Thus the model specification is:

$$\ln I_{ij} = \alpha_0 + \alpha_1 \ln MC_{ij} + \alpha_3 \ln OE_{ij} + \alpha_4 \ln AU_{ij} + \alpha_5 \ln IO_{ij} + \alpha_6 \ln CF_{ij} + \alpha_7 \ln S_{ij} + \varepsilon_{ij} \qquad (5)$$

where I_{ij} is the log of investment; MC_{ij} is the log of the market concentration measure; OE_{ij} is the log of the operating-expenses ratio; AU_{ij} is the log of the asset utilization ratio; IO_{ij} is the log of investment opportunities; CF_{ij} is the log of the cash-flow variable; S_{ij} is the log of the size of the firm; and ε_{ij} is the random error term.

We use the Ordinary-Least-Squares (OLS) technique to develop the regression analysis. Statistically the OLS technique provides us the best linear unbiased estimators (BLUE) under certain assumptions. Such assumptions include: 1) Linearity of the parameters; 2) Normality of errors, $\varepsilon_{ij} \sim N(0, \sigma^2)$; 3) Homoscedasticity, $VAR[\varepsilon_{ij}] = \sigma^2$; 4) No specification bias in the model; and 5) No perfect multicollinearity. Here we support the adequacy of the OLS

assumptions and the robustness of our results with several complementary statistical tests. Such tests include the Jarque-Bera, the Breuch-Pagan and the Ramseys´ RESET ones.

4. Empirical assessment

We begin by exploring the correlations between the independent variables. Concretely, we use pairwise correlation analysis to assess the degree of collinearity between the operating-expenses and asset-utilization ratios. We also estimate the correlations between the ownership and management indexes. We summarize the statistical results in Table 3.

Table 3. Correlations among the independent variables

Firm Size/ Correlations	Agency cost variables	Market concentration indexes	HHI and asset utilization ratios	HHI and operating expenses ratios	DI and asset utilization ratios	DI and operating expenses ratios
Micro	0.0474 (0.526)	0.7696*** (0.0000)	-0.0052 (0.9447)	0.1691** (0.0229)	-0.0358 (0.6320)	0.0259* (0.089)
Small	0.0858 (0.2509)	0.3697*** (0.0000)	0.0270 (0.7182)	0.1411* (0.0582)	0.2648*** (0.0003)	0.0647* (0.0868)
Medium	-0.0842 (0.2651)	0.2664*** (0.0003)	0.0563 (0.4569)	0.1455* (0.0534)	0.1533** (0.0416)	0.0917** (0.0248)
Large	-0.0881 (0.2503)	0.2598*** (0.0006)	0.0616 (0.4225)	0.0127* (0.0685)	0.1167* (0.074)	0.0497* (0.0517)

The estimations use pairwise correlations. The agency cost variables include the asset-utilization and operating-expenses ratios. The concentration indexes include the HHI and the DI. Significance levels are given in parenthesis. One, two and three asterisks indicate significance levels of 10, 5 and 1 percent respectively.

Table 3 confirms the necessity to use two regression sets to develop the econometric analysis. The results show that the measures of agency costs are complementary and that the ones of market concentration are substitutes. The non significant correlations between the agency cost proxies shows that they are statistically independent and that they can be included in

single regressions. However, this is not the case for the concentration measures. The finding of multicollinearity justifies the necessity to use independent regression sets for the HHI and DI variables. Furthermore the results show significant correlations between the operating-expenses ratio and the concentration measures. This finding suggests the existence of an inverse relationship between market competition and agency costs.

Tables (4) and (5) show the main estimation outcomes for the two sets of regressions defined by model (1). Concretely, Table (4) reports the outcomes for the regressions that use the HHI market concentration variable as determinant of investment decisions. Table (5) reports the outcomes for the regressions that use the DI concentration variable. Furthermore, both tables also report some statistical estimators to assess the adequacy of the regressions ant to support the econometric analysis. These estimators are the Jarque-Bera and Breusch-Pagan ones to assess, respectively, the normality and homocedasticity of residuals.

Table 4. Market concentration measures, agency cost proxies and investment decisions in Mexican manufacturing firms

(OLS regressions that include the Herfindal-Hirshmann Index)

Firm size	Micro	Small	Medium	Large
Regression indicators				
Herfindahl-Hirschman Index (HHI)	0.02	0.37	-0.29*	-0.14
	(0.12)	(1.03)	(-1.68)	(-0.67)
Operating-expenses ratio	0.48**	0.61**	0.99**	0.83**
	(2.44)	(2.48)	(2.53)	(2.45)
Asset-utilization ratio	0.01	0.00	0.00	0.00
	(1.17)	(0.06)	(0.24)	(0.04)
Cash flow	0.19*	0.06	0.33***	0.18***
	(1.76)	(0.62)	(3.90)	(3.04)
Size	0.82***	1.01***	0.63***	0.77***
	(6.76)	(9.27)	(5.55)	(11.73)
Investment opportunities	0.28**	0.49***	-0.11	0.66***
	(2.10)	(2.67)	(-0.45)	(3.18)
Constant	-8.41***	-9.39***	-5.43***	-5.07***
	(-8.15)	(-4.40)	(3.54)	(-3.93)
Observations	181	181	177	172
F	126.52***	115.56***	43.15***	107.43***
Prob > F	0.00	0.00	0.00	0.00
R^2	0.81	0.80	0.60	0.80
Jarque-Bera	2.02	1.14	4.84	4.72
Prob > χ^2	0.15	0.17	0.10	0.11
Breusch-Pagan	6.16	5.50	4.70	1.01
Prob > χ^2	0.13	0.19	0.23	0.31

The dependent variable is investment. The t-statistics are given in parenthesis. One, two and three asterisks indicate significance levels of 10, 5 and 1 percent respectively.

Table 4 reports the outcomes for the first set of regressions. In all the regressions, the coefficients associated to the operating-expense ratio are positive and mostly significant. Furthermore, the HHI coefficient is negative for medium and large firms. Indeed, for medium firms the coefficient is also significant. In most cases the coefficients associated to all the control variables are positive and significant. Thus the results support the claim that the increases in the separation of ownership and control or in the degree of market competition may encourage investment decisions.

Statistically, the goodness-of-fit estimators and complementary tests support the robustness of our results. In all cases, the R^2 estimators are relatively high and the joint significance tests suggest that the all the explanatory variables are necessary. Furthermore, the Jarque-Bera tests do not reject the null hypothesis of normality and the Breusch-Pagan tests do not reject the null hypothesis of homoscedasticity. Thus the regression models seem to explain the relationships among corporate governance, market competition and investment decisions in Mexican manufacturing firms.

Table 5 reports the outcomes for the second set of regressions. Like in the previous table, all the regressions, the coefficients associated to the operating-expense ratio are positive and mostly significant. Interestingly, the DI concentration coefficient is negative and significant for medium *and* large firms. Indeed the t-estimators of the DI variables are more significant than the HHI ones. Thus, from a statistical point of view, the evidence suggests that the DI variable may be a better determinant than the HHI one. Apparently, differences in firms´ size matter. These results confirm and complement the ones regarding the effects of corporate governance and market competition on investment.

The estimation of the goodness-of-fit estimators and complementary tests also confirm our previous findings. Again, the R^2 estimators are relatively high and the joint significance tests suggest that the all the explanatory variables are necessary. Furthermore, the Jarque-Bera tests confirm normality and the Breusch-Pagan tests accept that residuals are homoscedastic. The results again show that the coefficients associated to the control variables are positive and significant in most of the cases. Moreover, they confirm that the asset-utilization ratio is not a significant determinant of investment decisions.

Table 5. Market concentration measures, agency cost proxies and investment decisions in Mexican manufacturing firms

(OLS regressions that include the Dominance Index)

Firm size	Micro	Small	Medium	Large
Regression indicators				
Dominance Index (DI)	0.12	0.32	-0.66***	-0.75**
	(1.13)	(1.17)	(-2.98)	(-2.59)
Operating expenses ratio	0.49**	0.58**	1.03***	0.80***
	(2.52)	(2.35)	(2.69)	(2.42)
Asset utilization ratio	0.01	0.00	-0.00	-0.00
	(1.22)	(0.35)	(-0.34)	(-0.27)
Cash flow	0.20*	0.05	0.35***	0.20***
	(1.82)	(0.50)	(4.14)	(3.32)
Size	0.82***	1.00***	0.63***	0.75***
	(6.81)	(9.22)	(5.69)	(11.53)
Investment opportunities	0.28**	0.49***	-0.06	0.73***
	(2.16)	2.66	(-0.25)	(3.56)
Constant	-8.21***	-9.94***	-6.51***	-6.44***
	(-7.94)	(-5.94)	(-4.19)	(-4.94)
Observations	181	181	177	172
F	127.66***	115.81***	45.65***	112.51***
Prob > F	0.00	0.00	0.00	0.00
R^2	0.81	0.80	0.62	0.80
Jarque-Bera	1.97	1.26	4.41	4.86
Prob > χ^2	0.18	0.21	0.12	0.10
Breusch-Pagan	6.35	5.21	9.60	0.27
Prob > χ^2	0.17	0.22	0.10	0.60

The dependent variable is investment. The t-statistics are given in parenthesis. One, two and three asterisks indicate significance levels of 10, 5 and 1 percent respectively.

One of the main assumptions of the classical linear regression model is that the model is correctly specified. Here we assess this assumption for both regression sets with Ramsey´s RESET tests. Such tests are used to detect omitted variable-bias and/or incorrect functional forms. Here we use two variations of such test. The first one, the traditional RESET test, uses powers of the estimated independent variable as regressors. The second one uses powers of the RHS variables. The null hypothesis in both versions of the test is that the model is adequately specified (see Table 6).

The Ramsey´s RESET tests show that the regressions used to assess the determinants of investment in the medium and large firms do not have specification errors. However such finding does not hold for the micro and small firms. Such errors may occur due to the omission of non-measurable variables that may not be correlated with the corporate governance and market competition ones. We believe that the intuition, the social networks and the experience of the entrepreneurs may be some of these determinants. Thus our findings may be used to justify the necessity to develop qualitative studies to understand corporate decisions in micro and small firms.

Table 6. Specification tests for the regression models

Firm size	Micro	Small	Medium	Large
Models with Herfindhal-Hirschman Index (HHI)				
RESET test (H$_0$: model has no omitted variables	11.81***	8.22***	0.63	1.00
Prob > F	0.0000	0.0000	0.5974	0.3939
RHS-Ramsey test (H$_0$: model has no omitted variables)	2.81***	2.03**	1.44	1.21
Prob > F	0.0003	0.0109	0.1227	0.2604
Models with Dominance Index (DI)				
RESET test (H$_0$: model has no omitted variables	11.61***	8.21***	1.35	1.71
Prob > F	0.0000	0.0000	0.2614	0.1666
RHS-Ramsey test (H$_0$: model has no omitted variables)	3.51***	2.04***	0.89	1.15
Prob > F	0.0000	0.0107	0.5909	0.3128

The table shows the results of the Ramseys´ tests for the two sets of investment-determinant regressions. We show shows two versions of such test. The first one, the traditional RESET test, uses powers of the estimated independent variable as regressors. The second one uses powers of the RHS variables. One, two and three asterisks indicate significance levels of 10, 5 and 1 percent respectively.

We summarize our findings by indicating that the evidence suggests that the separation of ownership and control and market competition may encourage investment decisions. Our findings show that increases in agency costs or decreases in market concentration may increase investment in the manufacturing sector. Indeed the evidence suggests that the DI

variable may be a better determinant than the HHI one. Furthermore, the estimations support the necessity to include firm´ size, investment opportunities and cash flow as explanatory variables. The effects of the control variables on investment are mostly significant and positive.

5. Conclusion and discussion

We have studied how corporate governance and market competition determinants may explain investment decisions of Mexican manufacturing firms. We have studied them with census data of the 182 manufacturing industries, OLS regressions and statistical tests. The empirical study has relied on the estimation of two sets of regressions that include agency cost proxies and market concentration determinants. The agency cost proxies, the operating-expenses and asset-utilization ratios, are measures of the degree of separation between ownership and control. The market concentration measures include the HHI and DI indexes.

The evidence suggests that the separation of ownership and control and market competition may encourage investment decisions among the manufacturing firms. Increases in agency costs or decreases in market concentration may increase investment. Moreover the evidence suggests that the DI may be a better determinant than the HHI one. The estimations also show that the effects of firms´ size, cash flow and investment opportunities are mostly significant and positive. Furthermore, the statistical tests suggest that the regression models explain adequately investment decisions mainly for medium and large firms.

However, we should point out that our findings do no limit themselves to the determination of the significant determinants of capital formation. Statistically, the evidence suggests that

the DI is a better investment-determinant than the HHI. This finding implies that the degree of competition can affected by differences in the size of the firms in the market. The evidence also suggests that the asset-utilization ratio is not a determinant of investment decisions. Furthermore, it suggests that the modeling structure proposed is useful mainly for medium and large firms.

We believe that our findings support some hypotheses regarding corporate governance and market competition. Concretely they support that one that states that the degree of the separation between ownership and control explains investment decisions [Grabowski and Mueller (1972)]. Indeed, the evidence confirms the existence of a positive relationship between cash flows and investment for firms that experience agency problems. Furthermore our findings support the hypothesis that market competition may be an alternative mechanism to encourage corporate practices in emerging economies [Allen (2005)]. We should recall that our findings suggest an inverse relationship between competition and agency costs.

We also believe that our study supports the belief that corporate governance and market competition may encourage economic growth in emerging economies. However, we must recognize that further research on the relationships between corporate finance, industrial organization and economic development is necessary to prove such hypothesis. Mayer (2001), Estrin (2002) and Allen (2005) provide several ideas to study such relationships from different perspectives. Particularly, our findings suggest that further studies on the determinants of investment and corporate decisions may be necessary in the context of micro and small firms. Thus the analysis of these relationships seems a fruitful venue for future research.

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