ESSAYS ON INTERNATIONAL CORPORATE FINANCE

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ABSTRACT

The first chapter examines whether and how concentrated stock markets dominated by a small number of large firms affect economic growth. Using data from 47 countries worldwide relating to the period 1989–2013, I show that a country's stock market concentration is negatively related to capital allocation efficiency, which results in sluggish IPO activity, innovation, and economic growth. These findings suggest that the structure of a concentrated stock market indicates insufficient funds for emerging, innovative firms; discourages entrepreneurship; and is ultimately detrimental to economic growth.

In the second chapter, we challenge the finding of Weld, Michaely, Thaler, and Benartzi (2009). They find that the average nominal price of stocks listed on New York Stock Exchange and American Stock Exchange has been approximately $25 since the Great Depression and that this "nominal price fixation is primarily a U.S. or North American phenomenon." Using a larger data set from 38 countries, we show that the nominal share prices of most stocks in every country are mean–reverting and their best predictor is the beginning of sample period nominal stock prices. We demonstrate that corporate actions maintain these nominal stock price anchors.

The third chapter investigates the executive pay gap between public and private firms. We find that the executive pay gap escalates when there is less supply in potential competent executives, when shareholder's power is stronger, and when a stricter rule on monitoring and disclosure is enacted. These findings largely support the view of the competitive executive labor market hypothesis that executive compensation is determined by market forces and increases when executives bear additional risk. The findings are inconsistent with the argument of the entrenchment hypothesis.

DEDICATION

This dissertation is dedicated to my wife, Min–Young, for her devoted support throughout my Ph.D. study, and to my sons, Taein and Kenneth, who have reminded me of the passion in my life.

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CHAPTER ONE: MOTIVATION AND INTRODUCTION

The primary goal of this dissertation is to investigate various issues in corporate finance in an international context. Specifically, I examine the role of finance on economy, managerial behavior in corporations, and the contractual mechanism of executive compensation in this study. Cross-country differences in economic development, institution and regulation, and corporate governance enable me to test those issues at either country or firm level.

In the second chapter, I investigate whether stock market development boosts economic growth. The primary function of any financial system is to faciliate the efficient allocation of capital and economic resources (Merton and Bodie, 1995). A developed financial market should allocate more capital to more productive, innovative firms. Finance researchers have commonly used financial market size in investigating the relationshp between finance and growth. They assume implicitly that financial market size is commensurate with financial market development.

However, a larger financial market is not necessarily functionally more efficient. For instance, a sizeable stock market may simply allocate more capital to large, doddering firms than to small, emerging ones. This merely causes the stock market to appear larger in terms of capitalization even though it does not allocate funds efficiently. Appropriate measures that capture the functional efficiency of any financial market may need to be established first when the nexus between finance and growth is investigated.

In this chapter I introduce a new measure of stock market functionality—stock market concentration—and explore the relationship between stock market functionality and economic growth. I also investigate the channel through which stock market concentration affects growth. I provide evidence that stock market concentration is negatively associated with capital allocation efficiency, IPOs, innovation, and finally with economic growth. These findings suggest that the structure of a concentrated stock market indicates insufficient funds for emerging, innovative firms; discourages entrepreneurship; and is ultimately detrimental to economic growth.

The third chapter revisits Weld, Michaely, Thaler, and Benartzi's (2009) observation that the average nominal share price of NYSE and AMEX stocks has been approximately $25 since the Great Depression and this "nominal price fixation is primarily a U.S. or North American phenomenon."

We challenge their last conclusion. We term the tendency of stock prices to remain stable as "anchoring" hypothesis. Anchoring is a cognitive bias that describes the common human tendency to rely excessively on the first piece of information offered (the 'anchor') when making decisions. Because anchoring is such a common human trait, we are skeptical that the United States is the only country whose stock markets exhibit this phenomenon.

Using a larger data set of nominal stock prices of individual firms from 38 countries around the world, we compile some evidence in support of the existence of an anchor price in most countries. The nominal price fixation does not appear to be primarily a U.S. or North American phenomenon, but rather a global phenomenon. In other words, anchors are norms, a point made in Weld et al (2009), and norms exist in all countries.

The fourth chapter investigates the executive pay gap between public and private firms. We examine whether the supply in the executive labor market, the institutional protection on shareholder's rights against misappropriation by managers, and the introduction of stricter rules on monitoring and disclosure cause to widen the executive pay gap, noting the observation that each country has different environment in terms of labor market situation and legal, institutional background. This framework of research design enables us to test two competing hypotheses in agency theory: the entrenchment hypothesis and the competitive executive labor market hypothesis.

Conflicts of interest between executives and shareholders in modern public firms suggest two probable scenarios. First, the entrenchment hypothesis predicts that diffused ownership in public firms hinders shareholders from appropriately controlling the firm's managers who then become powerful enough to set their own compensation high, regardless of executive labor market factors. This situation is more pronounced when legal, institutional instrument and monitoring system to protect shareholder's rights is not in place in the country. Second, the competitive executive labor market hypothesis asserts that the firm's managers are controlled through relevant monitoring and incentive scheme and that executive pays are determined by market forces and risk and burden they bear.

We find that the executive pay gap between public and private firms escalates when there is less supply in potential competent executives, when shareholder's power is stronger, and when a stricter rule on monitoring and disclosure is enacted. These findings largely support the view of the competitive executive labor market hypothesis but are inconsistent with the argument of the entrenchment hypothesis.

The fifth chapter summarizes and concludes this study.

CHAPTER TWO: STOCK MARKET CONCENTRATION, ENTERPRENEURSHIP, AND ECONOMIC GROWTH

Because of their role in financing new ideas, financial markets keep alive the process of "creative destruction"—whereby old ideas and organizations are constantly challenged and replaced by new, better ones. Without vibrant, innovative financial markets, economies would invariably ossify and decline. (Rajan and Zingales, 2003, p. 1)

2.1. Introduction

One of the most important functions of financial markets is to nurture entrepreneurship by facilitating funding for new, innovative firms. An effectively functioning stock market allocates capital efficiently, providing sufficient funds to emerging, productive firms, which in turn breeds competition and innovation, and ultimately fuels economic growth. However, the existing literature has not established a robust relationship between stock market development and economic growth (Zingales, 2015). [1] Previous studies have typically used stock market capitalization over GDP, or the size of a stock market, as a proxy for stock market development. But the size measure may not be a good proxy for the functional efficiency of a stock market. Nor is stock market capitalization a precise measure of the size or quantity of funds raised in the stock market, because it accounts for both the issuance of stocks and the past performance (retained earnings) of firms, and reflects expectations of their future performance (Rajan and Zingales, 1998).

In this chapter, I propose a new measure of stock market functionality which I term "stock market concentration" and examine its relationship with capital allocation efficiency, initial public offerings (IPOs), innovation, and economic growth, using data from 47 countries worldwide relating to the period 1989–2013. The extent of stock market concentration is computed annually as the sum of the stock market capitalizations of the largest five or ten firms divided by the total stock market capitalization of a country's domestic stock exchanges. The idea is that a concentrated stock market dominated by a small number of large firms is likely to indicate the impediment to access to necessary funds for small new firms. My empirical goal for the new measure of stock market functional efficiency in this study is broadly twofold: to investigate the

[1] For example, Levine and Zervos (1998) find that stock market capitalization over GDP is not robustly correlated with economic growth, capital accumulation, or productivity improvements.

relationship between stock market functionality and economic growth, and to examine the channel through which the former affects the latter.

Stock market concentration is also related to the fate of the largest businesses in an economy because the rise and persistence of the largest firms intensifies the level of concentration. Fogel, Morck, and Yeung (2008) find that big business stability is negatively associated with future economic growth. Their finding suggests that the long–lasting prosperity of the largest firms implies that old, large firms in a country are not challenged and replaced by small new firms, resulting in a slow creative destruction process and economic growth, confirming Schumpeter's (1912) idea. Schumpeter (1912) also asserts that well–functioning financial markets are important in the real economy because they facilitate the creative destruction process by allocating funds to small new firms with innovative ideas for coping with old, large ones. Thus, according to Schumpeter (1912), whether stock market concentration captures the prosperity of the largest firms or is an inverse proxy for stock market functionality, it is expected to be negatively associated with future economic growth.

I begin the analysis by investigating the relationship between stock market concentration and capital allocation efficiency. This experiment is an important step because I should see a negative correlation between the two, to the extent that the concentration measure is a good proxy for the inverse level of stock market functionality. Following Wurgler (2000), I construct a measure that captures the efficiency of capital allocation at the industry level of each country. By regressing the growth rate of gross fixed capital formation (investment) in an industry on the growth rate of value added in that industry, I estimate the degree of efficiency in allocating capital; that is, the extent to which a country increases investment in its growing industries and decreases investment in its declining industries. I then run cross–sectional regressions of the capital allocation efficiency measure on stock market concentration. I find that stock market concentration is indeed negatively correlated with the proxy for capital allocation efficiency, suggesting that a highly concentrated stock market is less likely to allocate necessary capital to young, innovative firms that make efficient use of capital.

Next, I examine the relationship between stock market concentration and economic growth. Following the approach of King and Levine (1993), which relies on the "post hoc ergo propter hoc" (after this, therefore, because of this) argument, I regress real per capita GDP growth rates in year *t* on stock market concentration in year *t*–5 or *t*–10. Using lagged values of stock market concentration allows me to investigate the long–term effects of concentration on economic growth and to partially address concerns over reverse causality bias. Additionally, I run two–stage least squares and country fixed–effects regressions to further address endogeneity concerns.

I find that stock market concentration is a good predictor of economic growth in the subsequent five or even ten years and has large economic implications.[2] For example, a one standard deviation decrease (0.186) in stock market concentration by the top five firms in a basic regression predicts an increase of approximately 0.74 percentage points in real per capita GDP growth rates in five years. This effect is economically significant considering that the average real per capita GDP growth rate in the sample is 2.26%. The magnitude of the impact is more substantial if the effects are accumulated. Also worth noting is that the negative effect of stock market concentration on economic growth is more severe when a society is more bureaucratic or corrupt, implying that a severely concentrated stock market is more problematic if it is locked in with bad institutions.

I also examine the relationship of stock market concentration with IPOs and innovation. I hypothesize that stock market concentration adversely affects future economic growth through a negative effect on entrepreneurship by constricting the financing and innovative activities of new, innovative firms. Although a large body of literature investigates the relationship between finance and economic growth, the specific channels through which finance affects growth remain relatively unknown. Identifying the channels also affirms—at least partly—the causal link from finance to growth.

To the extent that the structure of a concentrated stock market suggests the difficulty faced by new, innovative firms in accessing the stock market and obtain necessary financing, I expect a country with high stock market concentration to have fewer IPO and innovative activities, which in turn slows its economic growth. To test this hypothesis, I run panel regressions of the IPO and innovation variables in year t on stock market concentration in year $t–5$ and find that stock market concentration is indeed negatively associated with IPO and innovation proxies. In the final empirical approach, I employ two–stage regressions to check the link between stock market concentration, access to funds by innovative entrepreneurs, and economic growth. I first estimate

[2] Stock market concentration in year t is not negatively correlated with contemporaneous (year t) economic growth but is negatively correlated with future (year t+5, t+10) economic growth. This finding may loosely imply a causal effect of stock market concentration on economic growth.

IPO and innovation activities at a certain level of stock market concentration by regressing them on concentration. Then I run real per capita GDP growth rates on the estimated IPO and innovation activities, finding that they are significantly correlated with economic growth. These results reaffirm that a dysfunctional stock market prevents small, new, but innovative firms from accessing the funds they require, which in turn hurts economic growth.

Whether finance makes a significant difference to economic growth is a classic debate. There are two opposing views on the relationship between finance and growth. The first is that financial markets are critical to economic growth; a well–functioning financial market facilitates the financing of new ideas by innovative entrepreneurs, which promotes the innovation that boosts a country's economic growth (Schumpeter, 1912; Goldsmith, 1969; McKinnon, 1973; Miller, 1998). The other view is that the financial system is a mere sideshow, responding passively to the demands created by economic development (Robinson, 1952; Lucas, 1988). Distinguishing between the two views has enormously important implications for policymakers, particularly in developing economies. Extensive studies on this important issue assert that financial development promotes economic growth (King and Levine, 1993; Levine and Zervos, 1998; Beck, Levine, and Loayza, 2000; Rousseau and Wachtel, 2000; Beck and Levine, 2004).[3] However, these studies focus mainly on the credit market and we still lack concrete evidence indicating that stock market development contributes to economic growth. Additionally, in the wake of the global credit crisis of 2008, several studies have questioned the benefits of financial (credit) market development, even suggesting that too much finance (credit) may not only not promote growth, but can even hurt it (Arcand, Berkes, and Panizza, 2012; Cecchetti and Kharroubi, 2012; Schularick and Taylor, 2012; Beck, Degryse, and Kneer, 2014; Mian and Sufi, 2014).

My study contributes to the literature in several ways. First, it introduces a new measure of the functional efficiency of the stock market, which is more relevant to theories on the role of finance. The existing literature focuses primarily on size measures (i.e., stock market capitalization over GDP for the stock market and credit amount over GDP for the credit market). Studies tend to assume implicitly that the development of a financial market is commensurate with its size. Once

[3] These articles are based on country–level analysis. Jayaratne and Strahan (1996) add evidence on the positive finance–growth nexus using state–level data for the United States. Rajan and Zingales (1998) provide industry–level evidence. Demirgüç–Kunt and Maksimovic (1998) and Guiso, Sapienza, and Zingales (2004) suggest that firm–level growth is associated with financial development. Levine (2005) provides a good survey of the literature on finance and growth.

this assumption is broken, there is no theoretical reason to maintain that a large financial market boosts economic growth. Second, this study provides evidence, with the new measure, indicating the positive role of a well–functioning stock market on the real economy. A large body of literature has paid attention to the credit market; the role of the stock market has not been studied extensively (Zingales, 2015). Third, this study suggests a probable channel through which finance affects growth. Its analysis shows that once a stock market is concentrated—indicating the difficulty of providing funds to small new firms—competition and innovation are discouraged. Such a situation is ultimately detrimental to economic growth.[4]

This chapter proceeds as follows. Section 2.2. elaborates on the data collected for the analysis, the variable constructions, and provides summary characteristics. Sections 2.3. and 2.4. examine the relationships between stock market concentration and both capital allocation efficiency and economic growth. Subsequently, Section 2.5. explores the relationships between stock market concentration and IPOs and innovation. Finally, Section 2.6. concludes.

2.2. Data and Summary Characteristics

2.2.1. Data and variables

Appendix A describes the data sources and the variable definitions used in the paper. To create stock market concentration variables, I first search for the stock market capitalization (stock price times the number of shares outstanding) of all firms listed on domestic stock exchanges in each country at the end of each year, as registered on Datastream. I sort the firms by market capitalization to identify the largest five or ten in each country in each year. I then divide the sum of the stock market capitalization of the largest five or ten firms by the total stock market capitalization of their country's domestic stock exchanges and term the variables *Mkt. Con. (top 5 (10) firms)*.

I compute stock market concentration from 1989 because it is from this year that reliable data are available on the market capitalization for both developed and developing economies. The computation ends in 2008 because I use five–year preceding values of stock market concentration

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[4] The inference that the function of financial markets is especially related to new, small firms' financing is in accord with Rajan and Zingales (1998) and Cetorelli and Gambera (2001). Rajan and Zingales (1998) provide the evidence that financial development promotes growth in the number of new firms rather than increasing the average size of existing ones. Cetorelli and Gambera (2001) find that bank concentration facilitates credit access to small young firms, even though bank concentration itself depresses economic growth in general by constricting the funds provided to old firms.

in the regressions of real per capita GDP growth rates—the main dependent variable—for which data are available up to 2013. Countries must have at least 40 listed firms in each year throughout the sample period to be included in the final sample. This restriction results in the variables being constructed for a sample of data for 47 countries from 1989 to 2008. I then collect data for these 47 countries from the same period on other financial development measures commonly used in the literature from the World Development Indicators (WDI) of the World Bank: total market capitalization for firms listed on domestic stock exchanges over GDP (*Mkt. Cap. / GDP*), the value of shares traded on domestic stock exchanges over market capitalization (*Turnover / Cap.*), and domestic credit provided to the private sector over GDP (*Credit / GDP*).

I create dependent variables for four different categories: economic growth, capital allocation efficiency, IPOs, and innovation. The proxy for economic growth is the annual per capita GDP growth rate ($\Delta\, ln(y)$, *%)* in real terms, which is computed as:

$$\Delta\, ln(y) = (ln(per\ capita\ GDP_t) - ln(per\ capita\ GDP_{t-1}))\ \times 100, \qquad (1)$$

where *per capita GDP* is in constant 2005 U.S. dollars and is collected from the WDI of the World Bank. The variable is constructed for 1994–2013, the period following that of stock market concentration data with a five–year time lag.

I follow Wurgler (2000) in collecting data and measuring the elasticity of capital allocation as a proxy for the capital allocation efficiency of each country. The data come from the Industrial Statistics Database of the United Nations Industrial Development Organization (UNIDO).[5] The 2013 version of the data source provides industry–level data on the amount of investment and value created by 151 manufacturing industries of 135 countries for 1991–2010, approximately overlapping with the period for data on real per capita GDP growth rates (UNIDO, 2014).

The elasticity of capital allocation (β_c) is estimated using the following regression:

$$ln\, \frac{I_{cit}}{I_{cit-1}} = \alpha_c + \beta_c\, ln\, \frac{V_{cit}}{V_{cit-1}} + \varepsilon_{cit}\ , \qquad (2)$$

[5] The official title of the CD–ROM for the data used is “Industrial Statistics Database at the 3– and 4–digit level of ISIC Code (Revision 3)” or “INDSTAT4 2013 ISIC Rev.3.” I use data at the three–digit International Standard Industrial Classification (ISIC) code level, following Wurgler (2000).

where I_{cit} and V_{cit} are gross fixed capital formation and value added in industry i of country c in year t, respectively. In regressing the growth rate of fixed capital formation (investment) in an industry on the growth rate of value added in that industry, I expect the coefficient (β_c) to capture the degree of efficiency in allocating capital. That is, the coefficient should capture the extent to which a country increases investment in its growing industries and decreases investment in its declining industries.

I apply the same data screening process elaborated by Wurgler (2000). First, I require a country to have at least 50 industry–year pairs of fixed capital formation and added value. Second, I exclude data for which the absolute value of fixed capital formation growth or value–added growth is greater than one. Third, I also dismiss industry observations for which the value added is less than 0.1% of the country's total value added in each year. This screening process results in data for 32 countries of the countries in the basic data set.

Following La Porta, Lopez–de–Silanes, Shleifer, and Vishny (1997), I create two variables as proxies for IPO activity: *IPO Amount / Pop.* and *IPO No. / Pop.*[6] *IPO Amount (No.) / Pop.* is calculated as the natural logarithm of one plus the IPO proceeds (the number of IPOs) in a year divided by a country's population.[7] These variables capture the amount of financing by new firms and the number of new firms entering the market scaled by population.

To collect and screen the IPO data, I refer to Doidge, Karolyi, and Stulz (2013). First, I collect all equity issuance data flagged as original IPOs from the SDC Platinum Global New Issues Database of Thomson Reuters.[8] Then I exclude international issuances, including American Depository Receipts (ADRs), and IPO data flagged as private placements. I also delete IPO data related to real estate investment trusts and investment funds (Standard Industrial Classification (SIC) codes: 6722, 6726, 6798, 6799), investment advice companies (6282), and special purpose finance companies (6198). In addition to the restrictions imposed by Doidge et al. (2013), I drop

[6] La Porta et al. (1997) employ only one variable as a proxy for IPOs (the number of IPOs divided by a country's population).

[7] The log transformation makes the dependent variables conform more to the normal distribution. I add one before taking the log because there are no IPOs in some country–year observations. I make the same adjustment when creating patent proxies.

[8] The database is frequently used in cross–country studies on IPOs; however, Henderson, Jegadeesh, and Weisbach (2006) and Gozzi, Levine, and Schmukler (2010) note that the international IPO data in the SDC Platinum Global New Issues Database are incomplete before 1991. I assume that most IPO activities for the sample countries are contained in the database because the sample period in this study starts in 1994; however, due caution is deemed necessary.

government–related IPOs (SIC codes in the 9000s) because a government agency's decision to pursue an IPO may not be affected by the functional efficiency of the stock market. Ultimately, this leaves me with IPO data for 46 of the countries in the basic data set for 1994–2013, the same period for the data on real per capita GDP growth rates.

Typically, cross–country studies on innovation use data on patents filed with the U.S. Patent and Trademark Office (USPTO) as a proxy for innovation (Acharya and Subramanian, 2009; Hsu, Tian, and Xu, 2014). Following Hsu et al. (2014), I utilize four innovation proxies derived from the number of patents submitted by individuals or non–government entities and approved by the USPTO, and the quality measures of the patents. The data are collected from the National Bureau of Economic Research (NBER) Patent Database, which provides detailed data on patents relating to the period 1976–2006. I aggregate various patent data at the country level in each year.

Patent / Pop. is the natural logarithm of one plus the number of patent applications (subsequently approved) in a year divided by a country's population. *Citation / Pop.* is the natural logarithm of one plus the number of citations received by the patents in a year divided by a country's population. Because citations can be received beyond 2006, the number of citations is adjusted for the truncation using the weighting factors from Hall, Jaffe, and Trajtenberg (2005), as in Hsu et al. (2014). *Generality / Pop.* is the natural logarithm of one plus the generality level of the patents in a year divided by a country's population. Generality measures the number of technology classes of patents that cite the submitted patent. *Originality / Pop.* is the natural logarithm of one plus the originality level of the patent in a year divided by a country's population. Originality measures the number of technology classes of patents as cited by the submitted patent. Whereas *Patent / Pop.* represents the quantity of patents, the other three variables correspond to the quality of the patents that supplement the former. Because the measures are related to the patents approved by the USPTO, data on the United States are excluded. The result is a sample of patent variables that matched the 43 countries in the basic data set from 1994 to 2006.

2.2.2. Summary statistics

Panel A of Table 2–1 presents the average value of the financial market development proxies and the dependent variables of four different categories for 47 countries during the sample period. First, the average value of stock market concentration displays quite large variations even among developed countries. The *Mkt. Con. (top 5 (10) firms)* values of Finland, Ireland, and the

Netherlands are 0.51 (0.61), 0.58 (0.73), and 0.53 (0.69), respectively, whereas those of Canada, Japan, and the United States are only 0.14 (0.22), 0.13 (0.20), and 0.09 (0.14), respectively. Among developing economies, the *Mkt. Con. (top 5 (10) firms)* values of Hungary and Kenya are conspicuously large at 0.76 (0.86) and 0.54 (0.74), respectively, whereas those of Brazil and China are quite low, at 0.09 (0.12) and 0.13 (0.18), respectively. Figure 2–1 presents the average stock market concentration of the largest five (ten) firms for the sample countries during 1989–2008, allowing visualization of the significant variations in the stock market concentration of these countries.

(SEE FIGURE 2–1)

Panel A of Table 2–1 shows that the size of the financial markets of the sample countries varies significantly. The *Mkt. Cap. / GDP* of Hong Kong is the highest at 3.01. In contrast, that of Bangladesh is merely 0.04. The *Credit / GDP* is 1.96 for Japan but only 0.17 and 0.18 for Argentina and Romania, respectively.

One may expect stock market concentration to be highly negatively correlated with stock market size or liquidity. That is, it is more likely that large companies will dominate a smaller or less liquid stock market, resulting in greater stock market concentration. However, Table 2–1 shows many contrary cases. For example, Hong Kong has very large stock markets in relation to the size of its economy (*Mkt. Cap. / GDP*: 3.01) and they are very concentrated (*Mkt Con (top 5(10) firms)*: 0.40 (0.53)). Switzerland also has stock markets that are large (*Mkt. Cap. / GDP*: 1.73) and concentrated (*Mkt Con (top 5(10) firms)*: 0.46 (0.58)). The stock markets in the Netherlands are fairly large (*Mkt. Cap. / GDP*: 0.88) and liquid (*Turnover / Cap.*: 1.03), but also concentrated (*Mkt Con (top 5(10) firms)*: 0.53 (0.69)).

The sample countries' economies present different levels of economic growth, capital allocation efficiency, IPOs, and innovation. For example, China's economy grew almost 9% per capita annually for two decades, whereas that of Italy grew a mere 0.41% per capita annually during the same period. In terms of capital allocation efficiency, the elasticities of France and Italy are 1.07 and 1.16, respectively, whereas that of Indonesia is only 0.07. With respect to IPO activity, Australia and Hong Kong show the most dynamism when scaled by their populations. In terms of innovation, Japan and Switzerland present the highest number of patent applications and citations scaled by population. Meanwhile, IPO and innovation activities in countries such as Bangladesh, Pakistan, and Sri Lanka are dormant.

Panel B of Table 2–1 reports the correlations between the key variables: financial market development measures and the dependent variables in four categories. The variables tagged with "at *t*–5" (*Mkt. Con. (top 5(10) firms)*, *Mkt. Cap. / GDP*, *Turnover / Cap.*, and *Credit / GDP*) are those observed five years earlier than the dependent variables.

A few interesting features are worth noting. *Mkt. Con (top 5(10) firms)* are only weakly negatively correlated with *Mkt. Cap. / GDP* (–0.04 and –0.07, respectively) and *Turnover / Cap.* (–0.03 and –0.05, respectively). This feature suggests that stock market concentration is a unique stock market characteristic that is different from the stock market's size or liquidity. The most interesting point of the correlation matrix is that the stock market concentration variables are negatively associated with future per capita GDP growth, the elasticity of capital allocation, and the proxies for IPOs and innovation—representing the main finding of this paper. Intriguingly, the size variables, *Mkt. Cap. / GDP* and *Credit / GDP*, are negatively correlated with per capita GDP growth even though they are positively correlated with the IPO and innovation proxies. I now investigate these findings in greater detail using multivariate regression models.

(SEE TABLE 2–1)

2.3. Stock Market Concentration and Capital Allocation Efficiency

In this section, I regress capital allocation efficiency on stock market concentration in order to confirm that the concentration measure is a good proxy for the inverse level of stock market functionality. Specifically, I test whether a more concentrated (less diversified) stock market allocates capital less efficiently. The measure of stock market concentration could inversely reflect the level of allocation efficiency to the extent that a highly concentrated stock market is less likely to allocate the necessary capital to young, emerging firms.

Table 2–2 reports the results of cross–sectional regressions of the efficiency measure (elasticity) of capital allocation on stock market concentration and the other financial market characteristics, while controlling for per capita GDP. These regressions are analogous to the basic regression model in Wurgler (2000). I calculate the elasticity of capital allocation from 1991 to 2010 for 32 countries.[9] I average per capita GDP for the same period, and average the

[9] The following 15 countries lack data and are excluded in the regressions: Argentina, Bangladesh, Brazil, Canada, China, Colombia, Egypt, Hong Kong, Kenya, Pakistan, Peru, South Africa, Sri Lanka, Switzerland, and Thailand.

concentration and other financial market characteristics for the period for which the data are available, 1989–2008.[10]

Table 2–2 shows that the financial market size variables, *Mkt. Cap / GD*P (stock market) and *Credit / GDP* (credit market), are not significantly positively associated with the capital allocation efficiency for the sample period. The coefficient of *Turnover / Cap.*, the liquidity measure of the stock market, in specification (4) is significantly positive but loses significance when the stock market concentration variables are included. In contrast, Table 2–2 shows that stock market concentration is significantly and negatively correlated with the elasticity of capital allocation, even when the other financial market variables are included—although the significance of the coefficients of *Mkt. Con. (top 10 firms)* is marginal. Overall, this result confirms the hypothesis that a more concentrated stock market is associated with less efficient capital allocation. It also assures that the stock market concentration measure is a fairly good proxy for the inverse level of stock market functionality to the extent that a better–functioning stock market allocates funds more efficiently.

(SEE TABLE 2–2)

2.4. Stock Market Concentration and Economic Growth

2.4.1. Regressions of real per capita GDP growth rates on stock market concentration

A common finding in the literature on finance and growth is that the effect of finance on growth occurs over a long period of time. Comparisons of contemporaneous financial development measures and economic growth are thus seldom meaningful. I therefore regress the economic growth of country *c* in year *t* on stock market concentration and other financial development measures in year *t*–5 by controlling for macroeconomic variables shown by the literature to affect economic growth. Using lagged values of stock market concentration allows for an investigation into the long–term effects of concentration on growth and partially addresses concerns over reverse causality bias. Specifically, I estimate the following regression model:

$$Per\ Capita\ GDP\ Growth_{c,t} = \beta_0 + \beta_1\ Mkt.Con\ (top\ 5\ (10) firms)_{c,t-5}$$

[10] I want to see if the current level of stock market concentration is correlated with future capital allocation efficiency to establish the causal relationship, but the duration of the data is short and does not permit this line of enquiry. The period for the data on concentration falls approximately into the same period as that for the elasticity measure but precedes it by two years.

$$+ \beta_2 \; Mkt.Cap./GDP_{c,t-5} + \beta_3 \; Turnover \; / \; Cap._{c,t-5}$$
$$+ \beta_4 \; Credit \; /GDP_{c,t-5} \; + \; \sum_{i=5}^{n} \beta_i \; Control\,Variable_{c,i,t} + \varepsilon_{c,t} \quad (3)$$

Following the literature, I add the following control variables to the regressions: *Initial per capita GDP*, the natural logarithm of real per capita GDP in 1993; *Initial Education*, the natural logarithm of the average number of years of education received by individuals aged 25 and older in 1990; *Gov. Spending / GDP*, general government consumption divided by GDP; *Inflation*, inflation rates represented by the GDP deflator; and *Openness / GDP*, the sum of the export and import of goods and services divided by GDP.[11] Following Petersen (2009), the estimated standard errors in the regressions are clustered by both country and year to draw statistical implications.[12]

Table 2–3 presents the output of the panel regressions of real per capita GDP growth rates on the five–year lagged variables of stock market concentration, other stock market characteristics, and the level of credit provided in a country. The signs of the macroeconomic variables are in line with the findings of previous studies. *Initial per capita GDP* and *Gov. Spending / GDP* are negatively associated with future per capita GDP growth, confirming the converging effect of economic growth and the crowding–out effect of government spending. Meanwhile, the initial levels of human capital (*Initial Education*) and trade openness (*Openness / G*DP) of a country are positively related to future growth, implying the positive effect of human capital and the openness of an economy on growth.

I find that stock market size (*Mkt. Cap. / GDP*) is not positively and significantly associated with economic growth five years later. This finding is consistent with Levine and Zervos (1998), who do not find robust correlation between stock market size and economic growth. However, unlike Levine and Zervos (1998), the liquidity measure (*Turnover / Cap.*) here is not significantly correlated with future growth, even though the signs of the coefficients are all positive. Even more intriguing is that *Credit / GDP* is negatively related to future economic growth, consistent with recent papers suggesting that a credit amount exceeding a certain level is disadvantageous to

[11] The data on *Initial Education* are available only once in the ten years before the 2000s in the United Nations' International Human Development Indicators. Therefore, I use the 1990 data as an alternative measure of the initial education level at the beginning of the regression period.
[12] Standard errors based on double clustering generate more conservative *t*–statistics than for only country–level clustering in all regressions in this paper. However, the double–clustering correction method does not produce stable standard errors and *t*–statistics of year or country dummies when included in the regressions. I subsequently use the country–level clustering correction method in year and country fixed–effects regressions.

economic growth.[13] The issue of the appropriate credit level for the size of an economy is the subject of serious debate, particularly after the financial crisis of 2008, because more credit does not always seem to benefit an economy.[14]

The stock market concentration variables are consistently and statistically significant regardless of whether the other stock market characteristics of size and liquidity are included in the regressions. Stock market concentration also has large economic implications. A one standard deviation decrease (0.186) in the level of stock market concentration by the top five firms, *Mkt. Con. (top 5 firms)*, in a basic regression (specification (1)) predicts an increase of approximately 0.74 percentage points in real per capita GDP growth rates in five years (–0.186 × –3.98). This effect is economically significant considering that the average real per capita GDP growth rate in the sample is 2.26%. The magnitude of the impact becomes more substantial if the effects are accumulated.

I run a series of robustness tests. First, I include year fixed–effects with standard errors clustered by country in the regressions. Second, I rerun the regressions excluding China because it is a definite outlier in a scatter plot of stock market concentration versus real per capita GDP growth rates. Third, I winsorize all variables at the 1% and 99% levels to formally address the concern of outliers and repeat the regression analysis. Fourth, I include bureaucracy and corruption indices retrieved from the World Competitiveness Center of the International Institute for Management Development (IMD) in the regressions to control for the effect of institutions on economic growth.[15] Finally, I regress real per capita GDP growth rates on the ten–year lagged values of stock market concentration, the other stock market characteristics, and credit measures with other contemporaneous macroeconomic variables (Appendix B). Both stock market concentration variables are significant at the 1% level in all of these additional tests.

(SEE TABLE 2–3)

2.4.2. Endogeneity tests

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[13] For example, Arcand et al. (2012) find that the credit provided to the private sector over GDP (%) has a negative impact on economic growth as long as it exceeds 100%.

[14] An extreme case is Iceland. The credit provided to the private sector over GDP (%) in 2006 and 2007 were 320% and 248%, respectively, whereas the average values in the sample countries in this paper in the same period were 97% and 100%, respectively. Iceland's banking sector was blamed for providing excessive credit to its economy when the country was hit by the worldwide financial crisis in 2008.

[15] The indices are available from 1995. The regression period thus runs from 1995 to 2013.

Using lagged values of stock market concentration in the regressions partially addresses concerns over reverse causality bias. However, if unknown time–invariant country characteristic variables are correlated with both stock market concentration and future economic growth—causing a spurious relationship between the two variables—the endogeneity concern remains. Thus, in this section, I run two–stage least squares regressions using instrument variables and country fixed–effects regressions.

2.4.2.1. First–stage regressions

In order to employ two–stage least squares regressions, I search for exogenous instrument variables that are possibly correlated with stock market concentration but are not related to real per capita GDP growth rates other than through the effect of concentration. As a preliminary step, I delve into factors that may be correlated with stock market concentration. I look into the probable factors that can be subsumed under physical, economic, institutional, and financial grounds and formally test in a regression format whether these factors are correlated with stock market concentration.

First, as shown in Figure 2–1, large countries tend to have less concentrated stock markets. Even firms with large stock market capitalization may represent only a small portion of the entire economy of a large country. I include real GDP deflated by a GDP deflator and the territory size of a country as proxies for a country's economic and physical size.

Second, the trade theory of comparative advantage asserts that small, open countries choose specialization and concentration because of optimal economies of scale (Dornbusch, Fischer, and Samuelson, 1977; Dixit and Norman, 1980). Strategically, these countries may have a few large companies rather than many small and medium–sized businesses, which leads to higher stock market concentration. To capture this economic feature, I consider a country's export of goods and services over its population as a proxy for the level of its dependence on exports relative to its population.

Third, I examine the possibility that economic institutions affect the extent of a country's stock market concentration. For example, a bureaucratic, corrupt government may provide business favors to large companies for political ends, which would elevate the level of concentration. I include *Gov. Spending / GDP* in the regressions as a proxy for government clout and the bureaucracy index gauged by the World Competitiveness Center of the IMD.[16]

Fourth, La Porta et al. (1997) find that civil law countries with poorer investor protections have the least developed capital markets. To the extent that the stock market concentration variables capture the (inverse) functionality level of a stock market, the stock market concentration is correlated with a country's legal origin and level of investor protections. Thus, I include French, German, and Scandinavian dummies that are equal to one if a country's commercial laws originate from French, German, or Scandinavian civil law traditions, and zero otherwise.

I also include the anti–self–dealing index that measures the extent of minority shareholder protections.[17] The regressions also contain *Mkt. Cap. / GDP*, *Turnover / Cap.*, and *Credit / GDP* in consideration of the possibility that the other financial characteristics may provoke higher stock market concentration. Additionally, Ferreira and Matos (2008) find that foreign institutional investors have a strong preference for large companies. Therefore, I add to the regressions a country's foreign portfolio equity inflows scaled by its GDP.

Table 2–4 shows that various factors, not just a single element, influence the level of stock market concentration.[18] A larger country characterized by high total GDP or vast territory tends to have lower stock market concentration as predicted. International trade theory asserts that a small, open economy represented by *Export / Pop.* has higher stock market concentration. French and German civil law traditions, in contrast to English common law, and weaker minority investor protection (lower anti–self–dealing index) induce higher stock market concentration, as affirmed by the law and finance literatures. Portfolio equity inflows from foreign investors also increase stock market concentration. Together, all of these factors explain more than 50% of the variation in stock market concentration. Table 2–4 presents interesting findings itself and serves as the first–stage regressions in two–stage least squares regressions.

(SEE TABLE 2–4)

2.4.2.2. Second–stage instrument and country fixed–effects regressions

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[16] The center also provides a corruption index, but it is highly correlated with the bureaucracy index. I only include the bureaucracy index due to the multicollinearity concern.

[17] The anti–self–dealing index is retrieved from Djankov, La Porta, Lopez–de–Silanes, and Shleifer (2008).

[18] The bureaucracy index is available only from 1995 and for 41 countries. The anti–self–dealing index is available for 46 countries.

Among the factors that are correlated with stock market concentration, as shown in Table 2–4, I select territory size and legal origin as exogenous instruments. There is little reason to expect that larger country size or English common law origin relates directly to higher economic growth rates. Subsequently, I formally test the exogeneity of these instruments.

Specifications (1) to (4) in Table 2–5 present the output of the second–stage instrumental variable regressions. In regression specifications (1) and (2), a country's territory size is utilized as an instrument. In regression specifications (3) and (4), both the territory size and the English legal origin dummy are used. The *F*–test in the first–stage regressions strongly suggests that the instruments are relevant, rejecting the hypothesis of weak instruments. More importantly, Table 2–5 shows the negative relationship between stock market concentration and future real per capita GDP growth rates in all specifications. In specifications (3) and (4), following Aggarwal, Erel, Ferreira, and Matos (2011), I inspect the exogeneity of the instruments on the dependent variable using over–identification tests because the number of instruments used is greater than the number of instrumented variables. The Hansen J–test does not reject the hypothesis that at least one of the instruments is exogenous to the dependent variable.

I also run country fixed–effect regressions to further mitigate the endogeneity concern. Specifications (5) and (6) in Table 2–5 present the results.[19] The signs of the coefficients of all of the variables are similar to those of the pooled ordinary least squares (OLS) regressions in Table 2–3. *Mkt. Con. (top 5 (10) firms)* are significantly negatively associated with future real per capita GDP growth rates in the regressions when formally controlling for time–invariant country effects.

(SEE TABLE 2–5)

2.4.3. Stock market concentration and stability

Because stock market concentration is derived from firms' stock market capitalizations and involves a firm's current performance and future prospects, stock market concentration by the largest firms represents the fate of big businesses and, thus, is closely related to the stability measure of Fogel et al. (2008). They show that the stability of the largest businesses in a country (or, reversely, their turnover) is negatively (positively) associated with the country's economic growth. Their finding supports the idea expressed by Schumpeter (1912) that "creative

[19] The double–clustering correction method in Petersen (2009) does not produce stable standard errors and *t*–statistics of country dummies, even though the stock market concentration variables are significant at the 5% level in an unreported table. I thus present a country–level clustering correction method in these regressions.

destruction"—the process through which technological innovation evolves by disavowing a battered, current regime and building a novel, new system—is critical to economic development.

I investigate whether the stock market concentration measure is differentiated from the stability measure. I construct the stability measure by counting the number of firms that remain in the top five (ten) list of firms in both the current year and five years ago and divide this number by five (ten). This measure lies between zero and one, the latter corresponding to perfect stability of the biggest five (ten) firms.

The stability measure in this paper differs from that in Fogel et al. (2008) in a number of ways. First, they define a large business as the union of firms or business groups. Second, in their study, the proxy for business size is the number of employees. Third, they consider that big businesses are stable if they subsequently remain in the top business list or their employment grows no slower than the country's GDP. Given the difference in measurement, it would be meaningless to compare the stability and concentration measures directly. In this experiment, I simply check whether stock market concentration captures a different aspect—stock market functionality—and not only the stability of the largest businesses in a country.

In Table 2–6, I add to the regressions the stability measure, in addition to other variables analyzed in Table 2–3.[20] For specifications (1) to (3), the stock market concentration and stability measures are derived using the top five firms, and using the top ten firms for (4) through (6). The stability measures are negatively associated with real per capita GDP growth rates, whether constructed with the top five or ten firms, confirming the findings in Fogel et al. (2008). The stock market concentration variables remain significant when included with the stability measures in specifications (3) and (6), suggesting that stock market concentration represents a different aspect of a financial market or an economy, not just the prosperity of the largest businesses. Moreover, both stock market concentration and the stability of large businesses are related to negative economic consequences.

(SEE TABLE 2–6)

2.4.4. Stock market concentration and institution

So far, the evidence indicates a negative relationship between stock market concentration

[20] The sample period in Table 2–6 is 1994–2008 because the stability measure drawn from stock market concentration is available until 2008 and is not a lagged variable.

and economic growth. However, the negative effect of concentration is not necessarily even in all countries; assuming the diminishing benefit of marginal funds, the role of finance may be much more critical in developing countries with poorer economic institutions than in developed countries. Thus, I conjecture that the negative impact of stock market concentration on growth might be more severe in a highly concentrated stock market in a bureaucratic, corrupt country. I examine this hypothesis in the following analysis.

Table 2–7 reports the results of the regressions of real per capita GDP growth rates on stock market concentration, where the sample countries in each year are partitioned into two groups with respect to bureaucracy and corruption indices.[21] The regressions are run separately for each group, and the other financial development measures and control variables in Table 2–2 are included in all regressions but are not shown in order to save space. In the first regression sets, in which the countries are divided by the bureaucracy index, stock market concentration is negatively associated with future economic growth regardless of the level of bureaucracy. However, the group with a higher level of bureaucracy (lower bureaucracy index) has more negative coefficients for the stock market concentration variables compared with the group with a lower level of bureaucracy (higher bureaucracy index). The coefficients of *Mkt. Con. (top 5 (10) firms)* of the group with a higher level of bureaucracy are more than twice as large in absolute value as those of the lower bureaucracy group (–6.74 (–6.21) versus –2.45 (–2.40)). The differences in the magnitude of the coefficients are statistically significant.

The regressions in which the countries are partitioned by the corruption index show a similar pattern. The stock market concentration coefficients of the group with a higher corruption level (lower corruption index) are more negative than those with lower corruption level (higher corruption index). Overall, Table 2–7 confirms the speculation that the negative impact of stock market concentration on economic growth is more severe if a society is more bureaucratic or more corrupt.

(SEE TABLE 2–7)

2.5. Stock Market Concentration, IPOs, and Innovation

[21] The sample period in Table 2–6 is 1995–2013 because the bureaucracy and corruption indices are available from 1995. The indices are also only available for 41 countries. The countries excluded in this experiment are Bangladesh, Egypt, Kenya, Morocco, Pakistan, and Sri Lanka.

In this section, I regress the proxies for IPOs and innovation on stock market concentration. I also apply two–stage regressions where economic growth is regressed on IPO and innovation activities estimated by the level of stock market concentration. These analyses identify the specific channel through which a concentrated stock market demotes growth.

2.5.1. Stock market concentration and IPOs

A concentrated stock market structure may indicate that new, innovative firms struggle to access the stock market and obtain the financing they need. Therefore, countries with high stock market concentration experience few IPOs of new firms. To test this hypothesis, I run panel regressions of the two IPO proxies of *IPO Amount / Pop.* and *IPO No. / Pop.* on stock market concentration. The macroeconomic conditions for the 46 countries in the basic data set are controlled for in the regressions for 1994–2013.[22] As in the regressions of real per capita GDP growth rates, the stock market concentration variables are lagged by five years to determine the long–term effects on IPO activity and to remedy the reverse causality bias.

Table 2–8 shows that the two size measures (*Mkt Cap. / GDP* and *Credit / GDP*) and the liquidity proxy (*Turnover / Cap.*) do not induce more vigorous IPO activity in the future. It also indicates that the stock market concentration variables are significantly negatively associated with both IPO activity proxies.

In specifications (3), (4), (7), and (8), I include the anti–self–dealing index because the law and finance literature emphasize the importance of institutions enforcing minority shareholders' rights on vigorous financing activities including IPOs.[23] Stronger protection of minority investors' rights is shown to promote IPOs as predicted by the law and finance literature. More importantly, the stock market concentration variables remain significantly negative in those regressions.

In an unreported analysis, I employ other proxies for IPOs, as in Doidge et al. (2013): IPO proceeds over the one–year lagged GDP and IPO count over the one–year lagged number of listed firms. Regressing these two IPO proxies on stock market concentration generates output that is

[22] IPO data for Peru are missing in the data source and, thus, are excluded in this experiment.
[23] The anti–self–dealing index for Bangladesh is not available in Djankov et al. (2008); the country is excluded from the regressions.

qualitatively the same.[24] The variables are still negative when controlling for time–invariant country effects (Appendix C).[25]

(SEE TABLE 2–8)

2.5.2. Stock market concentration and innovation

King and Levine (1993b) prove theoretically that a better financial system improves the probability of successful innovation. Hsu et al. (2014) find empirical evidence that stock market development promotes technological innovation but also that credit market development discourages innovation. In this subsection, I investigate whether stock market concentration depresses innovation.

If young, innovative firms find it difficult to access necessary financing in a concentrated stock market, fewer innovations are expected under such a stock market structure. To test this hypothesis, I run panel regressions of the innovation proxies on stock market concentration with a five–year lag—again controlling for macroeconomic variables—for 43 countries in the basic data set for 1994–2006.[26]

Table 2–9 presents the results of the regressions. Interestingly, *Mkt. Cap. / GDP* is negatively associated with all four innovation proxies, which indicates that having a large stock market does not boost a country's innovation activity in the long run. As previously seen with IPO activity, future innovation activity is not promoted by liquidity (*Turnover / Cap.*) or credit amount (*Credit / GDP*), according to the regression analysis. Finally, both stock market concentration variables (*Mkt. Con. (top 5 (10) firms))* are significantly negatively associated with not only quantity but also quality proxies of innovation.

I rerun the regressions of the innovation proxies only in manufacturing industries, as in Hsu et al. (2014), because innovation and attaining patents is more critical in manufacturing

[24] Stock market concentration variables are significant at the 1% level in all regressions. I report the regressions of IPO proceeds and count scaled by a country's population because the other dependent variables in this paper are scaled by population.
[25] I exclude the anti–self–dealing index in the regressions as I expect the country dummies to soak up all the effects of time–invariant institutional variables.
[26] Bangladesh, Pakistan, and Romania are excluded because they are missing from the patent files of the NBER. Additionally, the United States is also excluded in consideration of home bias. The regressions end in 2006 because the data permit analysis up to this year.

industries than other sectors.[27] An unreported table of the regressions presents results that are qualitatively similar to Table 2–9. The concentration variables are also still significantly negative when controlling for country fixed–effects (Appendix D).

(SEE TABLE 2–9)

2.5.3. Two–stage regressions

In this subsection, I apply two–stage regressions in order to establish the link between stock market concentration, IPO and innovation activities, and economic growth. First, I run the regressions of IPO and innovation proxies at *t* on stock market concentration at *t–5* to determine the IPO and innovation activities estimated with respect to a certain level of stock market concentration. Second, I run the regressions of real per capital GDP growth rates on the IPO and innovation activities estimated from the first–stage regressions. Table 2–10 presents the results of the second–stage regressions.[28] In regression specifications (1) through (4) ((5) through (8)), IPO and innovation activities are estimated with *Mkt. Con. (top 5 (10) firms)* at *t*–5, respectively.

The table shows that IPOs (*IPO Amount / Pop.* and *IPO No. / Pop.*) and innovation activities (*Patent / Pop.* and *Citation / Pop.)* estimated from the level of stock market concentration are significantly positively associated with real per capita GDP growth rates. In an untabulated table, I regress economic growth on the raw proxies of IPOs and innovation and do not see robust correlations. Meanwhile, the results in Table 2–10 show the link of growth with IPOs and innovation projected with concentration. This finding suggests that a concentrated stock market constricts IPOs and innovation by new firms, which is critical to economic growth.

(SEE TABLE 2–10)

2.6. Conclusions

The primary function of any financial system is to faciliate the efficient allocation of capital and economic resources (Merton and Bodie, 1995). A developed financial market should allocate more capital to more productive, innovative firms. Finance researchers have commonly used

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[27] I use a data file matching three-digit class codes of the USPTO with two–digit SIC codes provided by Hsu et al. (2014) to identify manufacturing industries.

[28] The sample includes country–year observations for 46 countries during 1994–2013 for specifications (1), (2), (5), and (6), and for 43 countries during 1994–2006 for (3), (4), (7), and (8).

financial market size in investigating the relationshp between finance and growth. They assume implicitly that financial market size is commensurate with financial market development. However, a larger financial market is not necessarily functionally more efficient. For instance, a sizeable stock market may simply allocate more capital to large, doddering firms than to small, emerging ones. This merely causes the stock market to appear larger in terms of capitalization even though it does not allocate funds efficiently. Appropriate measures that capture the functional efficiency of any financial market may need to be established first when the nexus between finance and growth is investigated.

In this chapter, I have introduced a new measure of stock market functionality—stock market concentration—and explored the relationship between stock market functionality and economic growth. I have also investigated the channel through which stock market concentration affects growth. I provide evidence that stock market concentration is negatively associated with capital allocation efficiency, IPOs, innovation, and finally with economic growth. These findings suggest a viable channel through which concentration hurts economic growth: stock market concentration prevents new Davids from accessing the funds required for innovative entrepreneurship to compete with old Goliaths.

Figure 2–1: Average Stock Market Concentration of Each Country

Figure 2–1 plots stock market concentration computed using the top 5 (10) firms of each country averaged for 1989–2008.

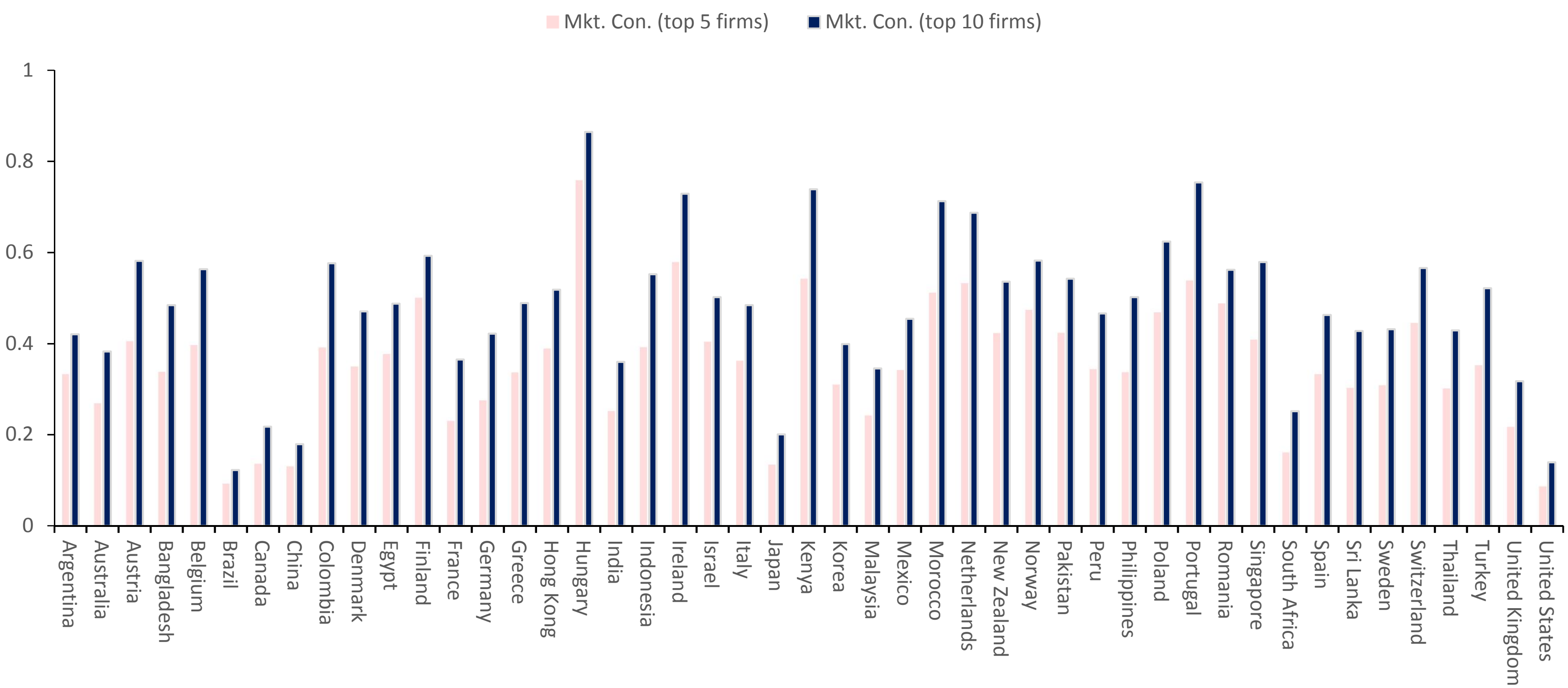

Table 2–2: Summary Statistics and Correlations of the Main Variables

Panel A: Average Value by Country

Panel A illustrates the average value (except for Elasticity) of the main variables used for analyses of the sample of 47 countries. All variables are as defined in Appendix A. "IPO amount / Pop.," "Patent / Pop.," and "Citation / Pop." are figures before taking the logarithm. "Mkt. Con. (top 5 (10) firms)," "Mkt. Cap. / GDP," "Turnover / Cap.," and "Credit / GDP" are averaged during 1989–2008. "Per capita GDP growth" and "IPO Amount / Pop." are averaged during 1994–2013. "Patent / Pop." and "Citation / Pop." are averaged during 1994–2006. The elasticity (of capital allocation) is estimated for 1991–2010.

Country	Mkt. Con. (top 5 firms)	Mkt. Con. (top 10 firms)	Mkt. Cap. / GDP	Turnover / Cap.	Credit / GDP	Per capita GDP Growth	Elasticity	IPO Amount /Pop.	IPO No. /Pop.	Patent /Pop.	Citation /Pop.
Argentina	0.33	0.42	0.29	0.21	0.17	2.49	.	1.35	0.03	0.20	0.57
Australia	0.27	0.39	0.86	0.59	0.84	2.00	0.80	103.34	4.10	26.13	215.82
Austria	0.40	0.58	0.22	0.45	1.03	1.48	0.69	28.37	0.29	27.83	119.92
Bangladesh	0.34	0.48	0.04	0.51	0.29	4.23	.	0.05	0.01	.	.
Belgium	0.40	0.57	0.56	0.29	0.72	1.32	0.49	28.79	0.44	34.42	224.88
Brazil	0.09	0.12	0.42	0.51	0.36	2.33	.	5.92	0.02	0.21	0.36
Canada	0.14	0.22	0.85	0.59	1.23	1.64	.	62.09	3.11	60.39	736.90
China	0.13	0.18	0.42	1.26	1.06	8.56	.	13.64	0.11	0.11	0.42
Colombia	0.39	0.58	0.21	0.09	0.31	2.17	.	4.78	0.01	0.05	0.15
Denmark	0.36	0.48	0.49	0.64	0.96	1.11	0.48	22.77	0.69	55.62	334.23
Egypt	0.38	0.49	0.47	0.30	0.49	2.45	.	1.73	0.02	0.01	0.00
Finland	0.51	0.61	0.87	0.76	0.70	2.11	0.76	36.84	0.90	125.30	1,344.53
France	0.23	0.37	0.60	0.75	0.90	1.14	1.07	43.09	0.65	45.11	304.76
Germany	0.28	0.42	0.38	1.23	1.06	1.36	0.98	28.55	0.37	91.05	595.82
Greece	0.34	0.49	0.43	0.43	0.51	0.72	0.38	30.57	0.81	0.41	1.61
Hong Kong	0.40	0.53	3.01	0.53	1.49	2.54	.	124.83	4.92	19.44	187.07
Hungary	0.76	0.86	0.21	0.64	0.37	2.32	0.11	2.24	0.06	1.68	4.98
India	0.25	0.36	0.43	1.05	0.30	5.18	0.68	0.76	0.14	0.12	0.32
Indonesia	0.39	0.55	0.26	0.48	0.36	2.39	0.07	1.74	0.06	0.01	0.11
Ireland	0.58	0.73	0.57	0.52	1.24	1.13	0.39	19.68	0.20	17.44	86.71
Israel	0.40	0.50	0.66	0.51	0.84	1.72	0.87	9.44	0.21	36.49	126.21
Italy	0.36	0.49	0.33	0.82	0.71	0.41	1.16	39.22	0.25	17.83	103.67
Japan	0.13	0.20	0.80	0.71	1.96	0.76	0.45	55.20	0.90	222.54	2,184.21
Kenya	0.54	0.74	0.23	0.06	0.28	1.35	.	1.01	0.01	0.01	0.00

Korea	0.31	0.40	0.47	2.00	0.72	4.08	0.69	51.50	1.23	63.37	540.84
Malaysia	0.24	0.34	1.63	0.42	1.17	3.04	0.58	21.94	1.56	0.47	2.71
Mexico	0.34	0.45	0.26	0.33	0.22	1.49	0.38	3.02	0.02	0.21	1.40
Morocco	0.51	0.71	0.38	0.17	0.44	3.20	0.27	3.01	0.06	0.01	0.01
Netherlands	0.53	0.69	0.88	1.03	1.23	1.47	0.33	34.85	0.24	68.78	452.48
New Zealand	0.42	0.54	0.39	0.39	1.03	1.68	0.65	28.96	0.79	15.70	104.33
Norway	0.48	0.59	0.39	0.85	0.67	1.52	0.64	91.09	1.76	32.67	232.33
Pakistan	0.42	0.54	0.21	2.21	0.26	2.07	.	0.22	0.01	.	.
Peru	0.34	0.47	0.39	0.11	0.22	4.76	.	.	.	0.01	0.00
Philippines	0.34	0.50	0.54	0.25	0.36	2.52	0.38	0.99	0.04	0.01	0.03
Poland	0.47	0.62	0.21	0.42	0.29	3.56	0.76	17.79	0.49	0.08	0.18
Portugal	0.55	0.77	0.30	0.53	1.01	1.01	0.92	26.05	0.17	0.43	1.53
Romania	0.49	0.56	0.12	0.20	0.18	4.22	0.66	2.67	0.03	.	.
Singapore	0.40	0.57	1.59	0.56	0.94	3.29	0.32	77.57	6.21	43.76	546.30
South Africa	0.16	0.25	1.63	0.28	1.23	1.33	.	1.47	0.03	0.95	4.43
Spain	0.33	0.46	0.58	1.22	1.06	1.29	0.78	20.44	0.12	2.89	14.44
Sri Lanka	0.30	0.43	0.15	0.14	0.25	4.60	.	0.79	0.08	0.00	0.00
Sweden	0.31	0.43	0.87	0.94	1.03	1.87	0.46	57.19	0.87	125.77	1,194.36
Switzerland	0.46	0.58	1.73	0.87	1.62	1.04	.	92.63	0.51	164.70	1,038.76
Thailand	0.30	0.43	0.54	0.78	1.13	2.85	.	7.96	0.30	0.08	0.54
Turkey	0.35	0.52	0.22	1.35	0.20	2.83	0.64	5.19	0.09	0.04	0.56
United Kingdom	0.22	0.32	1.21	0.89	1.33	1.62	0.71	68.74	1.33	31.10	263.67
United States	0.09	0.14	1.08	1.37	1.60	1.52	0.88	96.43	0.89	.	.
Total	0.35	0.48	0.66	0.68	0.81	2.26	0.61	32.45	0.84	34.78	290

Panel B: Correlations

Panel B presents the Pearson's correlations among the main variables. The sample includes country–year observations for 47 countries during 1994–2013 except for the Elasticity of Capital Allocation, which is estimated for 1991–2010, and "Patent / Pop." and "Citation / Pop.", whose data are collected for 1994–2006. The asterisks denote statistical significance at or below the 5% level.

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
[1] Mkt. Con. (top 5 firms) at *t*–5	1.00										
[2] Mkt. Con. (top 10 firms) at *t*–5	0.97*	1.00									
[3] Mkt. Cap. / GDP at *t*–5	–0.04	–0.07*	1.00								
[4] Turnover / Cap. at *t*–5	–0.03	–0.05	0.04	1.00							
[5] Credit / GDP at *t*–5	–0.20*	–0.21*	0.52*	0.25*	1.00						
[6] Per Capita GDP Growth	–0.14*	–0.16*	–0.11*	–0.04	–0.23*	1.00					
[7] Elasticity of Capital Allocation	–0.29*	–0.30*	–0.03	0.21*	0.18*	–0.07	1.00				
[8] IPO Amount / Pop.	–0.24*	–0.25*	0.25*	0.03	0.33*	0.21*	0.22*	1.00			
[9] IPO No. / Pop.	–0.18*	–0.18*	0.36*	–0.05	0.26*	0.15*	0.03	0.74*	1.00		
[10] Patent / Pop.	–0.13*	–0.18*	0.16*	0.01	0.45*	–0.11*	0.19*	0.47*	0.43*	1.00	
[11] Citation / Pop.	–0.20*	–0.24*	0.11*	–0.04	0.40*	–0.09*	0.19*	0.47*	0.45*	0.97*	1.00

Table 2–2: Cross–Sectional Regressions of Elasticity of Capital Allocation on Stock Market Concentration

Table 2–2 presents the results of cross–sectional regressions in which the elasticities of the capital allocation of each country (β_c) are regressed on stock market concentration. The elasticity of capital allocation is estimated from the following regression during 1991–2010:

$$ln \frac{I_{cit}}{I_{cit-1}} = \alpha_c + \beta_c \, ln \frac{V_{cit}}{V_{cit-1}} + \varepsilon_{cit}.$$

where I_{cit} and V_{cit} are the investment and the value added in each country–industry–year observation, respectively. The sample includes 32 countries. Per capita GDP is averaged for 1991–2010 and the financial development measures, including Mkt. Con. (top 5 (10) firms), are averaged for 1989–2008. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mkt. Con. (top 5 firms)	–0.66**					–0.87*	
	(–2.11)					(–2.01)	
Mkt. Con. (top 10 firms)		–0.56*					–0.73
		(–1.83)					(–1.66)
Mkt. Cap. / GDP			–0.08			–0.16	–0.16
			(–0.76)			(–1.24)	(–1.28)
Turnover / Cap.				0.20**		0.11	0.11
				(2.44)		(1.22)	(1.12)
Credit / GDP					–0.01	–0.12	–0.10
					(–0.07)	(–0.57)	(–0.47)
Per Capita GDP	0.07**	0.07**	0.08**	0.06*	0.08	0.10*	0.09*
	(2.15)	(2.14)	(2.09)	(1.75)	(1.63)	(1.90)	(1.81)
Constant	0.19	0.25	–0.13	–0.08	–0.12	0.09	0.18
	(0.56)	(0.72)	(–0.35)	(–0.27)	(–0.29)	(0.24)	(0.49)
No. of Observations	32	32	32	32	32	32	32
R^2	0.236	0.229	0.134	0.204	0.121	0.348	0.334

Table 2–3: Panel Regressions of Per Capita GDP Growth on Stock Market Concentration

Table 2–3 presents the results of the panel regressions in which per capita GDP growth rates are regressed on stock market concentration at *t*–5. This sample includes country–year observations for 47 countries during 1994–2013. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Mkt. Con. (top 5 firms) at *t*–5	–3.98***				–4.27***	
	(–3.44)				(–3.42)	
Mkt. Con. (top 10 firms) at *t*–5		–3.88***				–4.23***
		(–3.57)				(–3.61)
Mkt. Cap. / GDP at *t*–5			–0.50		–0.63	–0.72*
			(–1.41)		(–1.62)	(–1.78)
Turnover / Cap. at *t*–5				0.16	0.21	0.18
				(0.77)	(1.09)	(0.98)
Credit / GDP at *t*–5	–1.39***	–1.45***	–0.66	–0.99**	–1.14***	–1.16***
	(–3.24)	(–3.62)	(–1.14)	(–2.06)	(–2.98)	(–3.21)
Initial Per Capita GDP	–0.54	–0.53*	–0.54	–0.55	–0.54*	–0.52*
	(–1.64)	(–1.69)	(–1.49)	(–1.49)	(–1.69)	(–1.74)
Initial Education	1.07**	0.91*	1.11**	1.17**	1.15**	0.97*
	(2.23)	(1.95)	(2.43)	(2.42)	(2.23)	(1.93)
Gov. Spending / GDP	–7.51*	–6.70*	–11.57***	–10.77***	–8.40**	–7.67*
	(–1.93)	(–1.68)	(–2.89)	(–2.59)	(–2.24)	(–1.96)
Inflation	–0.03	–0.03	–0.03	–0.03	–0.03	–0.03
	(–1.34)	(–1.33)	(–1.27)	(–1.30)	(–1.37)	(–1.35)
Openness / GDP	0.57***	0.64***	0.43***	0.23	0.88***	1.00***
	(3.69)	(3.84)	(3.14)	(1.40)	(4.41)	(4.37)
Constant	8.53***	9.01***	7.48***	7.41***	8.40***	8.95***
	(4.31)	(4.55)	(3.67)	(3.68)	(4.47)	(4.78)
No. of Observations	834	834	834	832	832	832
R^2	0.170	0.178	0.142	0.137	0.181	0.192

Table 2–4: First–Stage Regressions: Regressions of Stock Market Concentration

Table 2–4 presents the results of panel regressions in which stock market concentrations are regressed on various factors. The sample includes country–year observations for 47 countries during 1989–2008. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)
Total GDP	–0.06***	–0.08***	–0.06***	–0.07***
	(–5.05)	(–5.46)	(–3.47)	(–3.70)
Territory Size	–0.01*	–0.02*	–0.03***	–0.04***
	(–1.67)	(–1.77)	(–3.42)	(–3.21)
Export / Pop.	2.49	3.28	0.32	0.99
	(1.39)	(1.63)	(0.20)	(0.56)
Gov. Spending / GDP	0.56*	0.67**	0.16	0.09
	(1.92)	(2.24)	(0.51)	(0.26)
Bureaucracy			0.01	0.00
			(0.69)	(0.26)
French	0.10***	0.13***		
	(3.75)	(3.94)		
German	0.11***	0.11**		
	(2.61)	(2.51)		
Scandinavian	0.04	0.02		
	(0.83)	(0.34)		
Anti–Self–Dealing			–0.22***	–0.25***
			(–3.23)	(–3.37)
Mkt. Cap. / GDP	–0.00	–0.02	–0.02	–0.04
	(–0.02)	(–0.66)	(–0.89)	(–1.62)
Turnover / Cap.	0.04***	0.04***	0.03*	0.03
	(3.20)	(3.14)	(1.84)	(1.40)
Credit / GDP	–0.03	–0.01	–0.02	–0.00
	(–0.76)	(–0.31)	(–0.49)	(–0.12)
Portfolio Inflows / GDP	0.38***	0.38***	0.35***	0.36***
	(4.79)	(4.41)	(4.98)	(4.69)
Constant	2.05***	2.58***	2.32***	2.83***
	(7.14)	(7.75)	(5.22)	(5.95)
No. of Observations	788	788	524	524
R^2	0.497	0.536	0.551	0.582

Table 2–5: Panel Regressions of Per Capita GDP Growth on Stock Market Concentration: Endogeneity Tests

Table 2–5 presents the results of the instrumental variable (specifications 1 to 4) and country fixed–effect (specification 5 and 6) regressions of per capita GDP growth on stock market concentration at *t*–5. The instruments used are the logarithm of a country's physical size in square kilometers in specifications 1 and 2, and country size and dummy for English common law origins in specifications 3 and 4. The sample includes country–year observations for 47 countries during 1994–2013. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country (instrumental variable regressions) and by country (country fixed–effects regressions). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	Instrumental Variable Regressions				Country Fixed–Effects Regressions	
	(1)	(2)	(3)	(4)	(5)	(6)
Mkt. Con. (top 5 firms) at *t*–5	–6.47*		–4.23**		–3.66**	
	(–1.91)		(–2.25)		(–2.41)	
Mkt. Con. (top 10 firms) at *t*–5		–4.97**		–3.59**		–3.79***
		(–1.99)		(–2.37)		(–2.77)
Mkt. Cap. / GDP at *t*–5	–0.71	–0.76*	–0.63	–0.69*	–1.05**	–1.06**
	(–1.63)	(–1.78)	(–1.63)	(–1.74)	(–2.19)	(–2.21)
Turnover / Cap. at *t*–5	0.24	0.19	0.21	0.18	0.01	0.02
	(1.20)	(1.02)	(1.08)	(0.95)	(0.04)	(0.12)
Credit / GDP at *t*–5	–1.37***	–1.23***	–1.14***	–1.09***	–1.77***	–1.74***
	(–3.68)	(–3.70)	(–2.63)	(–2.73)	(–3.21)	(–3.22)
Initial Per Capita GDP	–0.54*	–0.52*	–0.54*	–0.52*		
	(–1.80)	(–1.84)	(–1.72)	(–1.74)		
Initial Education	1.15**	0.94*	1.15**	1.00**		
	(2.03)	(1.84)	(2.28)	(2.03)		
Gov. Spending / GDP	–6.72	–6.96	–8.43**	–8.27**	–59.16***	–57.53***
	(–1.17)	(–1.31)	(–2.01)	(–1.96)	(–3.39)	(–3.33)
Inflation	–0.04	–0.03	–0.03	–0.03	–0.05	–0.05
	(–1.46)	(–1.42)	(–1.42)	(–1.40)	(–1.37)	(–1.39)
Openness / GDP	1.11**	1.09***	0.88***	0.91***	2.68**	2.70**
	(2.54)	(2.73)	(3.35)	(3.43)	(2.57)	(2.60)
Constant	8.93***	9.23***	8.39***	8.71***	11.49***	11.66***
	(4.11)	(4.12)	(4.57)	(4.58)	(5.19)	(5.39)
No. of Observations	832	832	832	832	832	832
R^2	0.171	0.190	0.181	0.190	0.336	0.338

Hansen J–Statistic	0.81	0.76
(*p*–value)	(0.37)	(0.38)

Table 2–6: Panel Regressions of Per Capita GDP Growth on Stock Market Concentration and Stability Measure

Table 2–6 presents the results of panel regressions in which the per capita GDP growth rate is regressed on stock market concentration, a stability measure. Specifications 1 to 2 and 3 to 4 use stability and stock market concentration measures of the top 5 and 10 firms, respectively. The sample includes country–year observations for 47 countries during 1994–2008. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	Concentration and Stability Measures Computed Using Top 5 Firms			Concentration and Stability Measures Computed Using Top 10 Firms		
	(1)	(2)	(3)	(4)	(5)	(6)
Stability	–1.26*		–0.90	–2.96**		–2.37**
	(–1.87)		(–1.52)	(–2.31)		(–2.08)
Mkt. Con. at *t*–5		–2.39**	–2.06**		–2.79***	–2.19***
		(–2.28)	(–2.13)		(–2.76)	(–2.63)
Mkt. Cap. / GDP at *t*–5	–0.72	–0.84	–0.76	–0.70	–0.90	–0.78
	(–1.22)	(–1.34)	(–1.20)	(–1.16)	(–1.39)	(–1.18)
Turnover / Cap. at *t*–5	0.51**	0.54**	0.54**	0.46*	0.53**	0.49**
	(2.10)	(2.34)	(2.32)	(1.91)	(2.37)	(2.16)
Credit / GDP at *t*–5	–0.51	–0.73	–0.74	–0.46	–0.80*	–0.75*
	(–0.93)	(–1.49)	(–1.58)	(–0.89)	(–1.69)	(–1.66)
Initial Per Capita GDP	–0.45	–0.48	–0.45	–0.43	–0.46	–0.42
	(–1.35)	(–1.43)	(–1.39)	(–1.41)	(–1.47)	(–1.46)
Initial Education	1.24**	1.15**	1.18**	1.16**	1.02*	1.02*
	(2.35)	(2.13)	(2.19)	(2.28)	(1.90)	(1.93)
Gov. Spending / GDP	–6.76	–5.16	–5.40	–6.26	–4.28	–4.42
	(–1.46)	(–1.09)	(–1.18)	(–1.40)	(–0.89)	(–0.97)
Inflation	–0.04	–0.04	–0.04	–0.04	–0.04	–0.04
	(–1.54)	(–1.57)	(–1.57)	(–1.58)	(–1.54)	(–1.58)
Openness / GDP	0.68***	0.85***	0.85***	0.74***	0.97***	0.98***
	(3.83)	(3.81)	(3.80)	(4.07)	(3.79)	(3.97)
Constant	6.26***	6.64***	6.67***	7.19***	7.09***	7.75***
	(3.29)	(3.49)	(3.62)	(3.76)	(3.83)	(4.32)
No. of Observations	599	599	599	599	599	599
R^2	0.127	0.132	0.136	0.145	0.143	0.159

Table 2–7: Panel Regressions of Per Capita GDP Growth on Stock Market Concentration Partitioned by Corruption and Bureaucracy Indices

Table 2–7 presents the results of panel regressions in which per capita GDP growth rates are regressed on stock market concentration at *t*–5, and the observations are divided into two groups with respect to the corruption and bureaucracy indices. The sample includes country–year observations for 47 countries during 1995–2013. The other financial development measures and control variables in Table 3–3–2–2 are included in all regressions but are not shown to save space. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The test of equality refers to the test of the equality of the coefficients of the two groups.

	(Bureaucracy Level)				Test of Equality
	High		Low		
	(1)	(2)	(3)	(4)	
Mkt. Con. (top 5 firms) at *t*–5	–6.74*** (–4.13)		–2.45** (–2.57)		–4.29*** (–3.34)
Mkt. Con. (top 10 firms) at *t*–5		–6.21*** (–3.86)		–2.40*** (–2.92)	–3.81*** (–2.67)
Control Variables	Yes	Yes	Yes	Yes	
No. of Observations	359	359	351	351	
R^2	0.219	0.232	0.153	0.157	
	(Corruption Level)				Test of Equality
	High		Low		
	(1)	(2)	(3)	(4)	
Mkt. Con. (top 5 firms) at *t*–5	–6.06*** (–2.98)		–2.46** (–2.06)		–3.60** (–2.16)
Mkt. Con. (top 10 firms) at *t*–5		–5.53*** (–2.86)		–2.48** (–2.31)	–3.05* (–1.66)
Control Variables	Yes	Yes	Yes	Yes	
No. of Observations	359	359	351	351	
R^2	0.227	0.236	0.170	0.174	

Table 2–8: Panel Regressions of IPO Activities on Stock Market Concentration

Table 2–8 presents the results of panel regressions in which measures of IPO activities are regressed on stock market concentration at *t*–5. The sample includes country–year observations for 46 countries during 1994–2013. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	IPO Amount / Pop.				IPO No. / Pop.			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mkt. Con. (top 5 firms) at *t*–5	–3.19***		–2.72***		–1.13***		–0.89***	
	(–4.22)		(–3.61)		(–4.46)		(–3.50)	
Mkt. Con. (top 10 firms) at *t*–5		–2.80***		–2.40***		–0.99***		–0.78***
		(–3.99)		(–3.43)		(–4.28)		(–3.35)
Anti–Self–Dealing			1.09**	1.07**			0.59***	0.58***
			(2.47)	(2.36)			(2.73)	(2.63)
Mkt. Cap. / GDP at *t*–5	–0.11	–0.15	–0.17	–0.20	–0.01	–0.03	–0.03	–0.05
	(–0.55)	(–0.78)	(–0.81)	(–0.98)	(–0.17)	(–0.38)	(–0.51)	(–0.67)
Turnover / Cap. at *t*–5	–0.08	–0.09	–0.07	–0.08	–0.05	–0.05	–0.04	–0.04
	(–0.59)	(–0.68)	(–0.49)	(–0.58)	(–0.94)	(–1.05)	(–0.72)	(–0.80)
Credit / GDP at *t*–5	–0.24	–0.21	–0.37	–0.35	–0.16*	–0.16	–0.25**	–0.24**
	(–0.77)	(–0.69)	(–1.22)	(–1.16)	(–1.68)	(–1.60)	(–2.28)	(–2.24)
Per Capita GDP	0.85***	0.84***	0.87***	0.85***	0.20***	0.19***	0.21***	0.20***
	(6.32)	(6.16)	(6.48)	(6.31)	(4.08)	(3.92)	(4.24)	(4.08)
Gov. Spending / GDP	–11.74***	–11.42***	–11.98***	–11.68***	–2.36**	–2.25**	–2.13**	–2.04**
	(–4.29)	(–4.11)	(–4.43)	(–4.26)	(–2.51)	(–2.31)	(–2.42)	(–2.24)
Inflation	–0.03***	–0.03***	–0.03***	–0.03***	–0.01***	–0.01***	–0.01***	–0.01***
	(–3.77)	(–3.41)	(–3.89)	(–3.55)	(–3.07)	(–2.71)	(–3.20)	(–2.87)
Openness / GDP	0.29*	0.33**	0.14	0.18	0.33***	0.35***	0.26***	0.28***
	(1.82)	(2.08)	(0.90)	(1.14)	(4.24)	(4.25)	(3.34)	(3.33)
Constant	–2.72***	–2.40***	–3.24***	–2.97***	–0.73***	–0.62**	–1.14***	–1.05***
	(–3.05)	(–2.61)	(–3.31)	(–2.90)	(–2.75)	(–2.28)	(–3.05)	(–2.71)
No. of Observations	820	820	806	806	820	820	806	806
R^2	0.391	0.392	0.396	0.397	0.442	0.444	0.480	0.481

Table 2–9: Panel Regressions of Innovation on Stock Market Concentration

Table 2–9 presents the results of panel regressions in which measures of innovation are regressed on stock market concentration at *t*–5. The sample includes country–year observations for 43 countries during 1994–2006. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	Patent / Pop.		Citation /Pop.		Generality / Pop.		Originality / Pop.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mkt. Con. (top 5 firms) at *t*–5	–2.19**		–4.73***		–2.66***		–1.84**	
	(–2.11)		(–3.46)		(–3.86)		(–2.04)	
Mkt. Con. (top 10 firms) at *t*–5		–2.08**		–4.38***		–2.44***		–1.76**
		(–2.14)		(–3.38)		(–3.70)		(–2.09)
Mkt. Cap. / GDP at *t*–5	–0.43**	–0.46**	–0.92***	–1.00***	–0.69***	–0.73***	–0.39**	–0.42***
	(–2.37)	(–2.59)	(–3.53)	(–3.98)	(–3.78)	(–4.07)	(–2.44)	(–2.65)
Turnover / Cap. at *t*–5	–0.17	–0.18	–0.48*	–0.51*	–0.30**	–0.32***	–0.16	–0.18
	(–0.82)	(–0.90)	(–1.66)	(–1.81)	(–2.47)	(–2.65)	(–0.99)	(–1.07)
Credit / GDP at *t*–5	0.61	0.61	0.61	0.62	0.47	0.48	0.60	0.60
	(1.16)	(1.17)	(0.87)	(0.89)	(1.37)	(1.41)	(1.32)	(1.33)
Per Capita GDP	0.95***	0.93***	1.39***	1.36***	0.56***	0.54***	0.76***	0.75***
	(6.18)	(5.96)	(6.40)	(6.15)	(4.70)	(4.48)	(5.74)	(5.51)
Gov. Spending / GDP	–0.55	–0.22	–3.71	–3.07	–2.24	–1.90	–0.19	0.10
	(–0.13)	(–0.05)	(–0.65)	(–0.53)	(–0.71)	(–0.59)	(–0.05)	(0.03)
Inflation	–0.02**	–0.02**	–0.03**	–0.02**	–0.01**	–0.01*	–0.01**	–0.01*
	(–2.22)	(–2.09)	(–2.23)	(–2.04)	(–2.15)	(–1.91)	(–2.02)	(–1.89)
Openness / GDP	0.18	0.23	0.48**	0.57***	0.20	0.25*	0.12	0.16
	(0.96)	(1.14)	(2.49)	(2.72)	(1.62)	(1.85)	(0.74)	(0.93)
Constant	–6.24***	–5.97***	–7.88***	–7.32***	–2.86***	–2.56***	–5.08***	–4.85***
	(–5.55)	(–5.10)	(–5.17)	(–4.67)	(–3.81)	(–3.37)	(–5.13)	(–4.70)
No. of Observations	473	473	473	473	473	473	473	473
R^2	0.570	0.575	0.523	0.532	0.435	0.445	0.538	0.544

Table 2–10: Second–Stage Regressions of Per Capita GDP Growth on Estimated IPO and Innovation Activities

Table 2–10 presents the results of the second–stage regressions in which per capita GDP growth is regressed on IPO and innovation activities that are estimated from the first–stage regressions. IPO and innovation proxies are regressed on stock market concentration at *t*–5 and control variables in the first–stage regressions to obtain the estimated IPO and innovation activities at a certain level of stock market concentration. The sample includes country–year observations for 46 countries during 1994–2013 for specifications (1), (2), (5), and (6), and for 43 countries during 1994–2006 for specifications (3), (4), (7), and (8). In (1) through (4) ((5) through (8)), IPO and innovation activities are estimated with Mkt. Con. (top 5 (10) firms) at *t*–5. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	IPO and Innovation Activities are Estimated with Mkt. Con. (top 5 firms) at *t*–5				IPO and Innovation Activities are Estimated with Mkt. Con. (top 10 firms) at *t*–5			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IPO Amount / Pop.	1.40***				1.49***			
	(3.31)				(3.61)			
IPO No. / Pop.		3.83***				4.15***		
		(2.90)				(3.15)		
Patent / Pop.			1.60**				1.67***	
			(2.41)				(2.80)	
Citation /Pop.				0.67*				0.76**
				(1.94)				(2.32)
Initial Per Capita GDP	–1.75***	–1.30***	–1.98***	–1.34**	–1.77***	–1.32***	–2.02***	–1.43***
	(–3.98)	(–3.58)	(–2.91)	(–2.47)	(–4.30)	(–3.85)	(–3.30)	(–2.83)
Initial Education	0.81*	0.88**	0.23	0.29	0.65	0.74*	0.08	0.15
	(1.94)	(2.04)	(0.57)	(0.74)	(1.58)	(1.75)	(0.18)	(0.37)
Gov. Spending / GDP	8.81	1.37	1.42	1.76	9.88	2.19	1.48	2.10
	(1.41)	(0.28)	(0.24)	(0.30)	(1.57)	(0.44)	(0.25)	(0.36)
Inflation	0.02	–0.00	0.01	–0.01	0.02	–0.00	0.01	–0.01
	(0.68)	(–0.06)	(0.26)	(–0.42)	(0.77)	(–0.00)	(0.32)	(–0.33)
Openness / GDP	0.09	–0.81**	0.45*	0.42	0.08	–0.90**	0.45	0.42
	(0.43)	(–1.98)	(1.65)	(1.55)	(0.38)	(–2.21)	(1.64)	(1.55)
Constant	12.05***	11.24***	16.52***	11.85***	12.27***	11.47***	17.01***	12.59***
	(5.83)	(5.39)	(3.32)	(3.07)	(6.27)	(5.73)	(3.77)	(3.48)
No. of Observations	826	826	477	477	826	826	477	477
R^2	0.160	0.151	0.096	0.081	0.167	0.158	0.107	0.092

CHAPTER THREE: NOMINAL STOCK PRICE ANCHORS: A GLOBAL PHENOMENON?

3.1. Introduction

Anchoring is a cognitive bias that describes the common human tendency to rely excessively on the first piece of information offered (the 'anchor') when making decisions. Tversky and Kahneman (1974) describe an experiment in which a group of students, who were given 5 seconds to evaluate the product of eight numbers, estimated that 1X2X3X4X5X6X7X8 was 512 but 8X7X6X5X4X3X2X1 was 2,250. The first digit, the anchor, mattered.[29]

Anchors also matter in finance. In an intriguing paper, Weld, Michaely, Thaler, and Benartzi (2009) find that the average nominal price for a share of stock in the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) has been approximately $25 since the Great Depression. The price has not even kept pace with the rate of inflation. However, they find that 16 other countries did not share this peculiar trait. Hence, they conclude that "the nominal price fixation is primarily a U.S. or North American phenomenon."

The goal of this paper is to revisit their conclusion. Because anchoring is such a common human trait, we are skeptical that the United States is the only country whose stock markets exhibit this phenomenon. To find out whether the nominal price fixation is indeed a North American phenomenon, we extend the analysis by Weld et al. (2009) to international markets. We collect the nominal stock prices of firms, in both the local currency and the U.S. dollar, at the end of June in each year for 38 countries from 1981– 2010.

A few interesting, sometimes, surprising facts stand out. First, a large variation is observed in the mean or median level of nominal stock prices across countries. The mean (median) of the nominal price level in Switzerland, for example, is $925 ($348.9) a share whereas that of Hong Kong is only $0.6 ($0.1). The mean (median) share price in the U.S. is $51.3 ($21.9).[30] It is clear that a single, global anchor does not exist.

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[29] Epley and Gilovich (2001) establish the existence of both anchoring and heuristic adjustment in the classic Tversky and Kahneman (1974) experiments.

[30] The mean nominal price of $51.3 for U.S. stocks in our sample differs from the mean price of $25 in Weld et al. (2009) for many reasons. Our sample covers only the stocks in NYSE from 1981–2010, whereas their sample covers all NYSE and AMEX stocks from 1933–2007. A more important difference is that they exclude Berkshire Hathaway from the sample, whereas we include it. The mean price drops to $26.2 without Berkshire Hathaway in our sample.

Second, surprisingly, we find that the median nominal stock price in dollar terms is remarkably flat and stable throughout the sample period for all countries, suggesting that although firms generate positive returns on average, their nominal share prices are held roughly constant. In fact, the level of current nominal stock prices in 2010 was remarkably similar to the level of nominal stock prices 29 years earlier.

Third, a firm's nominal stock price has a tendency to revert to its initial stock price level. When we partition our sample firms into tercile groups by their nominal stock price levels every year and keep track of the tercile groups to which they belong, we find that a majority of firms in almost all countries remains in their initial nominal stock price tercile group.

We test this last observation formally using a regression model. We hypothesize that the initial stock price of a listed firm, an IPO price, may well serve as an anchor for future nominal stock prices and may be the most important determinant of nominal share prices. To the extent that investors/managers tend to rely heavily on the first piece of pricing information offered, the anchor price is likely to affect how managers "control" the future nominal stock price with corporate actions such as stock splits, dividend payouts, and reverse stock splits. Given the paucity of IPO price data, we use the initial nominal stock price of a firm when it first entered our sample period as a proxy for anchor price. We run a cross–sectional regression of a firm's nominal stock prices in dollar terms on its initial stock price controlling for country and industry fixed effects and a firm size and its institutional ownership in each year during the sample period. The cross–sectional regression results show that the initial stock price is the single most important variable that explains the current nominal stock price. No other variables, whether they are firm–specific, industry–specific, or country–specific, matter much. When we replace a firm's initial nominal stock price with the initial public offering (IPO) price for the limited sample for which we can obtain IPO price data, we find remarkably similar results. Our empirical results indicate that the nominal price fixation is a global phenomenon.

Finally, we show that nominal stock prices tend to revert back to their anchors due to corporate actions such as stock splits, dividend payouts, or even reverse stock splits. This suggests that corporate managers seem to manage the nominal stock prices to revert to the anchor. The introduction of the euro in January of 1999 offers a natural experiment that further corroborates this finding. We find a much higher proportion of euro firm managers than non–euro firm managers in Europe taking corporate actions to bring down their nominal share prices just before and after the introduction of the euro. It appears that the introduction of the euro brought in a 'new' anchor for euro firms, which triggered euro firm managers to adjust their nominal stock prices.

Our findings have links, directly and indirectly, with many literatures. The direct link is with Weld et al. (2009), who find that firms proactively use corporate actions like stock splits to keep their prices within a narrow trading range. Why? They conclude that it must be norms and traditions. In our paper, we show that this phenomenon is global, and we therefore conclude that norms and traditions exist in all countries, not just in the U.S., as Weld et al. (2009) suggested. These norms and traditions, we find, are firm–specific. Our paper also has a direct link to Dyl and Elliott (2006), who find that firms tailor their share prices around a specific range to reflect the desires of owners.

The norm uncovered by the above two papers as well as our paper is the existence of an anchor price that firms try to target their nominal share price at. Our paper, therefore, has an indirect link to the anchoring literature. The underlying theme in this body of literature is that financial market participants make decisions based on a variety of anchors or reference points. George and Hwang (2004) observe that investors use the 52–week high as an "anchor" against which they value stocks. Hirota and Sunder (2007) show in a laboratory experiment that if investors do not have dividend anchors, price bubbles tend to arise. Baker, Pan, and Wurgler (2012) show that the 52–week high is used as a reference point for valuing corporations in mergers and acquisitions. Li and Yu (2012) find that the predictability of the market index also demonstrates this 52–week high effect. Farrell, Krische, and Sedatole (2012) report that employees evaluating the value of their stock options use three simple anchors, one of which is simply the current stock price. Cen, Hilary, and Wei (2013) investigate the role of anchoring bias on financial analysts' earnings forecasts. They find that analysts make optimistic (pessimistic) forecasts when a firm's forecast earnings per share are lower (higher) than the industry median. Chang, Luo, and Ren (2014) observe that cum–day prices are the dominating anchor for ex–day stock valuation. Dougal, Engelberg, Parsons, and Van Wesep (2014) find that the path of credit spreads since a firm's last loan influences the level at which it can currently borrow, indicating that even in a market as highly competitive as syndicated loans, behavioral biases play a role. Our study shows that the anchor of an initial nominal stock price that occurred as long as three decades ago still has a surprising effect on the current nominal stock price.

Incidentally, anchoring exists not just in financial markets but also in many other markets.[31] That leads to our last question. Why do firms use anchors? The anchoring literature, both in finance and other fields, suggests that it may be because their investors use anchors, and firms are just catering to their investors. So our paper has important ramifications for the catering hypothesis (Baker, Greenwood, and Wurgler (2009)) literature as well as the investor recognition literature (Merton (1987)).

The rest of the chapter proceeds as follows. Section 3.2. describes our data sources, sample construction, and summary statistics. Section 3.3. analyzes the trends in nominal stock prices. Section 3.4. shows that the most important determinant of a nominal stock price is its historical nominal stock price. Section 3.5. investigates the role of corporate actions in managing the nominal stock price. Section 3.6. examines how the exogenous shock of introducing the euro in 1999 has exogenously affected anchors and the corporate actions undertaken to handle this. Section 3.7. presents conclusions.

3.2. Data

3.2.1. Nominal stock price

We start with the 49 countries analyzed in La Porta, Lopez–de–Silanes, and Shleifer (2006), countries where the stock markets are reasonably large. We then drop nine countries that have fewer than 40 firms on average or whose macro–economic data are not available in the World Bank database. These nine countries are Ecuador, Jordan, Kenya, Nigeria, Sri Lanka, Taiwan, Uruguay, Venezuela, and Zimbabwe. We also exclude Finland and Mexico because they have less than 10 yearly observations of nominal stock prices prior to their currency regime changes, on which we will elaborate later. We collect, for the remaining 38 countries, nominal stock prices of firms listed on each country's main organized exchange, in both the local currency and the U.S. dollar, at the end of June in each year from 1981 to 2010. We define the main organized exchange in a country as the exchange that holds the largest total stock market capitalization of the listed firms in that country. For example, the New York Stock Exchange and the London Stock Exchange,

[31] Flood and Mussa (1994) discuss how important inflation anchors are in generating price–stability in monetary policy. Exchange rates serve as anchors (Edwards (1992)). Precedents in legal theory are nothing but anchors (see, for example, Diamond, Rose, Murphy, and Meixner (2011)). In labor economics, the concept of career anchors, first explored by Schein and Maanen (1990), is becoming a fruitful field of study. In marketing, it has been determined that the purchase decision and the sell decision use different anchors (see, Simonson and Drolet (2004)). In real estate, prior price discounts are often used as anchors in the housing choice decision (Arbel, Ben–Shahar, and Gabriel (2014)).

respectively, are the main exchanges in the United States and the United Kingdom. The nominal stock price data are obtained from Datastream. We require that our sample firms have at least 10 consecutive yearly observations of nominal stock prices and market capitalizations. This restriction results in a sample of 21,285 firms from these 38 countries.

The first four columns of Table 3–1 show the list of countries in the sample, the sample period in each country, the number of firms, and the name of the local currency. There is a large variation in the number of sample firms covered across countries ranging from a minimum of 44 firms in Brazil to a maximum of 2,816 firms in the United States. For most countries, the sample period is 20 to 30 years. The last four columns of Table 3–1 present the mean and the median of the nominal stock prices in the local currency and in the US dollar for each country during the sample period. Table 3–1 also shows that the mean share price is much higher than the median share price in all countries. In quite a few cases, the mean price is several times higher than the median price, suggesting positively skewed distributions in nominal stock prices. An extreme case is Chile, where the mean price (3,813,682 pesos) is 13,620 times greater than the median price (280 pesos). There appears to be a few stocks with unusually high nominal stock prices in each country, and for this reason, we focus on the median prices in the analyses that follow.

(SEE TABLE 3–1)

We note that some of our sample countries have experienced regime changes with respect to their local currencies. For example, nine European countries in our sample adopted the common currency euro in 1999.[32] Turkey revalued its currency in 2005. In the Datastream database, the nominal stock prices in a country are recorded in the currency after the regime change (i.e., the euro for all euro–currency countries, and the new lira for Turkey). Old nominal stock prices prior to the regime change are converted by Datastream to new nominal stock prices using the conversion rate on the date of the regime change. For example, all local currency nominal prices in the euro area before January of 1999 were converted to and presented in euros using the fixed exchange rate set for each country on December 31, 1998. Similarly, Turkish lira before January 1, 2005 was converted to and presented in the new currency using a fixed conversion rate set on December 31, 2004.

If anchors exist in nominal stock prices, the last two currency regime changes are likely to

[32] The number of euro countries in our sample becomes ten as Greece adopted the euro in January 1, 2001.

have disrupted the existing anchors. For this reason, they offer us a natural experiment to observe what happens before, during, and after the change.

3.2.2. Other variables

To check whether the stock price at the time of the initial public offering (IPO) serves as an anchor, we obtain a firm's IPO price; 2,788 IPO prices in the 1991–2000 period are matched with our sample firms. We choose the sample period of 1991–2000 because IPO data in Global New Issues of SDC Platinum are incomplete before 1991[33] and we require that the sample firms have at least 10 yearly observations of nominal stock prices after an IPO.

We obtain the firms' institutional ownership and industry classification data from Datastream. Institutional ownership is ownership defined as the proportion of shares exceeding 5% of the total shares outstanding held by institutional investors (such as pension funds and investment companies) among all shares outstanding. Datastream provides its own industry classification codes, which are based on Financial Times Stock Exchange's (FTSE's) industry classification. We use 19 different industry categories for our sample firms.

We also collect from Datastream the total return index of each stock that captures the actual growth in the value of a share held over the previous year to the current year adjusted for all capital distributions, including cash dividends, stock splits, stock dividends, etc. The difference between the growth of the nominal share price and the growth of the total return index is due to corporate actions. We analyze this difference in a later section.

3.3. Trends in Nominal Stock Prices

3.3.1. Time–series trends of nominal stock prices

In this section, we investigate the time–series trends of nominal stock prices. To obtain an overall picture of the trend in nominal stock prices, we examine the median nominal stock prices of the firms in our sample during the 1981–2010 period. To eliminate the potential effect of entry and exit of firms on the nominal stock price trend, and to eliminate stocks that have mid–period anchor changes (stocks from euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and Turkey), we include only 1,657 firms that had existed for

[33] Henderson, Jegadeesh, and Weisbach (2006) and Gozzi, Levine, and Schmukler (2010) note this.

the entire sample period. To obtain a single numeraire currency, we convert nominal stock prices in the local currency to the U.S. dollar using the 2000 U.S. dollar exchange rate (i.e., a fixed exchange rate). Using a fixed exchange rate removes the effect of exchange rate fluctuations.

Figure 3–1 shows the trends. Panel A of Figure 3–1 depicts the trends of the median nominal stock prices and the median total return stock prices of the sample firms. The median nominal stock price in year t is the median of the dollar–denominated nominal stock prices of the sample firms in year t. The median total return stock price is the median of the adjusted stock prices, where the adjusted stock price reflects the actual growth in the value of a share held over the sample period assuming dividends are reinvested. We also present trends in the equal– and value–weighted total dollar–denominated index returns constructed from total returns of 1,657 firms. Both indices are scaled at one U.S. dollar in 1981.

The three time–series generated using the firms' total returns and the indices continuously increase until 2008, suggesting that the actual total returns of the firms are positive during the sample period. However, the median nominal stock price is remarkably flat and stable throughout the sample period. This suggests that although firms generate positive returns, their nominal share prices are held roughly constant. The 2010 level of nominal stock prices is remarkably similar to the level of nominal stock prices that existed in 1981. The time series pattern of nominal stock prices is remarkably similar to the evidence presented by Dyl and Elliot (2006) in their analyses of U.S. firms' nominal stock prices. Using 1,019 firms with continuous annual price data available for the period from 1976 through 2001, they show that the average nominal price of these firms changes remarkably little over the 26–year period when the S&P 500 Composite index appreciated by 1,063% and the NYSE Composite Index appreciated by 1,238%.

Panel B of Figure 3–1 compares the level of the median nominal share price with the same three time–series of total return indices in Panel A adjusted for inflation. We use the U.S. consumer price index as the deflator. The figure shows that the three inflation–adjusted time series are still rising and are still above the median nominal stock price time series, suggesting that nominal stock prices do not even keep pace with inflation. This last conclusion is the same as that of Weld et al. (2009).

(SEE FIGURE 3–1)

We now investigate this phenomenon of a stable median nominal stock price at the firm level. The underlying motivation is simple. One may observe a stable median nominal price level even when no anchors exist in individual nominal prices. This is possible because upward trends of some nominal stock prices may cancel out downward trends in other nominal stock prices such that one observes no trends in the mean or the median.

3.3.2. Reversion of stock prices to initial price level: tercile analysis

In this section, we examine whether a firm's stock price tends to revert to its initial stock price level. For each country in each year, we partition our sample firms into tercile groups based on their nominal stock price levels. We then keep track of a firm's nominal price movements and the tercile groups to which it belongs year by year.

Such an analysis can tell us how many firms remain within their initial tercile group over time. If a large firm–specific shock hits a firm, whether positive or negative, its nominal stock price will likely deviate from its initial tercile group. If the firm's manager allows this deviation, the nominal stock price will leave its initial tercile group. On the contrary, if the firm's manager does not allow this deviation but "manages" the nominal share price by corporate actions such as stock splits, stock dividends, and reverse stock splits, the nominal stock price will revert back to the tercile group to which it initially belonged.

Table 3–2 presents the results.[34] The column labeled "< 50%" refers to the number of firms that stay within their initial tercile group for less than 50% of their sample years. Similarly, the columns labeled "50% <= & <75%" and ">=75%" denote the number of firms that stay within their initial tercile group, respectively, between 50% and 75% and more than 75%, of their sample years.

The last row of the table shows that the nominal stock prices of 7,712 sample firms around the world stay in their initial tercile group for more than 75% of the time. These 7,712 firms comprise 39.6% of the total sample of 19,465 firms. If we calculate the percentage of firms that stay in their initial tercile group more than 50% of the time, the percentage rises to 62.9% (=23.3% + 39.6%). When we examine this statistic country by country, we find that the majority of firms

[34] In Table 3–2 and later tables, and in Figure 3–1, we exclude from our analysis observations after the introduction of the euro (January 1999) of euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and after currency devaluation of Turkish lira (January 2005). This is because old anchors got disrupted after these regime changes. Later, we use these anchor disruptions as a natural experiment. In Table 3–2, the number of firms drops to 19,465 from 21,285 in Table 3–1 as we drop the after-regime-change observations and again require firms to have at least 10 consecutive yearly observations before the regime change.

stay in their initial tercile group more than half of the time for all countries except Indonesia, South Korea, and Thailand.

(SEE TABLE 3–2)

In sum, Table 3–2 shows that a majority of our sample firms remain in their initial nominal stock price tercile group most of the time. This finding further confirms our conjecture that most firms seem to have anchors. In the next section, we formally test the role of anchors in explaining nominal stock prices using a regression framework.

3.4. Determinants of Nominal Stock Price: the Role of Anchor

3.4.1. The role of the anchor price in predicting current nominal stock price level

In this section, we investigate the role of an anchor in explaining nominal stock prices. We hypothesize that the initial stock price of a listed firm, an IPO price, may well serve as an anchor for future nominal stock prices. This may occur if investors/managers tend to rely heavily on the first piece of price information offered, the IPO price, as 'the anchor'. Given the paucity of IPO price data, we use the initial nominal stock price of a firm when it first entered our sample period as a proxy for anchor price.

To test whether initial stock prices are anchors, we examine the determinants of nominal stock prices using cross–sectional regressions, and check whether initial stock prices serve as the main determinant of the current nominal stock price levels, controlling for other important factors. We rely on prior literature to identify these other important factors. Dyl and Elliott (2006), Baker, Greenwood, and Wurgler (2009), and Weld et al. (2009) show a strong cross–sectional relationship between a firm's size and its nominal share price. Weld et al. (2009) also find an industry effect on nominal share prices in the U.S. stock markets. Ferreira and Matos (2008) report that institutional investors have a strong preference for the stocks of large firms with good governance around the world. Chang and Luo (2010) find that stocks with low R–squared have low prices, are more difficult to value, are subject to noise trading, and attract individual investors. Hence, we include the firm's stock market capitalization and institutional ownership in the regressions as the main control variables. We also include industry dummies to control for the industry effect on the nominal stock price level.

Macroeconomic variables may affect the firm′s nominal stock price level. Different levels of institutional development and cultural background in various countries may also influence the nominal stock price level. There is a large body of law and finance literature that show that the degree of investor protection affects many aspects of financial markets.[35] When investor rights are well protected, small firms can have easy access to capital markets. When institutions are well developed, IPOs are actively pursued, and small firms with a low price level can be listed. This literature suggests that the degree of investor protection will be positively related to the proliferation of low−priced stocks.

Cross−cultural differences can also explain nominal stock price levels across countries. For instance, Hofstede′s (1980) cultural dimensions theory predicts that some countries tend to accommodate more uncertainty and risk, which may explain the significant presence of penny stocks in some countries that score low on the uncertainty avoidance index.[36] There is also a growing body of literature in which a country′s religion affects investors′ risk preferences, which again may affect the presence of lottery−type, low−priced stocks in some countries.[37] Instead of controlling for all these country−specific variables, we include the country dummy in our regressions. The country dummy variable captures time−invariant fixed effects as well as macroeconomic conditions at the country level. It should soak up the effects of not only the macroeconomic, institutional, and cultural aspects of a country but also other time−invariant features that we may have overlooked.

One concern in the regression analysis is exchange rate changes. To alleviate this concern, we convert the local currency prices to U.S. dollar prices with the exchange rates of June 2000, (i.e., fixed exchange rates). Alternatively, we can add the gain and loss due to foreign currency translation in the regressions to control for it directly. The untabulated results using the latter approach remain similar.

Table 3−3 presents the results of the cross−section OLS regressions of the firms′ nominal stock prices on country, industry, and firm characteristics and their initial nominal stock prices.

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[35] Many authors have contributed to this literature, but, according to our view, the most influential have been a series of papers by La Porta, Lopez–de–Silanes, Shleifer, and Vishny. Their 1998 paper provides a good overview.

[36] Hofstede's five culture dimensions are: (i) individualism–collectivism; (ii) uncertainty avoidance; (iii) masculinity–femininity; (iv) power distance; and (v) long–term orientation.

[37] See, for example, Barberis and Huang (2008), Hilary and Hui (2009), Kumar (2009), and Kumar, Page, and Spalt (2011).

We run these cross–sectional regressions every year for 29 years, rather than pooled cross–section time–series regressions, and report the summary statistics of the coefficient estimates and the R–squared. We do this because we have a concern that the nominal stock price might be non–stationary, and this would nullify the interpretations obtained in any panel regressions. Cross–section regressions are free from any problems associated with the non–stationarity of the variable. While we do not utilize time–series feature of the data using panel regression approach, the cross–sectional regressions can help us understand the role of an initial stock price or an IPO price as an anchor in explaining nominal stock prices.[38] Instead of presenting all the 29 regression results in Table 3–3, we show aggregate cross–section regression outputs where coefficients and t–statistics are the weighted average derived from the cross–sectional regressions with the number of observations in each regression being the weight. We show the weighted average rather than the simple average of the coefficients, t–statistics, and R^2, because the number of observations increases with time in general in our sample. Of all regressions, the numbers of coefficients that are positively and negatively significant at 10% level or less, respectively, are in square brackets. We also report R^2 of the weighted–average, the 25th percentile, the median, and the 75th percentile at the bottom of the table.

The initial stock prices are collected when the firms are initially included in the sample. The regressions cover the period of 1982 to 2010 because we need to use the 1981 price observation of each firm as the initial stock price. For firms that entered in our sample after 1981, the regressions are run one year after they enter. The (initial) nominal stock prices are winsorized at 1% and 99% levels to remove the effect of outliers. The stock market capitalization and the institutional ownership of each firm are winsorized in the same manner and lagged by one period.

In Panel A of Table 3–3, we run the regressions using all sample firms regardless of their sample period. In column (1), we regress the nominal stock prices only on firms' initial stock prices at the beginning of the sample. The overall coefficient estimates on initial stock price are positive and highly significant in all the 29 yearly cross–sectional regressions. The weighted

[38] For robustness, we do run a modified panel regression, and its results (unreported) are qualitatively similar to our cross–sectional results. The modifications are as follows: We first conduct a unit root test at the individual firm level. If a firm's stock price does not have a unit root, the nominal stock prices may or may not be mean–reverting (i.e., have an anchor). If it has a unit root, the volatility of the nominal stock prices around the time trend is not finite, and it does not have an anchor. We include only the firms that have no unit roots in their nominal stock prices into the sample of panel regression analysis.

average (median) R^2 is remarkably high at 0.60 (0.63). This means that about 60% of the variation in the current nominal stock price can be explained by just one piece of time–invariant information: the initial nominal price at the beginning of the sample. In 2010, for example, the information on the initial stock price is 29 years old, and yet, it has such high explanatory power to explain the variation in 2010 nominal stock prices. When we additionally include country fixed effects in column (2), the weighted average (median) R^2 rises slightly to 0.64 (0.67). When we add industry fixed effects as regressors in column (3), the weighted average (median) R^2 does not change. In column (4), we just use firm size (measured as market value of equity of each firm) and the initial stock price as explanatory variables. The estimates on the firm size are significant and positive at the 10% significance level or less for 27 times among 29 regressions, indicating that larger firms tend to command higher nominal share prices, an observation also made by Weld et al. (2009). However, the weighted average (median) R^2 hardly changes; it is at 0.60 (0.63). In column (5), we include all variables available in addition to the initial stock price. The weighted average (median) R^2 is 0.64 (0.67). In columns (6) and (7), we repeat columns (1) and (5), respectively, using the sample period of 2003–2010, during which we have the firms' institutional ownership data available. Including the institutional ownership variable in addition to the other variables in column (7) does not increase the weighted average (median) R^2 significantly compared to column (6) where only the initial stock price is included as a regressor (0.48 (0.52) from 0.44 (0.48)). The estimates on the institutional ownership are overall positive and significant for about half of the regressions.

One concern with the results in Panel A of Table 3–3 is that the initial stock price at the beginning of the sample in Panel A may be too near its current nominal stock price, and this may drive the results. In Panel B of Table 3–3, we restrict our dependent variable of nominal stock prices such that they are 10 or more years away from their initial stock prices.[39] Even after we do this, we notice that in column (1) of Panel B, the initial stock price alone explains almost half of the variation in the nominal stock prices (weighted average (median) R^2 of 0.44 (0.49)). Adding firm–level variables and country and industry fixed effects as regressors does not help boost the explanatory power, similar to the results in Panel A.

[39] In Panel A of Table 3–4, the average time gap between the nominal stock prices and the initial stock prices is 9.76 years. The gap becomes larger and is 15.61 years in Panel B.

In sum, the regression results in Table 3–3 show that the initial stock price, our proxy variable for anchor price, is the single most important variable that explains current nominal stock prices and that none of the other variables, whether they are firm–specific, industry–specific, or country–specific, matters much.

(SEE TABLE 3–3)

Table 3–4 presents the results of regressions similar to those used in Table 3–3 but with the firms' IPO prices replacing their initial nominal stock prices. To the extent that IPO price serves as a better proxy for anchor price, we should expect a stronger result. The downside of using the IPO sample is that we have a much smaller sample size due to the lack of IPO prices for international firms. The average sample size drops from 10,971 firms to 1,952 firms. But the results of Panels A and B in Table 3–4 using IPO data are remarkably similar to those of the corresponding panels in Table 3–3. We find that the single most important variable that explains the current nominal stock price of a firm is its IPO price and that adding other firm–level and country–level variables do not add much power to explain the variation in nominal stock prices.

(SEE TABLE 3–4)

3.4.2. Speed of nominal price adjustment to anchor price

In this section, we estimate the speed of adjustment (SOA) of a firm's nominal stock price in getting back to its anchor price. We borrow the test methodology from Lemmon, Roberts, and Zender (2008), who study the speed of leverage adjustment to the target leverage ratio. Similar to the regression model employed in Lemmon et al. (2008), we assume that nominal price change is a product of speed of adjustment and anchor price ("target price" in the terminology used by Lemmon et al. (2008)). We assume that anchor prices are determined by initial stock price, country, year (time), industry and firm fixed effects. Specifically, we run the following regression model of nominal stock prices.

$$\Delta Nominal\ price_{ft} = \alpha + \gamma_1(\beta_1 Initial\ price_{1f} + \upsilon_c + \tau_t + \iota_i + \phi_f - Nominal\ price_{1ft-1}) + \gamma_2(\beta_2 Initial\ price_{2f} + \upsilon_c + \tau_t + \iota_i + \phi_f - Nominal\ price_{2ft-1}) + \varepsilon_{it} \quad (1)$$

where υ_c, τ_t, ι_i, and ϕ_f are country, year (time), industry, and firm fixed effects. *Initial price* and *Nominal price* refer to the firm's initial stock price and nominal stock price, respectively. *Initial price*$_{1f}$ and *Nominal price*$_{1\ ft-1}$ (*Initial price*$_{2f}$ and *Nominal price*$_{2\ ft-1}$) are set to zero when the firm's nominal stock price at t–1 is less than or equal to (greater than) its initial stock price. Ideally, we would like to measure the speed of adjustment partitioning the nominal stock prices depending on whether they are higher or lower than the anchor price, but since we do not know the anchor price, we partition the sample based on whether the nominal stock prices are higher or lower than their initial stock prices.

The main parameters of interest are γ_1 and γ_2, and β_1 and β_2. γ_1 captures the speed of adjustment when the nominal price is above the initial price, whereas γ_2 captures the speed of adjustment when the nominal price is below or equal to the initial price. If γ_1 and γ_2 are positive, nominal stock prices approach the target price and these prices are mean–reverting. If they are negative, nominal stock prices move away from the target price and they are explosive. β_1 and β_2 measure the extent to which the initial stock price has an effect on the anchor price determination. If current nominal stock prices target only the initial stock prices, then the coefficient will be one. As for the computation of standard errors of γ_1, γ_2, β_1, and β_2, we use the delta method, a first–order approximation of the Taylor expansion, following Lemmon, Roberts, and Zender (2008).[40]

Table 3–5 presents the results of this test. The SOA estimates, γ_1, are positive and significant in all regression models, indicating that nominal stock prices are indeed mean–reverting when the nominal stock prices are higher than the initial nominal stock price. The coefficient estimates of the initial stock price (β_1) are also significant and positive. This result implies that a firm's initial nominal stock price level is an important anchor in guiding the level of its future nominal stock prices even when we control for the stock prices in the previous year. In fact, the estimate of β_1 in column (1) in which we include only the firm's initial price in the specification of the target price is 0.89. This estimate is very close to 1, and it suggests that the initial nominal price is a very strong anchor for the current nominal price. The estimates of β_1 are all significantly positive, although their magnitude drops in columns (2), (3), and (4), where we add country, year, and industry fixed effects, but still are close to 1. Finally, when we include only firm fixed effects

[40] Calculating standard errors of the variables is not trivial; they are presented in the form of the variance of the product of two variables. This is not equal to the product of the variance of each variable: $V(xy) \neq V(x) \times V(y)$. In computing $V(f(x))$ where $f(X) = xy$, we use the delta approximation of the Taylor expansion: $f(x) \approx f(a) + f'(a)(x - a)$. Then $V(f(x)) = E[f(x) - f(\mu)]^2 = E[f(\mu) + f'(\mu)(x - \mu) - f(\mu)]^2 = f'(\mu)^2 E[x - \mu]^2 = f'(\mu)^2 V(x)$.

in column (5), the estimate of the speed of adjustment jumps to 0.26. This result implies that time–invariant firm–specific factors such as the initial level of a firm's nominal stock price are the most important determinants of future nominal stock price levels.

The SOA estimates, γ_2, are also positive and significant in all regression models, indicating that nominal stock prices are indeed mean–reverting when they are lower than the initial nominal stock price. Their magnitude does not decrease with the inclusion of country, year, and industry fixed effects. However, the estimates of γ_2 are much smaller than those of γ_1, and the estimates of β_2 become insignificant when country, year, and industry fixed effects are included. This finding suggests that firms adjust their nominal stock prices more promptly toward their anchor prices when their nominal stock prices are high relative to the anchor price than when the stock prices are low relative to the anchor. It also suggests that the effect of the initial nominal price on future nominal stock prices is larger when the nominal stock prices are higher than when they are lower than the initial stock price.

In sum, the results of the speed of price adjustment to the anchor indicate that a firm's nominal stock price does mean–revert to its anchor price, and the main determinant of an anchor price is the firm's initial stock price.

(SEE TABLE 3–5)

3.5. Corporate Actions and Anchoring

The previous sections show that nominal stock prices tend to stay in their initial tercile group, and their initial stock prices in the remote past or their IPO prices are the best predictor of the firms' current nominal stock prices. Formal tests show that these prices mean–revert to their initial nominal prices, particularly if the deviation from the initial stock price is high.

In this section, we examine how the firms manage their nominal stock prices to target an anchor. Assuming that average stock returns are positive, nominal stock prices would increase with their accumulated earnings if the number of shares outstanding was left untouched and/or there were no payouts. Corporate actions such as stock splits and dividend payouts are the usual managerial instruments in curbing the explosion of the stock price when it becomes too high, whereas reverse stock splits are the main tool in preventing the implosion of the stock price when it becomes too low.

Ideally, we would like to document the actual corporate actions that force the nominal prices to change, but such data are not easily available to compile in an international setting. As an alternative approach, we proceed in the following way. We first compute the extent of deviation from the firms' initial nominal stock price in the beginning of year t as in equation (2):

$$Deviation\ (D) = \frac{Price_{t-1} - Inital\ Price}{Initial\ Price} \quad (2)$$

We then classify stocks in each country into three groups based on the extent of the deviation in the beginning of year t. A firm belongs to group 1, 2, or 3 if D is less than –0.5, if D is between –0.5 and 0.5, or if D is greater than 0.5, respectively. Stocks in group 1 have their t–1 share prices that are well below (where "well below" is defined as 50% or less) their anchors, stocks in group 2 have their t–1 nominal share prices that are close to their anchors, and stocks in group 3 have their t–1 nominal share prices that are much higher (where "much higher" is defined as 50% or more) than their anchors.

We then compute change in the nominal stock price (%) from t–1 to t as:

$$Change\ in\ nominal\ stock\ price\ (\%) = \frac{Price_t - Price_{t-1} * (1 + total\ return_t)}{Price_{t-1}} \times 100 \quad (3)$$

where *total return*$_t$ is the actual growth in the value of a share held from year t–1 to year t adjusted for all capital distributions including dividends. Because corporate actions such as stock splits, dividend payouts, and reverse stock splits are likely causes for the difference between the actual total return of a share and the return on its nominal share prices, the change in (3) will be 0 if there are no such corporate actions. Based on this observation, we make the following assumption. If the change is over x% (or below –x%), this change is caused by corporate actions that force the nominal stock price to increase (decrease). Without corporate actions, a positive or negative x% change in nominal stock price is highly unlikely. To be conservative, we assume x to be 20%.

We now provide evidence that corporate actions may cause the nominal share price to mean–revert to an anchor. Table 3–6 presents the number and percentage of nominal stock price changes due to corporate actions per country from July 1981 to June 2010 for firms that have at least 10 consecutive yearly observations. The first four columns of Table 3–6 list the name of the country and the number of firm–year observations in each group, partitioned by the extent of the deviation of the nominal price from the initial price as explained in (2). The next six columns show the number of firm–year observations whose nominal stock prices are forced to increase by corporate actions and their percentages by each group, as explained in (3). The last six columns show the number of firm–year observations whose nominal stock prices are forced to decrease by corporate actions and their percentages by each group as explained in (3).

The results in the last row of Table 3–6 shows that when the firms' nominal stock prices fall by more than 50% compared to their initial stock prices (group 1), 2.25% of these firms increase their nominal share prices by corporate actions. However, when the firms' nominal stock prices rise by more than 50% compared to their initial stock prices (group 3), only 0.26% of these firms increase their nominal share prices. This figure is almost 10 times lower. We also see that when the firms' nominal stock prices rise by more than 50% compared to their initial stock prices (group 3), 8.60% of these firms decrease their nominal share prices. However, when the firms' nominal stock prices fall by more than 50% compared to their initial stock prices (group 1), only 4.17% of these firms decrease their nominal share prices by deliberate actions. This figure is less than half.

When we examine this pattern country by country, in 36 out of 38 countries, corporate actions increase nominal prices more often when their nominal stocks are considerably lower than their initial stock prices. In 34 out of 38 countries, corporate actions decrease nominal prices more often when their nominal stocks are considerably higher than their initial stock prices.

We also note that the decrease in nominal stock price due to corporate actions such as stock splits and large dividend payouts is more frequent than the increase due to, for example, reverse stock splits. Firms tend to adjust their stock prices more promptly toward the initial price, or the anchor, when they are greater than the anchor. When the prices are lower than the anchor, the adjustment is slower. This finding is consistent with the results in Table 3–5, which shows that the speed of adjustment to the initial nominal stock price is faster when the current nominal price is higher than the initial stock price, but the speed of adjustment is slower when the current nominal price is lower than the initial stock price. The fact that dividend payouts and stock splits are easier to do than reverse stock splits may drive the asymmetry. Further, negative dividends are not possible.

(SEE TABLE 3–6)

3.6. Nominal Stock Price after Euro Introduction

As of January 1, 1999, nominal stock prices in nine European Union members in our sample were converted to the euro using the fixed exchange rate set for each country on December 31, 1998.[41] This currency regime change, which entails the change of nominal price units, is a shock to old anchors. This external shock offers us a natural experiment to investigate what happens before, during, and after the change.[42] So far, in our analysis, we have excluded the euro countries after the introduction of the euro from the sample because their old anchors were disrupted. In this section, we include them to find out what their new anchors are.

In Figure 3–2, we draw the time–series pattern of the nominal stock prices for firms in euro countries and firms in non–euro European countries separately. The figure shows the trend of median nominal stock prices presented for the period 1987 to 2010. We use the 2000 euro as the numeraire currency. We partition the sample into two 12–year periods: 1987 to 1998 before the euro introduction and 1999 to 2010 after the euro introduction. We require that the firms be present during the entire 24–year period. Therefore, we have 350 firms from the euro countries and 463 firms from non–euro European countries.[43] Plotted in Figure 3–2 are each sub–group's average median nominal prices in each year for each sub–period.

Figure 3–2 shows that the median of non–euro European firms' nominal stock prices are quite stable throughout the entire sample period. This is similar to what we observe in Figure 3–1. However, the average of the median nominal stock prices of euro area firms, whose stock prices are being measured in euro instead of their local currency after January 1, 1999, dropped dramatically after the euro introduction. The average median nominal prices in the euro area dropped more than half (€25.0 from €61.4), whereas that of the non–euro European countries stayed almost the same.

(SEE FIGURE 3–2)

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[41] The nominal stock prices of firms in Greece were converted to euro as of January 1, 2001.

[42] The reaction of the nominal stock prices to the regime change is an important empirical question, but beyond the scope of this study.

[43] We exclude firms from Greece that adopted the euro in 2001 to clearly compare before and after the initial introduction of the euro in 1999. Non–euro European countries are: Denmark, Norway, Sweden, Switzerland, and the United Kingdom.

In Figure 3–3, we plot the trend of median absolute difference in nominal stock prices between euro firms and matching non–euro European firms. All nominal prices are at the end of June in each year and are measured in the 2000 euro term. We match 350 firms from euro countries in Figure 3–2 with non–euro European firms in Figure 3–2 with respect to industry and firm size. A matching firm is selected such that it has the closest market capitalization in the same industry as of the end of June in 1998. Figure 3–3 shows that the median absolute difference in nominal stock price between firms in euro countries and their matching firms in non–euro European countries significantly drops right after the euro introduction, narrowing the gap between euro firms and their comparable non–euro European neighbors. This suggests that the new anchors for the euro firms, whose old anchors got disrupted by the introduction of the euro in the beginning of 1999, may possibly be the nominal prices of similar European firms that are outside the euro area.

(SEE FIGURE 3–3)

An interesting question is whether corporate actions facilitated the drop in the nominal stock price in the euro area. To answer this, we examine the number and percentage of firms whose nominal stock prices in local currency decrease due to corporate actions. We use the same methodology as in Table 3–6. However, here we focus on firms that took corporate actions to reduce the nominal prices.

Table 3–7 presents the statistics by year for euro and non–euro European countries, for firms that had been present during the entire period of July 1998 to June 2010. Thus we have 1,068 firms for euro countries and 1,037 firms for non–euro European countries for this experiment. Columns 3 and 5 in Table 3–7 present the percentage of firms that took corporate actions to decrease the nominal share prices for euro countries and non–euro European countries, respectively. We notice that a much higher percentage of the euro firms decreases their stock prices by corporate actions right after the euro introduction (1999 and 2000). These percentages in 1999 and 2000 are 11.0% and 15.2%, respectively, and they are much higher than the corresponding percentages for the non–euro European firms in 1999 and 2000 (5.6% and 7.3%, respectively). It is interesting to observe that after these two years, there appears to be little difference between the percentages of euro and non–euro European firms that reduce their nominal share prices by corporate actions.

The results in Table 3–7, along with Figure 3–2 and 3–3, seem to suggest that more firms in the euro area intentionally decreased their stock prices after the regime change. Why did this happen? We believe that currency regime changes are likely to disrupt existing anchors present in nominal prices that investors/managers have been accustomed to. The introduction of the euro is likely to have made the ‘old’ anchor disappear and brought in a ‘new’ anchor for euro firms. It is plausible that the new anchors will be nominal prices of other European firms that are not in the euro area. One looks for one’s neighborhood for a ‘norm’. Realizing that their nominal prices in the new currency will be much higher than the nominal prices of non–euro European firms, euro firm managers brought down their stock prices by corporate actions like stock splits or dividend payouts. In other words, euro firm managers adjust their stock prices to a ‘new’ anchor, the nominal stock prices of other non–euro European firms. We see this happening in Figures 3–2 and 3–3. This is consistent with the overall story in Table 3–5, where we observe that corporate actions deliberately bring down the nominal share prices if they are higher than the anchor. Here the new anchor was nominal prices of other European firms that were not in the euro area.

(SEE TABLE 3–7)

3.7. Conclusions

In this paper, we revisit Weld et al.’s (2009) observation that the average nominal share price of NYSE and AMEX stocks has been approximately $25 since the Great Depression and this “nominal price fixation is primarily a U.S. or North American phenomenon.” Using a larger data set of nominal stock prices of individual firms from 38 countries around the world, we compile some evidence of the existence of an anchor price in most countries. The nominal price fixation does not appear to be primarily a U.S. or North American phenomenon, but rather a global phenomenon. In other words, anchors are norms (a point made in Weld et al (2009), and norms exist in all countries.

We also find that the best predictor of a firm’s current stock price is its initial nominal stock price, suggesting that subsequent nominal stock prices tend to revert back to their initial nominal prices. The reversion, we document, is stronger if nominal prices are higher than the anchor than when they are lower than the anchor.

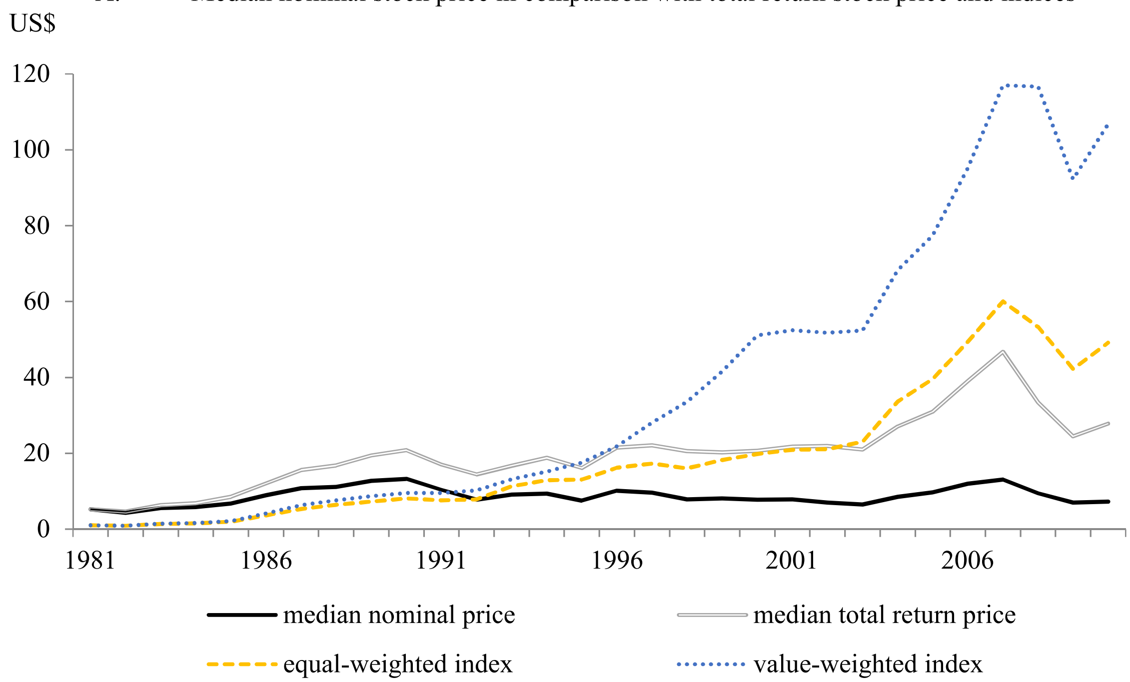
Further tests indicate that corporate actions, such as stock splits, dividend payouts, and even reverse stock splits, are responsible for this curious phenomenon. We see this quite dramatically during the introduction of the euro in 1999, where corporate actions in euro firms adjusted very fast to the disappearance of old anchors and the birth of new anchors.

We do not answer why firms anchor. It is a puzzle. We leave it to future research to explore the motivations of corporations to anchor their nominal share price.

Figure 3–1: Trends of median nominal and median total return stock price, equally– and value–weighted total return index

Panel A shows the trend of median nominal and median total return stock prices denominated in 2000 U.S. dollar, equally– and value–weighted total return index for the period 1981 to 2010 for 1,657 firms that had been present during the whole sample period. Euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and Turkey are excluded. The median total return price is the median of the adjusted stock prices where the adjusted stock price reflects the actual growth in value of a share held over the sample period assuming dividends are reinvested. Equal– and value–weighted total return indices are constructed using 1,657 firms' adjusted stock prices where value–weighted is weighted by firms' market capitalizations. Both indices are scaled as 1 U.S. dollar in 1981. Panel B shows the trend of median nominal and deflated median total return stock prices, deflated equally– and value–weighted total return index. The last three series are deflated by the consumer price index of the U.S.

A. Median nominal stock price in comparison with total return stock price and indices



B. Median nominal stock price in comparison with inflation–adjusted total return stock price and indices

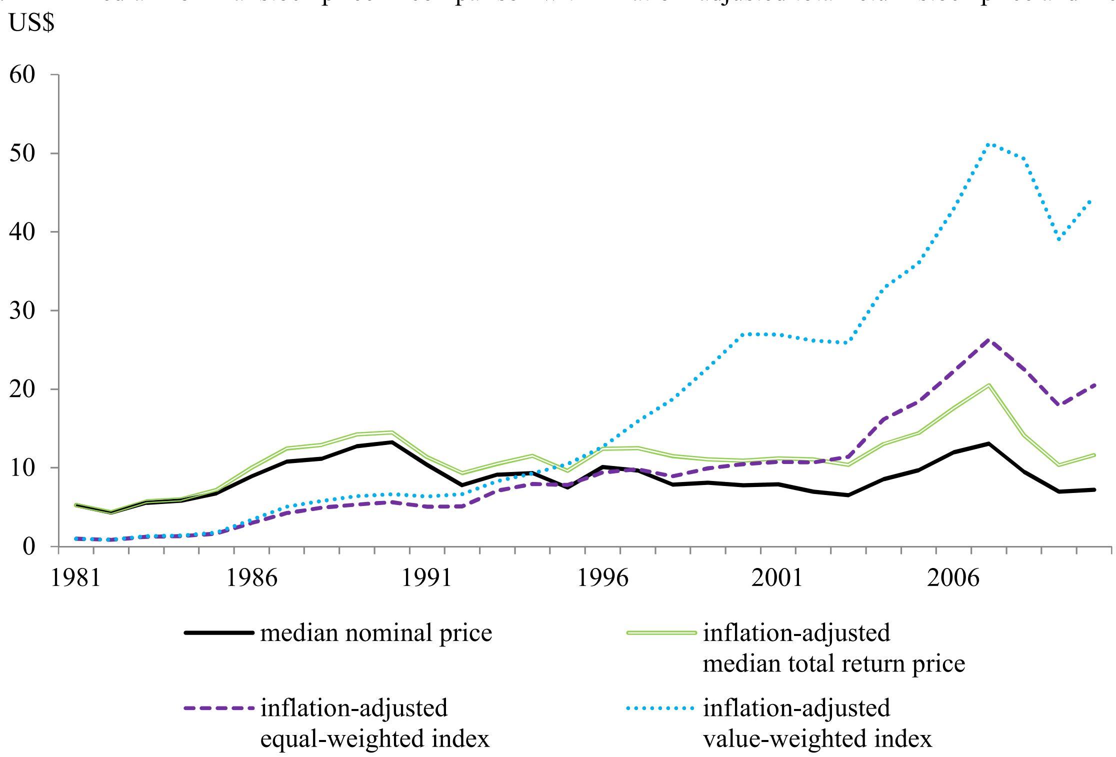


Figure 3–2: Trend of median nominal stock price of euro and non–euro European countries in euro

The figure shows the trend of median nominal stock prices in 2000 euro at the end of June in each year for 1987 to 2010, partitioned into two 12–year periods (1987 to 1998, and 1999 to 2010), for firms that had been present during the entire 1987 to 2010 period. Firms are divided into two groups: 350 firms from the euro countries (excluding Greece which adopted the euro in Jan. 2001) and 463 firms from non–euro European countries. Euro countries are Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Portugal, and Spain. Non–euro European countries are Denmark, Norway, Sweden, Switzerland, and the U.K. The "average" is the average of each year's median nominal price for each sub–group for each sub–period.

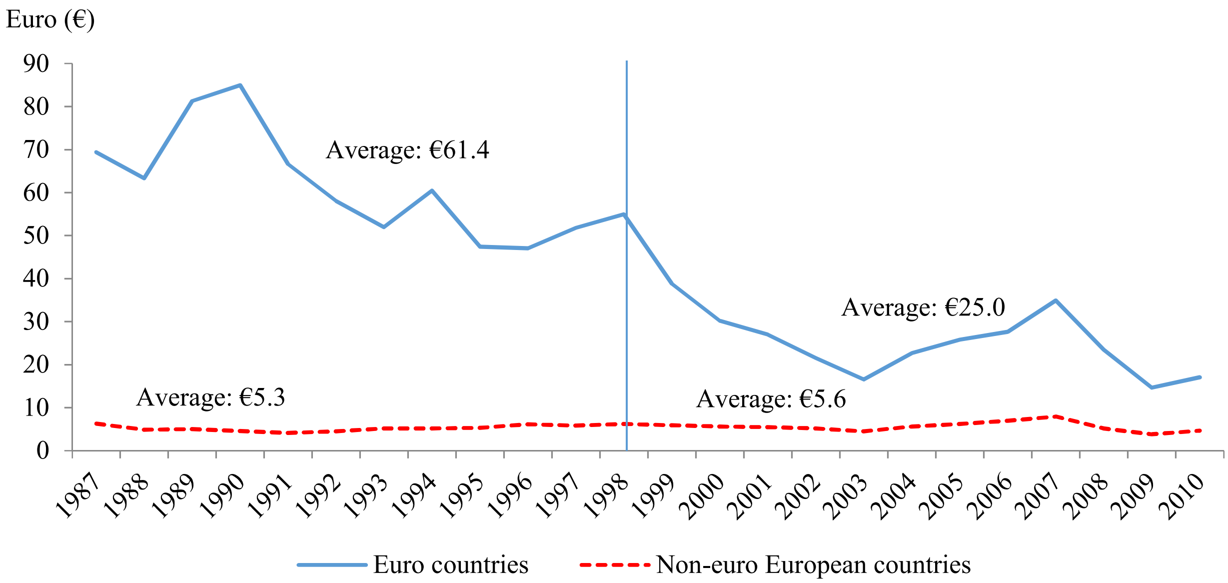


Figure 3–3: Trend of median absolute difference in nominal stock price in euro between firms in euro countries and their matching firms in non–euro European countries

The figure shows the trend of median absolute difference in nominal stock prices between euro firms and matching non–euro European firms. All nominal prices are at the end of June each year and are measured in the 2000 euro term. The sample firms in the figure have to have been present during the entire 1987 to 2010 period. 350 firms from euro countries in Figure 3–2 are matched with non–euro European firms in Figure 3–2 with respect to industry and firm size. A matching firm is selected such that it has the closest market capitalization in the same industry as of the end of June in 1998. Euro countries include Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Portugal, and Spain (excluding Greece which adopted the euro in Jan. 2001). Non–euro European countries include Denmark, Norway, Sweden, Switzerland, and the U.K.

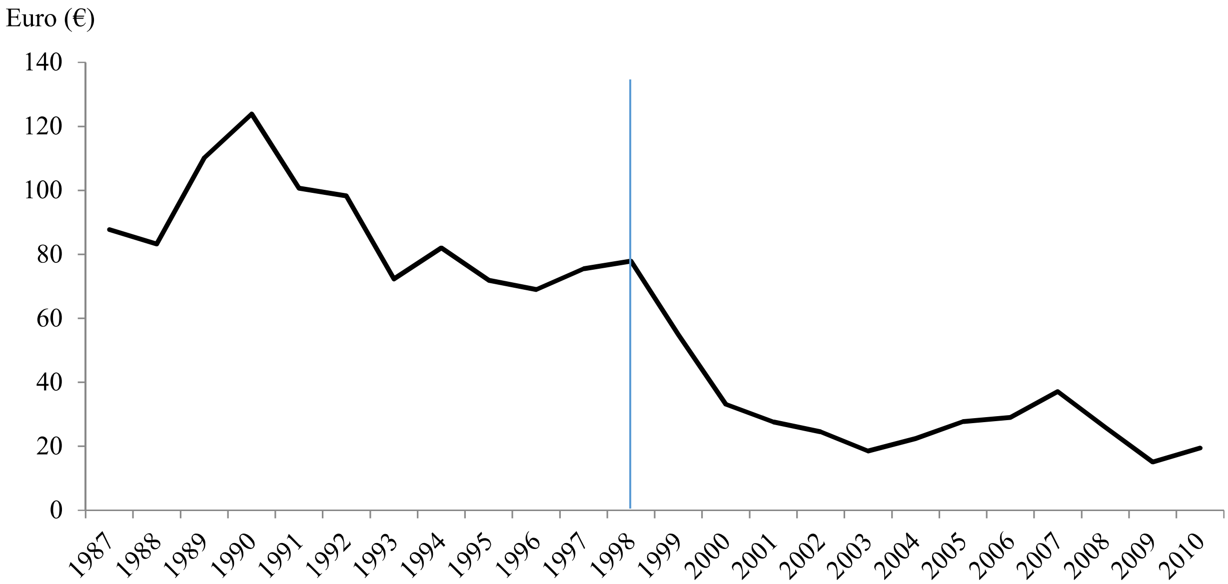


Table 3–1: Mean and median of nominal stock prices per country
This table shows the mean and median of nominal stock prices at the end of June in each year from 1981 to 2010. To be included in the sample, firms are required to have at least 10 consecutive yearly observations.

Country	Period	No. of firms	Local currency			USD	
			Name	Mean	Median	Mean	Median
Argentina	94 ~ 10	80	Argentine peso	4.6	2.0	2.4	1.0
Australia	81 ~ 10	1,154	Australian dollar	2.2	0.4	1.6	0.3
Austria	86 ~ 10	114	Euro*	143.7	47.5	164.5	55.1
Belgium	81 ~ 10	206	Euro*	249.5	72.6	287.1	79.3
Brazil	94 ~ 10	44	Real	90.3	25.0	55.8	13.5
Canada	81 ~ 10	1,351	Canadian dollar	9.3	3.1	7.3	2.4
Chile	90 ~ 10	208	Chilean peso	3,813,682	280.0	7,748.5	0.6
Colombia	95 ~ 10	51	Colombian peso	5,436.4	1,500.0	2.8	0.8
Denmark	87 ~ 10	224	Danish krone	1,609.8	335.0	248.9	51.2
Egypt	97 ~ 10	95	Egyptian pound	58.3	24.4	12.6	5.0
France	81 ~ 10	966	Euro*	109.5	40.9	125.9	45.5
Germany	81 ~ 10	846	Euro*	134.9	36.5	152.3	41.4
Greece	88 ~ 10	279	Euro*	8.5	4.0	11.0	4.8
Hong Kong	81 ~ 10	736	Hong Kong dollar	4.4	1.0	0.6	0.1
India	90 ~ 10	1,524	Indian rupee	51.0	9.2	1.4	0.2
Indonesia	91 ~ 10	264	Rupiah	2,849.2	850.4	0.7	0.1
Ireland	86 ~ 10	71	Euro*	4.3	2.0	5.1	2.3
Israel	86 ~ 10	559	New shekel	128.7	6.9	43.1	1.9
Italy	81 ~ 10	312	Euro*	6.7	3.1	8.4	3.9
Japan	81 ~ 10	2,343	Yen	10,720.2	706.0	93.1	5.8
Malaysia	86 ~ 10	721	Ringgit	3.4	1.9	1.2	0.5
Netherlands	81 ~ 10	233	Euro*	118.6	24.7	127.3	27.2
New Zealand	99 ~ 10	66	New Zealand dollar	2.3	1.4	1.4	0.8
Norway	81 ~ 10	180	Norwegian krone	166.1	88.5	24.0	12.7
Pakistan	93 ~ 10	301	Pakistani rupee	63.6	18.0	1.2	0.3
Peru	92 ~ 10	126	Nuevo sol	149.6	1.6	48.3	0.6
Philippines	90 ~ 10	209	Philippine peso	41.5	1.8	1.2	0.0
Portugal	88 ~ 10	116	Euro*	10.2	6.5	12.4	7.9
Singapore	83 ~ 10	369	Singapore dollar	2.3	0.9	1.4	0.5
South Africa	81 ~ 10	463	Rand	22.6	5.0	5.4	1.0
South Korea	85 ~ 10	785	Won	21,307	12,450	22.8	13.7
Spain	87 ~ 10	170	Euro*	23.9	13.5	30.2	16.2
Sweden	82 ~ 10	325	Krona	98.6	63.0	13.4	8.2
Switzerland	81 ~ 10	298	Swiss franc	1,397.9	510.0	925.0	348.9
Thailand	89 ~ 10	385	Baht	76.6	22.7	2.7	0.6
Turkey	92 ~ 10	272	Turkish lira**	16.1	4.2	123.0	5.2
United Kingdom	81 ~ 10	2,023	British pound	3.3	1.2	5.4	2.0
United States	81 ~ 10	2,816	US dollar	51.3	21.9	51.3	21.9
Total	**81 ~ 10**	**21,285**				**135.9**	**4.0**

* Local currencies before January 1999 (2001) were converted to euro using fixed exchange rates set on December 31, 1998 (2000 for Greece).
** Old currencies before January 2005 were converted to new currencies using fixed conversion rates

Table 3–2: Percentage of firms whose stock prices in local currency remain in their initial tercile groups per country

This table presents the number and percentage of firms whose stock prices remain in their initial tercile groups for a certain percentage of the time for which they are in the sample. The nominal stock prices for each year are determined at the end of June in each year for the period 1981 to 2010. Observations after the introduction of the euro (Jan. 1999) of euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and after currency devaluation of Turkish lira (Jan. 2005) are excluded. To be included in the sample, firms are required to have at least 10 consecutive yearly observations. Nominal stock prices for each country in each year are partitioned by tercile groups and are assigned into a tercile group. The initial tercile group for a firm is the tercile group that it belongs to when it is initially included in the sample period. The column labeled "< 50%" refers to the number (or the percentage) of firms that stay within their initial tercile group less than 50% of their sample years. Similarly, the columns labeled "50% <= & <75%" and ">=75%" denote the number (or the percentage) of firms that stay within their initial tercile group between 50% and 75%, and greater than 75%, of their sample years.

Country	Period	all (A)	Number of firms that remain in their initial tericle group during sample period (B)			B/A (%)		
			< 50%	50% <= & < 75%	>= 75%	< 50%	50% <= & <75%	>= 75%
Argentina	94 ~ 10	80	33	22	25	41.3	27.5	31.3
Australia	81 ~ 10	1,154	390	298	466	33.8	25.8	40.4
Austria	86 ~ 98	51	17	11	23	33.3	21.6	45.1
Belgium	81 ~ 98	110	32	18	60	29.1	16.4	54.5
Brazil	94 ~ 10	44	16	15	13	36.4	34.1	29.5
Canada	81 ~ 10	1,351	440	310	601	32.6	22.9	44.5
Chile	90 ~ 10	208	44	28	136	21.2	13.5	65.4
Colombia	95 ~ 10	51	11	9	31	21.6	17.6	60.8
Denmark	87 ~ 10	224	94	69	61	42.0	30.8	27.2
Egypt	97 ~ 10	95	39	21	35	41.1	22.1	36.8
France	81 ~ 98	437	148	93	196	33.9	21.3	44.9
Germany	81 ~ 98	355	97	86	172	27.3	24.2	48.5
Greece	88 ~ 98	71	14	18	39	19.7	25.4	54.9
Hong Kong	81 ~ 10	736	341	171	224	46.3	23.2	30.4
India	90 ~ 10	1,524	602	415	507	39.5	27.2	33.3
Indonesia	91 ~ 10	264	138	62	64	52.3	23.5	24.2
Ireland	86 ~ 98	53	19	6	28	35.8	11.3	52.8
Israel	86 ~ 10	559	202	118	239	36.1	21.1	42.8
Italy	81 ~ 98	180	44	34	102	24.4	18.9	56.7
Japan	81 ~ 10	2,343	818	503	1,022	34.9	21.5	43.6
Malaysia	86 ~ 10	721	342	171	208	47.4	23.7	28.8
Netherlands	81 ~ 98	177	76	37	64	42.9	20.9	36.2
New Zealand	99 ~ 10	66	6	15	45	9.1	22.7	68.2
Norway	81 ~ 10	180	66	47	67	36.7	26.1	37.2
Pakistan	93 ~ 10	301	91	62	148	30.2	20.6	49.2
Peru	92 ~ 10	126	31	38	57	24.6	30.2	45.2
Philippines	90 ~ 10	209	69	38	102	33.0	18.2	48.8
Portugal	88 ~ 98	69	18	19	32	26.1	27.5	46.4

Singapore	83 ~ 10	369	142	84	143	38.5	22.8	38.8
South Africa	81 ~ 10	463	121	100	242	26.1	21.6	52.3
South Korea	85 ~ 10	785	413	190	182	52.6	24.2	23.2
Spain	87 ~ 98	94	31	18	45	33.0	19.1	47.9
Sweden	82 ~ 10	325	134	78	113	41.2	24.0	34.8
Switzerland	81 ~ 10	298	113	83	102	37.9	27.9	34.2
Thailand	89 ~ 10	385	200	88	97	51.9	22.9	25.2
Turkey	92 ~ 04	168	82	31	55	48.8	18.5	32.7
United Kingdom	81 ~ 10	2,023	741	432	850	36.6	21.4	42.0
United States	81 ~ 10	2,816	999	701	1,116	35.5	24.9	39.6
Total	**81 ~ 10**	**19,465**	**7,214**	**4,539**	**7,712**	**37.1**	**23.3**	**39.6**

Table 3–3: Cross–section regressions of nominal stock prices on firm's IPO prices

This table presents the result of cross–section regressions of firms' nominal stock prices at the end of June in each year for the period from 1982 to 2010 on country/firm characteristics and their IPO prices. The coefficients and t–statistics in parentheses (which are based on White heteroscedasticity–corrected standard errors) are weighted averages derived from the cross–section regressions, the number of observations in the regressions being the weight. The number of coefficients that are positively and negatively significant at 10% level or less, respectively, are in brackets. Observations after the introduction of the euro (Jan. 1999) of euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and after currency devaluation of Turkish lira (Jan. 2005) are excluded. To be included in the sample, firms are required to have at least 10 consecutive yearly observations. IPO prices in local currency are converted to the U.S. dollar prices with exchange rates at the end of June 2000. The firm–level independent variables are lagged by 1 period and all variables are winsorized at 1% and 99% percentiles. IPO price is the price offered by a firm in IPO expressed in 2000 US dollar. Log (market value of equity) is the natural logarithm of a firm's share price in 2000 million U.S. dollar multiplied by its number of shares outstanding. Institutional ownership is strategic ownership collected from Datastream which defines it as the proportion of shares exceeding 5 % of total shares outstanding held by institutional investors such as pension funds and investment companies among all shares outstanding (%). Industry classification is Datastream level 2 group (19 industries) based on FTSE's industry classification benchmark.

Variables	Panel A: All sample						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IPO price	0.84						0.81
	(10.28)						(11.43)
	[16,0]						[8,0]
Log (market value of equity)		13.68				10.78	3.20
		(3.76)				(3.52)	(2.82)
		[16,0]				[8,0]	[7,0]
Institutional ownership					0.04	0.02	0.00
					(0.89)	(0.42)	(0.08)
					[2,0]	[0,0]	[0,0]
Constant	0.85	6.70	3.19	3.21	11.93	2.95	–0.78
	(0.47)	(5.30)	(3.46)	(5.87)	(5.76)	(0.82)	(–0.18)
	[11,2]	[19,0]	[16,0]	[16,0]	[8,0]	[0,0]	[0,0]
Country fixed effects	No	No	Yes	No	No	Yes	Yes
Industry fixed effects	No	No	No	Yes	No	Yes	Yes
No. of regressions	19	19	19	19	8	8	8
Average no. of firms	1,952	1,952	1,952	1,952	2,138	2,138	2,138
R^2: average	0.66	0.13	0.15	0.03	0.00	0.19	0.71
25^{th}	0.46	0.10	0.11	0.02	0.00	0.18	0.61
median	0.61	0.11	0.14	0.03	0.00	0.20	0.75
75^{th}	0.79	0.19	0.26	0.03	0.00	0.20	0.84
Adj. R^2: average	0.66	0.13	0.14	0.02	0.00	0.18	0.71

Variables	Panel B: Sample of nominal prices that are 10 or more years away from the IPO price						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IPO price	0.76						0.77
	(5.82)						(6.87)
	[9,0]						[8,0]
Log (market value		9.98				10.00	3.27

of equity)		(3.46)				(3.24)	(2.35)
		[10,0]				[7,0]	[6,0]
Institutional ownership					0.03 (0.72)	0.02 (0.55)	0.01 (0.55)
					[2,0]	[0,0]	[1,0]
Constant	0.76 (1.17)	3.16 (3.25)	4.71 (2.83)	3.17 (5.34)	9.25 (5.05)	4.07 (0.69)	–25.39 (–1.08)
	[3,0]	[9,0]	[8,0]	[10,0]	[8,0]	[0,0]	[0,1]
Country fixed effects	No	No	Yes	No	No	Yes	Yes
Industry fixed effects	No	No	No	Yes	No	Yes	Yes
No. of regressions	10	10	10	10	8	8	8
Average no. of firms	1,406	1,406	1,406	1,406	1,353	1,353	1,353
R^2: average	0.61	0.20	0.12	0.02	0.00	0.26	0.69
25^{th}	0.47	0.14	0.09	0.02	0.00	0.24	0.67
median	0.66	0.20	0.11	0.02	0.00	0.30	0.78
75^{th}	0.72	0.26	0.11	0.04	0.00	0.31	0.82
Adj. R^2: average	0.61	0.20	0.10	0.02	0.00	0.25	0.68

Table 3–4: Cross–section regressions of nominal stock prices on firm's initial stock prices

This table presents the result of cross–section regressions of firms' nominal stock prices at the end of June in each year for the period from 1982 to 2010 on country/firm characteristics and their initial nominal stock prices. The coefficients and t–statistics in parentheses (which are based on White heteroscedasticity–corrected standard errors) are weighted averages derived from the cross–section regressions, the number of observations in the regressions being the weight. The number of coefficients that are positively and negatively significant at 10% level or less, respectively, are in brackets. Observations after the introduction of the euro (Jan. 1999) of euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and after currency devaluation of Turkish lira (Jan. 2005) are excluded. To be included in the sample, firms are required to have at least 10 consecutive yearly observations. Stock prices in local currency are converted to the U.S. dollar prices with exchange rates at the end of June 2000. The firm–level independent variables are lagged by 1 period and all variables are winsorized at 1% and 99% percentiles. Initial stock price for a firm is the stock price when it is initially included in the sample as expressed in 2000 US dollar. Log (market value of equity) is the natural logarithm of a firm's share price in 2000 million U.S. dollar multiplied by its number of shares outstanding. Institutional ownership is strategic ownership collected from Datastream which defines it as the proportion of shares exceeding 5 % of total shares outstanding held by institutional investors such as pension funds and investment companies among all shares outstanding (%). Industry classification is Datastream level 2 group (19 industries) based on FTSE's industry classification benchmark.

Variables	Panel A: All sample						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Initial Stock price	0.62 (31.06) [29,0]						0.43 (14.37) [8,0]
Log (market value of equity)		3.35 (7.91) [29,0]				2.53 (6.93) [8,0]	1.61 (6.11) [8,0]
Institutional ownership					0.08 (3.05) [6,0]	0.12 (3.89) [7,0]	0.05 (2.04) [5,0]
Constant	7.19 (18.04) [29,0]	20.98 (26.16) [29,0]	34.04 (5.28) [28,0]	13.04 (9.35) [29,0]	14.99 (16.45) [8,0]	–1.81 (–0.84) [0,2]	0.36 (–0.13) [0,2]
Country fixed effects	No	No	Yes	No	No	Yes	Yes
Industry fixed effects	No	No	No	Yes	No	Yes	Yes
No. of regressions	29	29	29	29	8	8	8
Average no. of firms	10,971	10,971	10,971	10,971	10,254	10,254	10,254
R^2: average	0.60	0.02	0.42	0.01	0.00	0.21	0.48
25^{th}	0.54	0.00	0.22	0.01	0.00	0.19	0.41
median	0.63	0.01	0.51	0.01	0.00	0.20	0.52
75^{th}	0.72	0.03	0.65	0.02	0.00	0.22	0.54
Adj. R^2: average	0.60	0.02	0.42	0.01	0.00	0.20	0.48
Variables	Panel B: Sample of nominal prices that are 10 or more years away from the initial nominal price						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Initial Stock price	0.50 (16.50) [20,0]						0.26 (5.15) [8,0]
Log (market value		2.73				2.17	1.74

of equity)		(8.18)				(6.39)	(6.31)
		[20,0]				[8,0]	[8,0]
Institutional ownership					0.08	0.06	0.04
					(2.71)	(2.08)	(1.49)
					[4,0]	[5,0]	[3,0]
Constant	9.30	18.52	22.01	12.93	14.49	–0.08	0.62
	(16.62)	(19.88)	(4.21)	(8.06)	(15.59)	(–0.12)	(0.09)
	[20,0]	[20,0]	[19,0]	[20,0]	[8,0]	[0,0]	[0,1]
Country fixed effects	No	No	Yes	No	No	Yes	Yes
Industry fixed effects	No	No	No	Yes	No	Yes	Yes
No. of regressions	20	20	20	20	8	8	8
Average no. of firms	7,149	7,149	7,149	7,149	7,899	7,899	7,899
R^2: average	0.44	0.02	0.40	0.02	0.00	0.29	0.36
25th	0.37	0.01	0.29	0.01	0.00	0.27	0.34
median	0.49	0.02	0.52	0.02	0.00	0.31	0.37
75th	0.58	0.03	0.60	0.02	0.00	0.33	0.40
Adj. R^2: average	0.44	0.02	0.40	0.01	0.00	0.29	0.36

Table 3–5: Speed of adjustment of nominal stock prices

This table presents the result of the following regression model of nominal stock prices at the end of June in each year for the period 1982 to 2010:

$$\Delta Nominal\ price_{ft} = \alpha + \gamma_1\left(\beta_1 * Initial\ price_{1f} + \upsilon_c + \tau_t + \iota_i + \phi_f - Nominal\ price_{1ft-1}\right) + \gamma_2\left(\beta_2 * Initial\ price_{2f} + \upsilon_c + \tau_t + \iota_i + \phi_f - Nominal\ price_{2ft-1}\right) + \varepsilon_{it}$$

where $\upsilon_c, \tau_t, \iota_i,$ and ϕ_f are country, year (time), industry, and firm fixed effects and *Initial price* and *Nominal price* refer to the firm's initial stock price and nominal stock price at t–1, respectively. $Initial\ price_{1f}$ and $Nominal\ price_{1\,ft-1}$ ($Initial\ price_{2f}$ and $Nominal\ price_{2\,ft-1}$) are set to zero when the firm's nominal stock price at t–1 is less than or equal to (greater than) its initial stock price. To be included in the sample, firms are required to have at least 10 consecutive yearly observations. Observations after the introduction of the euro (Jan. 1999) of euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and after currency devaluation of Turkish lira (Jan. 2005) are excluded. Stock prices in local currency are converted to the U.S. dollar prices with exchange rates at the end of June 2000 and winsorized at 1% and 99% percentiles. Industry classification is Datastream level 2 group (19 industries) based on FTSE's industry classification benchmark. The t–statistics in parentheses are based on robust standard errors that are corrected for clustering at the firm level. Standard errors of $\gamma_1, \gamma_2, \beta_1,$ and β_2 are derived using the delta method. ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)
$Nominal\ price_{ft-1} > Initial\ price_f$					
Speed of adjustment (γ_1)	0.10***	0.13***	0.12***	0.12***	0.26***
	(10.25)	(11.57)	(11.42)	(11.46)	(33.65)
Initial Stock price (β_1)	0.89***	0.63***	0.63***	0.63***	
	(10.14)	(6.72)	(6.59)	(6.63)	
$Nominal\ price_{ft-1} \leq Initial\ price_f$					
Speed of adjustment (γ_2)	0.06***	0.06***	0.06***	0.06***	0.19***
	(13.18)	(13.27)	(13.21)	(13.35)	(18.29)
Initial Stock price (β_2)	0.23***	0.04	0.05	0.05	
	(7.54)	(0.95)	(1.04)	(1.14)	
Constant	0.99***	0.59**	–3.18***	–3.48***	5.34***
	(23.21)	(2.50)	(–9.21)	(–9.62)	(29.81)
Country fixed effects	No	Yes	Yes	Yes	No
Year fixed effects	No	No	Yes	Yes	No
Industry fixed effects	No	No	No	Yes	No
Firm fixed effects	No	No	No	No	Yes
No. of observations	318,181	318,181	318,181	318,181	318,181
R^2	0.03	0.05	0.05	0.05	0.12

Table 3–6: Change (increase / decrease) in nominal stock price in local currency due to corporate actions per country

This table presents the number and percentage of nominal stock prices in local currency that change (increase / decrease) due to corporate actions per country for July 1981 to June 2010, where firms' nominal stock prices in each country are divided into 3 groups with respect to the deviation defined as:

$$Deviation\ (D) = \frac{Price_{t-1} - Inital\ Price}{Initial\ Price}$$

A firm's stock belongs to group 1, 2, or 3 if D is less than –0.5, if D is between –0.5 and 0.5 (inclusive), or if D is greater than 0.5, respectively. To be included in the sample, firms are required to have at least 10 consecutive yearly observations. Observations after the introduction of the euro (Jan. 1999) of euro countries (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain) and after currency devaluation of Turkish lira (Jan. 2005) are excluded. The nominal stock prices are yearly observations at the end of June in each year for 1981 ~ 2010. Change in nominal stock price due to corporate actions (%) is defined as:

$$Change\ in\ nominal\ stock\ price\ (\%) = \frac{Price_t - Price_{t-1} * (1 + total\ return_t)}{Price_{t-1}} \times 100$$

where total $return_t$ is the actual growth in value of a share held from t–1 to t adjusted for all capital distributions including dividends. If it is over 20% (or below –20%), it is assumed there is an increase (decrease) in nominal stock price due to corporate actions such as reverse stock splits (stock splits or large dividend payouts).

Country	No. of firm/year observations By Group (A)			Increase No. by Group (B)			Increase B / A (%)			Decrease No. by Group (C)			Decrease C / A (%)		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Argentina	354	460	245	4	6	0	1.13	1.30	0.00	27	48	32	7.63	10.43	13.06
Australia	5,353	5,600	5,029	364	98	25	6.80	1.75	0.50	173	186	200	3.23	3.32	3.98
Austria	94	278	139	2	2	0	2.13	0.72	0.00	2	24	15	2.13	8.63	10.79
Belgium	119	457	742	1	0	1	0.84	0.00	0.13	0	9	28	0.00	1.97	3.77
Brazil	203	114	226	3	2	1	1.48	1.75	0.44	19	25	50	9.36	21.93	22.12
Canada	5,119	7,257	6,986	255	107	77	4.98	1.47	1.10	111	209	395	2.17	2.88	5.65
Chile	522	712	2,074	5	1	2	0.96	0.14	0.10	40	39	84	7.66	5.48	4.05
Colombia	124	251	243	2	0	0	1.61	0.00	0.00	11	7	10	8.87	2.79	4.12
Denmark	1,061	1,678	875	2	11	0	0.19	0.66	0.00	52	93	127	4.90	5.54	14.51
Egypt	516	375	129	2	0	0	0.39	0.00	0.00	104	67	26	20.16	17.87	20.16
France	696	2,076	1,826	3	2	1	0.43	0.10	0.05	27	162	169	3.88	7.80	9.26
Germany	308	2,015	1,789	6	7	0	1.95	0.35	0.00	24	79	123	7.79	3.92	6.88
Greece	109	264	261	0	1	0	0.00	0.38	0.00	12	58	54	11.01	21.97	20.69
Hong Kong	5,244	3,764	2,517	336	55	18	6.41	1.46	0.72	257	315	210	4.90	8.37	8.34
India	11,274	6,133	3,272	30	11	1	0.27	0.18	0.03	270	227	186	2.39	3.70	5.68

Indonesia	2,671	896	302	21	1	0	0.79	0.11	0.00	233	188	59	8.72	20.98	19.54
Ireland	83	262	192	2	1	0	2.41	0.38	0.00	2	16	15	2.41	6.11	7.81
Israel	3,169	2,989	2,421	33	3	3	1.04	0.10	0.12	110	165	105	3.47	5.52	4.34
Italy	648	1,075	427	10	6	2	1.54	0.56	0.47	51	101	47	7.87	9.40	11.01
Japan	13,097	19,276	14,531	36	18	3	0.27	0.09	0.02	182	372	214	1.39	1.93	1.47
Malaysia	4,464	3,649	3,054	53	11	4	1.19	0.30	0.13	222	319	358	4.97	8.74	11.72
Netherlands	452	962	927	1	0	1	0.22	0.00	0.11	10	56	127	2.21	5.82	13.70
New Zealand	124	337	180	10	2	2	8.06	0.59	1.11	8	16	9	6.45	4.75	5.00
Norway	948	998	555	18	2	0	1.90	0.20	0.00	67	85	92	7.07	8.52	16.58
Pakistan	1,168	1,605	1,145	4	2	1	0.34	0.12	0.09	113	203	202	9.67	12.65	17.64
Peru	557	603	486	4	0	1	0.72	0.00	0.21	74	98	97	13.29	16.25	19.96
Philippines	1,265	983	910	28	36	31	2.21	3.66	3.41	84	104	79	6.64	10.58	8.68
Portugal	362	231	16	1	0	0	0.28	0.00	0.00	28	24	3	7.73	10.39	18.75
Singapore	2,078	2,575	928	18	1	2	0.87	0.04	0.22	133	217	98	6.40	8.43	10.56
South Africa	1,482	2,019	2,848	43	6	3	2.90	0.30	0.11	88	156	187	5.94	7.73	6.57
South Korea	4,058	4,390	5,178	247	33	12	6.09	0.75	0.23	257	377	420	6.33	8.59	8.11
Spain	313	406	151	1	4	1	0.32	0.99	0.66	15	30	9	4.79	7.39	5.96
Sweden	1,713	1,553	900	50	14	0	2.92	0.90	0.00	103	150	170	6.01	9.66	18.89
Switzerland	1,920	2,151	940	4	0	0	0.21	0.00	0.00	100	117	106	5.21	5.44	11.28
Thailand	4,476	1,266	373	31	4	2	0.69	0.32	0.54	299	181	59	6.68	14.30	15.82
Turkey	387	460	833	1	0	2	0.26	0.00	0.24	161	247	432	41.60	53.70	51.86
United Kingdom	7,118	11,397	13,304	279	46	30	3.92	0.40	0.23	172	418	865	2.42	3.67	6.50
United States	6,716	23,909	15,222	125	49	15	1.86	0.20	0.10	128	1,726	2,465	1.91	7.22	16.19
Total	**90,365**	**115,426**	**92,176**	**2,035**	**542**	**241**	**2.25**	**0.47**	**0.26**	**3,769**	**6,914**	**7,927**	**4.17**	**5.99**	**8.60**

Table 3–7: Number and percentage of decrease in nominal stock price in local currency due to corporate actions by year for euro and non–euro European countries

This table presents the number and percentage of the firms whose nominal stock prices in local currency decrease due to corporate actions by year for euro (excluding Greece which adopted the euro in Jan. 2001) and non–euro European countries, for firms that had been present during the entire period of July 1998 to June 2010. A (%) and B (%) present the percentage of those firms, out of the total firms in each subgroup, which decrease their nominal stock price by corporate actions. Euro countries are Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Portugal, and Spain (excluding Greece which adopted the euro in Jan. 2001). Non–euro European countries are Denmark, Norway, Sweden, Switzerland, and the U.K. The nominal stock prices are yearly observations at the end of June in each year. Change in nominal stock price due to corporate actions (%) is defined as:

$$\textit{Change in nominal stock price (\%)} = \frac{Price_t - Price_{t-1}*(1+total\ return_t)}{Price_{t-1}} \times 100$$

where total $return_t$ is the actual growth in value of a share held from t–1 to t adjusted for all capital distributions including dividends. If it is below –20%, it is assumed there is a decrease in nominal stock price due to corporate actions such as stock splits or large dividend payouts. The t–statistics in parentheses are the result of the test of mean equality and are based on the assumption of unequal variances of the two subsamples. ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Period	Euro countries (1,068 firms)		Non–euro European countries (1,037 firms)		A – B (%p)
	No. of firms	A (%)	No. of firms	B (%)	
1998.7 ~ 1999.6	117	11.0	58	5.6	5.4 (4.49)***
1999.7 ~ 2000.6	162	15.2	76	7.3	7.9 (5.75)***
2000.7 ~ 2001.6	87	8.1	67	6.5	1.6 (1.49)
2001.7 ~ 2002.6	48	4.5	35	3.4	1.1 (1.32)
2002.7 ~ 2003.6	42	3.9	32	3.1	0.8 (1.06)
2003.7 ~ 2004.6	53	5.0	51	4.9	0.1 (0.05)
2004.7 ~ 2005.6	59	5.5	53	5.1	0.4 (0.42)
2005.7 ~ 2006.6	69	6.5	70	6.8	–0.3 (–0.27)
2006.7 ~ 2007.6	84	7.9	63	6.1	1.8 (1.61)
2007.7 ~ 2008.6	44	4.1	37	3.6	0.5 (0.66)
2008.7 ~ 2009.6	29	2.7	26	2.5	0.2 (0.30)
2009.7 ~ 2010.6	25	2.3	43	4.1	–1.8 (–2.34)**

CHAPTER FOUR: WHAT CAUSES THE PAY GAP BETWEEN PUBLIC AND PRIVATE FIRM EXEUCUTIVES?

4.1. Introduction

Managing a public firm entails broader and more difficult issues than working for a private firm as an executive or a chief executive officer (CEO). Public firm executives are required to deal with institutional investors, dispersed individual shareholders, the media, and analysts who track the share price of the firm. Additional legal and institutional responsibilities are also taken by public firm executives. They, for example, have to abide by the rules set by regulators to protect minority shareholders and face more rigid accounting and reporting standards. Public firms may pay talented executives higher than private firms as public firm executives would request higher compensation for bearing additional burden and higher risk.

The central view of agency theory also suggests that more diffused ownership and thus the lack of direct monitoring on executives in public firms leads to performance– or equity–based compensation, generally resulting in higher pay (Jensen and meckling, 1976; Holmstrom, 1979; Murphy, 1985; Conyon, Core, and Guay, 2010; Fernandes, Ferreira, Matos, and Murphy, 2012; and Gao and Li, 2015).

This paper investigates the pay gap between public and private firm executives, utilizing a unique dataset of Capital IQ which provides the detailed information on executive compensation not just of public but also of private firms around the world. We test our hypothesis taking advantage of the fact that each country has different economic and institutional environments. Between–country analyses enable us to examine whether these economic, market–driven variables that make public firms hard to hire competent executives and institutional factors that put more burden and risks on public firm executives drive up the pay for public firm executives.

If executive labor markets are competitive, those economic and institutional elements would well explain the executive pay gap between public and private firms (Abowd and Ashenfelter 1981; Garbaix and Landier, 2008; Kaplan and Minton, 2012; and Peters and Wagner, 2014). On the contrary, if the labor markets are not competitive and the executive compensation is set by other factors rather than the market forces, the economic and institutional factors would not affect the pay level much or work against an economic equilibrium. For example, the entrenchment hypothesis predicts that powerful and rent–extracting executives make their own way in determining their pays thus the executive compensation mechanism deviates from the equilibrium pay level (Core, Holthausen, and Larcker, 1999; Bebchuk and Fried, 2004; Jensen, Murphy, and Wruck, 2004; and Morse, Nanda, and Seru, 2011).

Using a wide–ranging sample for the period of 2001 ~ 2012 for 22 countries that have enough information on both public and private firm executive pays, first of all, we find that public firm executives are paid more in terms of total compensation than private firm executives by 11%, controlling for various executive and firm characteristics that may affect the executive pay level.[44] This public pay premium is even higher when we exclude the United States that takes up the largest portion of the sample and has been arguably blamed for exorbitantly high compensation for public firm CEOs. The public pay premium increases to 22% excluding the United States.

We also find that the public pay premium is higher when well–educated, competent senior managers are less available in the labor market, when there exists stronger investor protection and shareholder power, and when improved disclosure requirements (i.e., introduction of International Financial Reporting Standards (IFRS)) are enforced to public firms. These findings are robust whether we define total compensation, salary, salary plus bonus, or cash compensation as the compensation and whether we narrow down the definition of executives to top 5, top 3, chief financial officers (CFOs), or CEOs.[45]

These findings support the view that executive labor markets are competitive and public firm executives receive higher pays when they are harder to be obtained by public firms or they are to assume higher risk. Meanwhile, empirical findings in this paper is largely inconsistent with the argument of entrenchment hypothesis that public firms are entrenched by powerful executives and CEOs who can control their pays; the pubic pay premium would not be much affected by the labor market situation and decrease under the stronger shareholder power and more stringent disclosure and scrutiny regime with the entrenchment proposition. The data shows otherwise.

This paper is differentiated from related prior studies and add values to the existing literature in several ways. First, we investigate comprehensively the executive compensation level of international firms. Most of empirical studies on executive compensation so far have mainly focus on public firms in the United States and the study on international executive compensation is quite sparse due to the lack of reliable and comparable international data. An exception, Fernandes, Ferreira, Matos, and Murphy (2012) study CEO pays of public firms for 14 countries

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[44] Hereafter, we dub the gap in executive pay between public and private firms as public pay premium.
[45] Top 5 (3) executives refer to the highest five (three) ranking executives including the CEO within a firm.

but their focus of interest was on the CEO pay level in the United States. They include 13 other countries in their analysis to investigate whether the CEO pay level in the United States is inflated in comparison. Our study is not just focused on the United States and covers a larger number of countries. In investigating the executive compensation level around the world, we let it more comparable by analyzing the executive compensation scaled by GDP per capita of a country where a firm operates. This measure controls the different level of economic development and exchange rates fluctuation in each country. Thus the findings in the paper can be generalized for the international executive labor markets.

Second, we include private firm executive compensation in our analysis and use it as a natural benchmark to public firm compensation. Gao and Li (2015) investigate pay–for–sensitivity of public and private firms in the United States. Cole and Mehran (2013) find that the executive compensation of public firms in the United States has recently increased while the private firm executive pay has decreased in general. Both papers study the U.S. firms and do not investigate the determinants of executive pay gap between the two different groups of firms. A small strand of studies that explores private firm executive compensation such as Ke, Petroni, and Safieddine (1999) and Leslie and Oyer (2009) focuses on a specific industry in the United States and their findings may hardly be generalized. Our study directly investigates the determinants of the executive pay gap between public and private firms.

Third, this study complements existing studies on whether executives and CEOs in large, publicly held firms, especially in the United States, are unreasonably highly paid. Numerous studies such as Murphy (1999), Core, Holthausen, and Larcker (1999), and Bebchuk and Fried (2004) confirm the conventional idea that pays of U.S. CEOs are quite excessive and rent–extracting. However, more recent studies provide opposing evidence that suggests that executive labor markets are competitive and the pay contract mechanism somehow conforms to shareholder value maximization. Conyon, Core, and Guay (2010) and Fernandes, Ferreira, Matos, and Murphy (2012) find the U.S. pay premium reflects the additional risk in terms of pay structure assumed by the CEOs. Peters and Wagner (2014) show that CEO pays are higher in the United States in industries where there exists higher turnover risk, suggesting that CEOs request higher pays if they face higher turnover risk. Our study adds additional evidence to support the latter view that executive labor markets are competitive and the executive pay contract mechanism is consistent with shareholder value maximizing.

The rest of the chapter proceeds as follows. Section 4.2. describes two competing hypotheses we test. Section 4.3. elaborates on the data collected for the analysis, the variable construction, and summary characteristics. Sections 4.4. examine the pay gap of executive compensation between public and private firms and its determinants. Finally, Section 4.5. concludes.

4.2. Hypothesis

4.2.1. Entrenchment hypothesis

The agency problem in modern corporate finance theory caused by the separation of management and ownership in public firms have significant implications on the contract design of executive compensation (Jensen and Meckling, 1976). However, diffused ownership in public firms makes it hard for shareholders to have optimal remuneration contract with executives and CEOs. Powerful, rent–extracting executives set their own pays regardless of contribution they make for firms and risks they are supposed to assume.

Related to the agency problem, there has been a heated debate for decades on whether CEOs of large, publicly held firms in the United States are unjustifiably paid more than those in any other comparable countries. Many studies such as Core, Holthausen, and Larcker (1999) and Bebchuk and Fried (2004) assert that public firm CEOs in the United States have power and discretion enough to set their own compensation high, resulting in the executive compensation level deviating from the equilibrium level.

Hartzell and Starks (2003) find that institutional ownership concentration is negatively related to the level of executive compensation. Their finding suggests that institutional investors serve a monitoring role in mitigating the agency problem between shareholders and managers, thus lowering executive pays.

According to the entrenchment hypothesis, the pay gap between public and private firm executives would not be affected by the less supply of competent executives as powerful executives would set their pays high and secure their jobs regardless of the market condition. The hypothesis also predicts that the pay gap would decrease if shareholder power is stronger and more stringent monitoring system is in place. Conversely, public firm executives get paid high when the power of shareholders and the monitoring system are comparatively weak if public firms are entrenched by powerful, self–interest–seeking executives.

4.2.2. Competitive executive labor market hypothesis

An alternative view to the contracting mechanism of executive compensation backed up by recent empirical and theoretical studies is that executive pays are competitively determined by market forces and reflect the risk that the managers assume.

Conyon, Core, and Guay (2010) and Fernandes, Ferreira, Matos, and Murphy (2012) find the U.S. pay premium reflects the additional risk in terms of pay structure assumed by the CEOs in the United States. Peters and Wagner (2014) show that, in the United States, CEO pays are higher in industries where there exists higher turnover risk, which implies that CEOs request higher pays if they assume higher turnover risk. They note that CEO pays and turnover risk would be negatively associated if powerful CEOs enjoy high compensation and job security at the same time. Their findings suggest that executive labor markets are competitive and that the risk assumed by executives are appropriately priced in their compensation, which leads to the competitive executive labor market hypothesis.

In terms of theoretical views on the related issue, Hermalin and Weisbach (2012) prove that increased disclosure posits executives under severer monitoring by shareholders thus under greater risk of getting fired. Firms pay more to competent managers to compensate for the termination risk, resulting in higher pay for executives in equilibrium under increased disclosure requirements.

Thus the competitive executive labor market hypothesis predicts that the pay gap between public and private firm executives would increase if there is less supply in competent executives in the labor market. The hypothesis also directs that the pay gap would escalate if shareholder power in public firms is stronger or more stringent monitoring and disclosure system is enacted thus executives have to assume higher risk of termination of employment and have less opportunity for extracting private benefits.

4.3. Data and Summary Statistics

4.3.1. Data and variables construction

Appendix E describes the data source and definition of the variables. We first collect detailed data on executive compensation and executive– and firm–level variables from Capital IQ. The dataset in this study begins in 2001 because the data for non–U.S. countries is quite sparse before 2001 and it ends in 2012. We first require that firms and executives have non–missing characteristics that may affect the level of compensation. Then we drop the first and last pay observations of each executive due to the concern that those pays may not reflect the compensation for the whole year as executives may be newly hired or fired during the fiscal year, following Balsam et al. (2015). We observe multiple pays for some executives as they may take multiple positions at affiliated firms. We keep the highest compensation if multiple pays at the same year for an executive are detected.

Some executives and CEOs receive quite low, symbolic pays.[46] These pays do not reflect actual pays they are supposed to get with a regular remuneration contract. We drop pay observations if total compensation of an executive is less than GDP per capita of the country where the firm resides.[47] Finally, we drop observations of countries if the number of public firms or private firms in a country is less than 10 in total because we need to compare public firms with private firms in terms of executive compensation thus require a reasonable number of firms to compare for each country. We convert the data in local currencies to US dollars using exchange rates we retrieve from the World Bank. With the screening process described above, we have 322,588 executive pays from 22 countries for 2001 ~ 2012 in the final dataset.

The main dependent variable in this study is total compensation scaled by GDP per capita. Total compensation includes all pays awarded to executives regardless of the item name in the paycheck and is the most comprehensive definition of compensation.[48] Later, we do experiments as robustness checks with other definition of compensation: salary, salary plus bonus, and cash compensation as complimentary measures of executive compensation. We notice that executive pay level across the countries is quite variant depending on the country's economic development.[49] Thus we use pays scaled by GDP per capita of the country that the firms reside in as dependent variables. This scaled measure controls the different level of economic development and exchange rates fluctuations of each country.

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[46] Steve Jobs of Apple Inc., for example, had been paid 1 dollar a year since 1998 when he returned to the company.
[47] This restriction makes the dependent variable, the natural log of (total compensation over GDP per capita), is equal to or greater than zero.
[48] Specifically, total compensation includes, but is not limited to, salary, bonus, stock and option awards and grants, non–equity incentive plan, and director fees and bonus.
[49] As in Panel A of Table 4–1 below, the average executive compensation of Thailand is 36,909 US dollars whereas that of Germany is 1,621,882 US dollars.

Panel A of Table 4–1 presents the mean and median of total compensation of public and private firm executives by country during the sample period.[50] *Total Compensation* is in 2012 US dollars and *Total Compensation / GDP* (total compensation scaled by GDP per capita of country) is before taking the logarithm in the table. In 21 (20) out of 22 countries, the mean (median) *Total Compensation* of public firms is higher than that of private firms. When it is pooled for all countries, the mean (median) of public firms is 998,647 (376,749) dollars. Those numbers are 41(7) % higher than the mean (median) of private firms which are 710,768 (351,985) dollars. The table also reveals that the mean executive compensation is much higher than the median compensation (the data is negatively skewed) which implies a relatively small number of executives, especially in public firms, receive quite high pays compared to other executives. *Total Compensation / GDP* that controls economic development and exchange rates in each country shows a similar but more distinct pattern. When it is pooled for all countries, the mean (median) of public firms is 39.16 (11.44). Those numbers are 118(42) % higher than the mean (median) of private firms which are 17.97 (8.05).

Panel B and C of Table 4–1 present the distribution of the number of executive pays with respect to year and industry. In panel B, the number of executive compensation in 2012 is lower than previous years because the last executive pays in the sample are dropped as described above. In panel C, the largest number of observations belong to financial industry. Overall, both tables show that the sample is well distributed throughout years or industries.

(SEE TABLE 4–1)

We collect country–level variables that we conjecture would affect the executive pay gap between public and private firms. Appendix F presents country–level indices and IFRS Adoption dates by country. First, we consider two measures that may represent the situation of executive labor markets of each country. *Manager deficiency* is derived from an index that measures to what extent competent senior managers are readily available in the country. We multiply the index by –1 so that *Manager deficiency* assesses the deficiency of senior managers in the economy. *Brain–drain* is also derived from an index that measures to what extent the emigration of well–educated and skilled people does not hinder competitiveness in the economy. We multiply the index by –1

[50] At the bottom of the table, sum of public and private firms (18,655) is greater than the total number of firms (18,276) because some firms converted from public (private) to private (public) firms during the sample period.

again so that *Brain–drain* assesses the drain level of potential competent executives in the economy. Both indices are collected from International Institute for Management Development (IMD). These two indices are time variant measures and they are averaged during the sample period for each country in appendix F.

We collect two indices that measure the extent of shareholder power from the World Bank. *S/H suits* ranges from 0 to 10, with higher values indicating the greater power of shareholders to challenge the transaction of executives and sue them for misconduct. *Transparency* also ranges from 0 to 10, with higher values indicating the higher level of corporate transparency that lets shareholders monitor executive's compensation and financial prospects with ease.

We obtain *IFRS Adoption Date* from Balsam et al. (2015). Most countries in the sample have adopted the IFRS in the year 2005 whereas 5 countries including the United States have never adopted it. In order to gauge the effect of the stricter disclosure rule imposed on public firms, we create a dummy variable, *IFRS* which is equal to 1 in the years since a country adopted the IFRS or zero otherwise.

4.3.2. Summary statistics

Panel A of Table 4‒2 presents number of observations, mean, 25th percentile, median, 75th percentile of the variables. 4 executive compensation variables (*Total compensation / GDP, Salary / GDP, Salary & Bonus / GDP, and Cash compensation / GDP*) before taking natural logarithm show that the mean is much greater than the median which implies that they are highly negatively skewed. Thus we take natural logarithm of those variables so that they conform more to the normal distribution.

All firm level variables are lagged by 1 year. *Total assets* is also significantly skewed which means there are a few large firms dominating the sample in terms of size. We take natural logarithm of the variable as well in the regression analysis. It is peculiar that the mean of *ROA (%)* is negative (–3.83) whereas the median is positive (3.14) which indicates a few firms generate considerably negative returns.

Panel B–1 of Table 4‒2 shows the correlation matrix among executive and firm level variables. Overall, correlations between the variables are reasonably low, which alleviate the concerns on collinearity. One exception is the correlation of *Ln (age)* and *Age 65* which is 0.72. We exclude these two variables in the later regression analysis but the results do not change.

Education, CEO, Ln (total assets), ROA (%), and *Ln (firm age)* are highly positively correlated with compensation variables whereas *Female* and *Leverage (%)* are negatively correlated with compensation variables.

Panel B–2 of Table 4–2 displays the correlations among country level variables. The two variables related to the executive labor market, *Manager deficiency* and *Brain–drain* are quite correlated. Meanwhile, the two variables that measures investor protection and shareholder power, *S/H suits* and *Transparency* are not correlated much, which indicates they gauge different aspects of shareholder power against executives.

Panel C of Table 4–2 shows the mean and median of firm level variables between public and private firms. It is worth noting that private firms in our sample are quite comparable to public firms in terms of size, or total assets. The mean (median) of total assets of private firms is just 12% (34%) less than that of public firms. It indicates that private firms in Capital IQ may not be the representatives of typical private firms in the world in terms of size. But the fact that private firms in our dataset are fairly larger than typical private firms would work against us finding any significant difference in executive pays between public and private firms. The table shows that, compared to public firms, private firms in the sample are less profitable (lower return on assets), slower in sales growth, more levered, and younger whereas their capital expenditure scaled by total assets are not different from that of public firms.

In the next section, we investigate whether public firms pay more to their executives and what economic and institutional factors drive the executive pay gap between public and private firms in the regression format.

(SEE TABLE 4–2)

4.4. Pay Gap between Public and Private Firms

4.4.1. Overall pay gap

In the regressions hereafter, all firm level variables are lagged by 1 year and all continuous variables are winsorized at 1% and 99%. Country, industry, and year fixed effects are included and robust standard errors are clustered by country in drawing statistical implication in all regressions. Table 3 presents the results of the panel regressions in which natural logarithm of total executive pays scaled by country's GDP per capita are regressed on public dummies and executives and firm characteristics. The main purpose of analysis with regressions in Table 4–3 is to see if the coefficients of public dummy are significantly positive and economically large. Since the dependent variable is the natural logarithm of total compensation over GDP per capita, e raised to the coefficient of public dummy ("*public*") –1, or e^{public}–1 measures the executive pay gap between public and private firms.

In the table, the signs of coefficients of control variables are consistent with the correlation analysis with two exceptions; the coefficients of *ROA* and *CAPEX / Assets* are significantly negative, which is counter–intuitive. This may be so due to the fact that the two variables are highly correlated with firm size, or total assets. The coefficients of *ROA* turn significantly positive and those of *CAPEX / Assets* become positive as well, though not significant, when *Ln (total assets)* is excluded in the regressions. The negative coefficients of *ROA* seems also to be driven by a small number of firms with negative return on assets.[51] The coefficients of *ROA* turn again significantly positive when those firms with negative return on assets are dropped in the regressions.

The table suggests that executives are paid higher when they are more educated, older thus more experienced, and when they are CEOs. On the contrary, female executives are significantly less paid than male executives. Executives older than 65 are less paid. The size, or total assets is significantly positively related to executive compensation, which is consistent with previous empirical findings in the literature. Firm leverage is, in general, negatively associated with executive pays whereas firm age is positively correlated with executive compensation.

More importantly, the public dummy is significantly positively correlated with executive compensation across the regressions regardless of the definition of executives. In the regression model (1) where only country, industry, and year fixed effects are included, the public pay premium is about 28% ($e^{0.25}$–1). The premium decreases to 27% ($e^{0.24}$–1) and 12% ($e^{0.11}$–1), respectively, when executive characteristics in regression (2) and executive- and firm- level control variables in regression (3) are included. The models (4) through (9) where compensation of top 5 executives and CEOs are regressed show quite a similar pattern.

(SEE TABLE 4–3)

One may suspect that the result in Table 4–3 may be driven by the United States which takes up the largest portion in the sample and is known for quite high CEO pays of large, public

[51] The mean of *ROA (%)* in the previous section is negative but the median is positive, which indicates that a small portion of firms with highly negative return on assets in the sample drives the mean as negative.

firms.[52] In Table 4–4, we exclude the U.S. observations and rerun the regressions. The table strikingly shows that the public pay premium is even larger without the United States. In regression (1) of Table 4–4 with only fixed effects, the public pay premium is almost 40% ($e^{0.33}$– 1). The premium remains economically large when executive characteristics in regression (2) and firm-level control variables as well as executive characteristics in regression (3) are included. Again, this result is robust whether we narrow down the definition of executives to top 5 executives or CEOs of firms.

(SEE TABLE 4–4)

4.4.2. Managerial supply

In this sub–section, we test whether less supply of competent managers in an economy thus causing the situation that managerial talent is harder for a firm to obtain enlarges the executive pay gap between public and private firms. This prediction of positive correlation between less supply of managerial talent and executive compensation in public firms is consistent with the competitive executive labor market hypothesis.

In the meantime, the entrenchment hypothesis asserts that the status of supply of qualified managers would not affect the executive pay level as powerful executives enjoy high pays while keeping their positions firmly regardless of the labor market situation. One may argue that entrenched executives would get also paid higher when there is less supply in managerial talent in the labor market because they will have stronger negotiating power. However, since their influence and control over their own compensation comes from poor corporate governance according to the entrenchment hypothesis, not by the labor market situation, the executive pay in public firms would be insensitive to the less supply of competent executives.

In Table 4–5, all control variables at executive and firm levels and country, industry, and year fixed effects as in Table 4–3 are included in the regressions. And two proxies for the extent to which potential managerial talent in the country is less abundant are added in the regressions: *Managerial deficiency* and *Brain–drain*. These two variables are interacted with the public dummy to measure the effect of the two variables on public firm executive compensation. In the regression model (1), (3), and (5), ((2), (4), and (6)), respectively, *Managerial deficiency (Brain–drain)* and

[52] Gao and Li (2015) report that the public pay premium in the United States is almost 30% (Table 3 in page 377) for this matter.

its interaction with the public dummy are included. In the regressions, the coefficients of *Managerial deficiency* are not significant. It seems that the extent of availability of managerial pool itself does not affect the general level of executive compensation. Meanwhile, the coefficients of *Brain–drain* are significant, which indicates that the exodus of potential managerial pool out of country increases the executive compensation level of private firms. More importantly, the interactions of the public dummy with *Managerial deficiency* and *Brain–drain* are all significantly positive across the regressions. This finding implies that less supply of managerial pool in an economy escalates executive pays in public firms more than private firms because public firms need managerial talent more desperately and public firms pay more to competent executives when they are harder to obtain. It confirms the competitive executive labor market hypothesis.

(SEE TABLE 4‒5)

4.4.3. Investor protection and shareholder power

An important implication of the entrenchment hypothesis in terms of executive compensation is that executives are paid more when their power is stronger than shareholders'. And the power structure is formalized by corporate governance; good corporate governance practice induced by proper institutions enables shareholders to hold managers in check and put down their compensation in control. Specifically, the entrenchment hypothesis predicts lower executive compensation if institutions support shareholders to more easily sue executives for their misconduct or provide more transparent corporate systems on executive's compensation and financial prospects.

On the contrary, the competitive executive labor market system expects higher executive pay in those cases above because executives request more pay due to the increased legal risk and burden and the decreased opportunity of misappropriation. This sub–section provides the results of tests on whether stronger shareholder power sustained by proper institutions increases the executive compensation level of public firms thus widens the executive pay gap between public and private firms.

In Table 4‒6, *S/H suits (Transparency)* and its interaction with the public dummy are included in the regression model (1), (3), and (5), ((2), (4), and (6)), respectively, with all control variables and fixed effects.[53] The coefficients of *S/H suits* and *Transparency* are not significant in

[53] Country fixed effects are dropped as *S/H suit* and *Transparency* are time–invariant country–level indices.

any regression models. However, the coefficients of interactions of *S/H suits* and *Transparency* are significant across the regressions, which suggests that public firm executives are paid more in countries with stronger shareholder power and supports the competitive executive labor market hypothesis. This finding is contradictory to the entrenchment hypothesis.

(SEE TABLE 4–6)

4.4.4. International Financial Reporting Standards (IFRS)

In this sub–section, we investigate the effect of the introduction of the IFRS, more stringent monitoring and reporting standards, on the executive pay gap between public and private firms. The pay gap will be affected mainly through the effect of the IFRS on public firms because the IFRS has become mandatory to public firms since a country adopted it. A large body of literature reports effects on better monitoring and disclosure process under the IFRS than countries' own accounting standards (Balsam, Gordon, and Li, 2015).

Improved monitoring on firm's performance and executives' private transactions may have different implications on the executive pay. Hartzell and Starks (2003) find that institutional ownership concentration is negatively associated with the executive compensation level. Their finding suggests that large institutional investors serve as a monitoring role and stringent monitoring scheme implemented by institutional investors lowers the executive compensation level of public firms. The finding in their study is congruent to the view of the entrenchment hypothesis. Conversely, with the competitive executive labor market hypothesis, the executive compensation level of public firms would rise with more austere monitoring and disclosure requirements because public firm executives request higher pay due to the increased risk of employment termination and the decreased opportunity of misappropriation.

Table 4–7 shows the results of regressions where the IFRS dummy and its interaction with the public dummy are included. As in the regression analysis in Table 4–3, all executive- and firm-level characteristics and country, year, industry fixed effects are also included. In the table, first of all, the coefficients of the IFRS dummy are significantly negative across the board. This result can be translated that the executive pay level in private firms drops with the introduction of the IFRS. More importantly, the coefficients of interaction between the public and IFRS dummies are significantly positive, showing that the more stringent monitoring and disclosure requirements increase the executive pay gap between public and private firms. This finding again confirms the competitive executive labor market hypothesis and denounces the entrenchment hypothesis.

(SEE TABLE 4‒7)

In Figure 4‒1, we plot the time trend of public pay premium during the sample period. The pay premium in each year is calculated by interacting the public dummy with the year dummies in the regressions where all executive– and firm–level control variables and country, industry, and year fixed effects as in Table 4‒3 are included. The solid line is the time trend of all sample firms whereas the dotted line is that without the U.S. firms. The figure shows the definitive pattern of the emergence of the public pay premium around the year of 2005 when the most of countries in the sample adopted the IFRS. The pattern of the emergence of public pay premium is more prominent without the U.S. firms that never adopted the IFRS. The two time trends do not show any upward or downward drifts after 2005.

The pattern in Figure 4–1 also complements the finding of Fernandes, Ferreira, Matos, and Murphy (2011) who reports that the CEO pay gap of public firms between U.S. and 13 other developed countries has dropped dramatically around 2005 and 2006; most countries except for the United States among the sample countries in Fernades et al. (2011) adopted the IFRS at the end of 2005. It may be the case that the reason why they observe the recent decrease in the pay gap between the U.S. and 13 other countries is that public firms in the IFRS adoption countries increased their executive pays around 2005.

(SEE FIGURE 4‒1)

4.4.5. Robustness tests

So far, we analyze the public pay premium with total compensation which is the most comprehensive definition of executive compensation as it includes all pays in the paycheck. However, it might be a noisy measure if some firms, especially private firms, do not report precisely somewhat arbitrary items such as non–cash incentives.

In Table 4–8, we extend the definition of executive compensation and executives for robustness checks. The table presents coefficients and t–statistics of interacted terms of public dummy with *Manager deficiency, Brain–drain, S/H Suits, Transparency,* and *IFRS* respectively with the expanded definition of compensation and executives. Compensation is defined as salary, salary and bonus, and cash compensation. Executives are defined as all executives, top 5 and 3 highest ranking executives, CFOs, and CEOs. The coefficients and t–statistics are based on the results of panel regressions in which natural logarithm of salary, salary and bonus, or cash compensation scaled by country's GDP per capita are regressed on public dummy, its interactions with *Manager deficiency, Brain–drain, S/H Suits, Transparency,* and *IFRS,* respectively, and all executive- and firm-level characteristics. Industry and year dummies are included in all regressions. Country dummies are included except for the regressions on *S/H Suits* and *Transparency* and their interactions with the public dummy.

The table presents that the coefficients of the interaction terms are positive and significant in all regressions except for some regressions on *S/H Suits* and *Transparency*. The result is quite robust regardless of the definition of executive compensation and executives.

(SEE TABLE 4–8)

4.5. Conclusions

In this study, we investigate the executive pay gap between public and private firms. We examine whether the supply in the executive labor market, the institutional protection on shareholder's rights against misappropriation by managers, and the introduction of stricter rules on monitoring and disclosure cause to widen the executive pay gap, noting the observation that each country has different environments in terms of labor market situation and legal, institutional background. This framework of research design enables us to test two competing hypotheses in agency theory: the entrenchment hypothesis and the competitive executive labor market hypothesis.

Conflicts of interest between executives and shareholders in modern public firms suggest two probable scenarios. First, the entrenchment hypothesis predicts that diffused ownership in public firms hinders shareholders from appropriately controlling the firm's managers who then become powerful enough to set their own compensation high, regardless of executive labor market factors. This situation is more pronounced when legal, institutional instrument and monitoring system to protect shareholder's rights is not in place in the country. Second, the competitive executive labor market hypothesis asserts that the firm's managers are controlled through relevant monitoring and incentive scheme and that executive pays are determined by market forces and risk and burden they bear.

We find, in this study, that the executive pay gap between public and private firms escalates when there is less supply in potential competent executives, when shareholder's power is stronger, and when a stricter rule on monitoring and disclosure is enacted. These findings largely support the view of the competitive executive labor market hypothesis but are inconsistent with the argument of the entrenchment hypothesis.

Figure 4–1: Trend of public pay premium

Figure 4–1 plots time tend of public pay premium. In order to compute public pay premium for each year, the public dummy is interacted with each of year dummies controlling for executive and firm characteristics as in the regression model (3) in Table 3. The premium is calculated by $e^{\text{public} \times \text{year dummy}} - 1$. The solid line is the time trend of all sample firms whereas the dotted line is that without the U.S. firms.

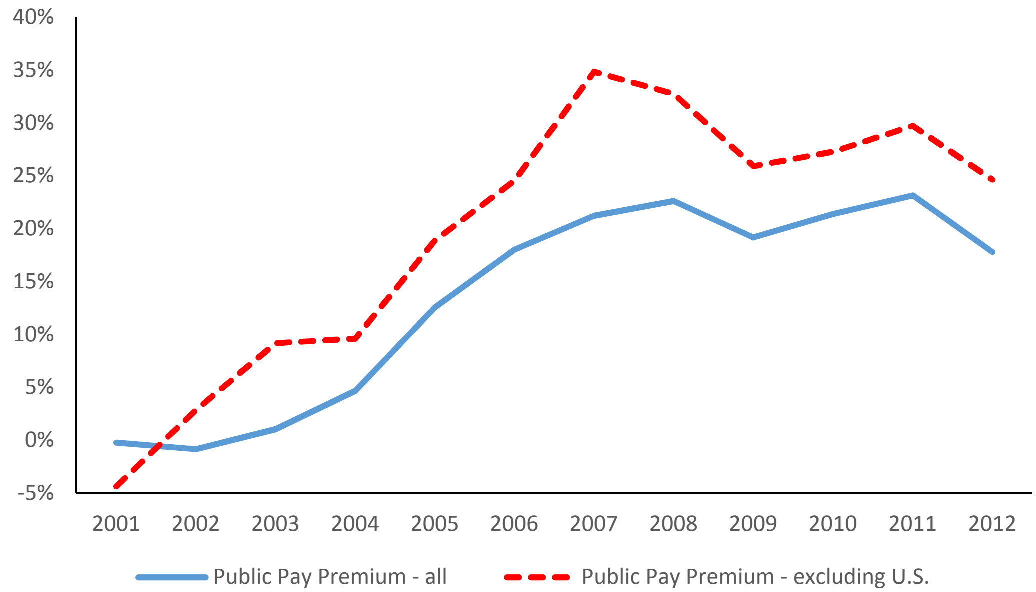

Table 4–1: Distribution of Total Executive Compensation
"Total Compensation" is in 2012 US dollars. "Total Compensation / GDP" is before taking the logarithm.

Panel A: Mean and Median of Total Executive Compensation of Public and Private Firms by Country

Country	No of Firms			No of Executive Compensation			Mean Total Compensation		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
Australia	1,462	1,203	267	27,018	23,750	3,268	504,986	527,454	341,701
Canada	1,674	1,196	493	24,733	19,966	4,767	635,355	706,399	337,795
China	406	384	142	8,079	7,453	626	198,104	203,010	139,686
Denmark	44	32	12	372	280	92	829,727	869,056	710,032
Finland	106	93	17	1,040	963	77	626,443	621,267	691,177
France	241	215	34	3,640	3,333	307	1,251,465	1,285,956	877,002
Germany	330	284	48	4,428	3,943	485	1,621,882	1,709,960	905,814
Hong Kong	879	848	76	14,864	14,364	500	490,327	494,259	377,374
India	2,577	2,420	210	31,414	30,133	1,281	174,367	178,337	80,990
Ireland	46	31	15	889	772	117	1,046,777	1,060,624	955,409
Italy	195	169	30	2,758	2,407	351	1,158,362	1,206,315	829,520
Malaysia	78	64	14	731	662	69	329,420	355,521	79,007
Netherlands	133	89	46	2,001	1,501	500	1,272,836	1,429,104	803,718
New Zealand	144	83	62	1,276	916	360	246,924	294,773	125,175
Norway	141	92	54	2,249	1,624	625	576,045	619,797	462,361
Slovenia	20	10	10	201	140	61	326,790	356,079	259,568
South Africa	282	219	63	6,372	5,437	935	510,924	535,577	367,563
Sweden	202	161	46	1,617	1,098	519	673,453	724,700	565,034
Switzerland	181	166	15	1,495	1,445	50	1,358,900	1,386,055	574,145
Thailand	265	253	13	3,465	3,400	65	36,909	37,163	23,594
United Kingdom	1,267	857	428	23,323	18,283	5,040	809,163	880,857	549,084
United States	7,603	5,566	2,125	164,313	137,615	26,698	1,350,951	1,433,336	926,300
Total	18,276	14,435	4,220	326,278	279,485	46,793	957,361	998,647	710,768

country					Median						
	Total Compensation / GDP				Total Compensation			Total Compensation / GDP			
	Total	Public (a)	Private (b)	ratio (a/b)	Total	Public	Private	Total	Public (a)	Private (b)	ratio (a/b)
Australia	10.30	10.73	7.19	1.49	266,884	273,980	228,270	5.40	5.48	4.78	1.15
Canada	14.15	15.58	8.14	1.91	281,645	308,684	207,444	6.49	7.03	5.13	1.37
China	51.17	51.95	41.96	1.24	83,654	86,083	62,046	21.65	21.87	18.58	1.18
Denmark	13.24	13.87	11.31	1.23	690,933	714,333	549,214	11.08	11.61	9.31	1.25
Finland	12.48	12.39	13.66	0.91	191,472	180,351	377,458	3.71	3.45	6.91	0.50
France	28.75	29.52	20.47	1.44	612,676	632,500	450,094	13.88	14.21	10.70	1.33
Germany	36.05	37.99	20.34	1.87	799,008	819,166	665,180	17.56	18.11	15.09	1.20
Hong Kong	14.60	14.71	11.50	1.28	269,317	271,578	205,702	8.06	8.12	6.33	1.28
India	149.91	153.13	74.20	2.06	74,297	76,358	36,826	63.34	65.27	34.05	1.92
Ireland	18.30	18.59	16.40	1.13	808,502	849,073	421,191	14.34	14.96	8.06	1.86
Italy	29.49	30.64	21.59	1.42	531,334	557,508	428,622	13.55	14.24	11.26	1.26
Malaysia	40.24	43.14	12.42	3.47	154,884	173,144	61,821	20.01	22.73	10.14	2.24
Netherlands	24.20	27.12	15.44	1.76	894,226	992,685	773,850	17.07	18.77	14.49	1.30
New Zealand	7.42	8.84	3.81	2.32	96,403	131,108	58,298	2.83	3.89	1.70	2.29
Norway	6.19	6.65	5.01	1.33	417,666	447,359	362,995	4.41	4.85	3.86	1.26
Slovenia	12.74	13.90	10.09	1.38	249,562	280,056	216,956	9.75	11.12	8.53	1.30
South Africa	76.55	80.00	56.49	1.42	325,901	343,351	266,813	50.73	53.28	41.52	1.28
Sweden	12.24	13.18	10.26	1.28	366,169	351,287	376,901	6.69	6.45	6.84	0.94
Switzerland	17.47	17.83	7.22	2.47	599,159	611,421	393,213	7.49	7.76	4.62	1.68
Thailand	7.82	7.87	5.07	1.55	16,748	16,995	10,268	3.51	3.56	2.38	1.50
United Kingdom	18.28	19.87	12.53	1.59	454,745	489,658	369,174	10.45	11.16	8.62	1.29
United States	26.46	28.05	18.27	1.53	532,942	560,422	437,058	10.53	11.03	8.74	1.26
Total	36.12	39.16	17.97	2.18	372,454	376,749	351,985	10.71	11.44	8.05	1.42

Panel B: Number of Total Executive Compensation of Public and Private Firms by Year

Year	No of Executive Compensation		
	Total	Public	Private
2001	16,378	11,914	4,464
2002	18,882	13,786	5,096
2003	21,197	15,798	5,399
2004	23,754	18,155	5,599
2005	25,390	21,105	4,285
2006	28,064	24,290	3,774
2007	32,316	29,013	3,303
2008	34,792	31,277	3,515
2009	37,700	33,507	4,193
2010	38,230	34,479	3,751
2011	37,419	34,656	2,763
2012	12,156	11,505	651
total	326,278	279,485	46,793

Panel C: Number of Total Executive Compensation of Public and Private Firms by Industry
Industry classification is based on 23 industry categories in Barth, Beaver, and Landsman (1998).

Industry	No of Executive Compensation		
	Total	Public	Private
Mining/Construction	15,175	13,664	1,511
Food	9,046	7,811	1,235
Textiles/Print/Publish	15,408	12,865	2,543
Chemicals	8,734	7,887	847
Pharmaceuticals	14,393	13,097	1,296
Extractive	13,115	11,737	1,378
Manufacturing: Rubber/glass/etc.	7,521	6,443	1,078
Manufacturing: Metal	9,122	8,202	920
Manufacturing: Machinery	8,839	7,858	981
Manufacturing: Electrical Equipment	10,213	8,969	1,244
Manufacturing: Transport Equipment	7,405	6,681	724
Manufacturing: Instruments	11,625	10,384	1,241
Manufacturing: Miscellaneous	2,200	1,872	328
Computers	33,035	27,389	5,646
Transportation	17,324	14,642	2,682
Utilities	10,040	8,168	1,872
Retail: Wholesale	9,869	8,269	1,600
Retail: Miscellaneous	13,207	10,825	2,382
Retail: Restaurant	3,453	2,476	977
Financial	41,393	36,026	5,367
Insurance/Real Estate	8,264	7,107	1,157
Services	25,506	20,141	5,365
Others	31,391	26,972	4,419
Total	326,278	279,485	46,793

Table 4–2: Summary Statistics of the Variables

Panel A: Descriptive Statistics of Variables
All variables are as defined in Appendix E. "Total Compensation / GDP," "Salary / GDP," "Salary & bonus / GDP," "Cash compensation / GDP," "Age," "Total assets," and "Firm age" are figures before taking the logarithm. "Total assets" are in million 2012 US dollars.

Variables	Level	No. of observations	Mean	25th	Median	75th
Total compensation / GDP	Executive	326,278	36.12	5.13	10.71	27.93
Salary / GDP	Executive	284,786	14.79	4.12	6.52	11.65
Salary & bonus / GDP	Executive	284,786	19.87	4.64	7.97	16.34
Cash compensation / GDP	Executive	326,278	26.64	4.30	8.50	19.28
Education	Executive	326,278	0.91	0.00	1.00	2.00
Female	Executive	326,278	0.07	0.00	0.00	0.00
Age	Executive	326,278	59.07	53.00	58.21	65.00
Age 65	Executive	326,278	0.26	0.00	0.00	1.00
CEO	Executive	326,278	0.31	0.00	0.00	1.00
Total assets	Firm	99,476	7,512	32	198	1,082
ROA (%)	Firm	99,476	–3.83	–0.60	3.14	7.02
Sales growth (%)	Firm	99,476	13.13	–2.48	9.04	26.08
CAPEX / assets (%)	Firm	99,476	5.81	0.93	2.89	6.81
Leverage (%)	Firm	99,476	356.35	19.93	53.31	128.30
Firm age	Firm	99,476	40.94	15.00	26.00	54.00
Public	Firm	99,476	0.85	1.00	1.00	1.00
Manager deficiency	Country	241	–6.17	–6.95	–6.42	–5.60
Brain drain	Country	241	–5.63	–6.79	–5.78	–4.93
S/H suits	Country	22	7.71	7.00	7.75	9.00
Transparency	Country	22	6.73	6.00	6.75	8.00
IFRS dummy	Country	241	0.50	0.00	0.61	1.00

Panel B–1: Correlations

Panel B–1 presents the Pearson's correlations among the dependent variables and firm/executive level variables. All variables are as defined in Appendix E. All continuous variables are winsorized at 1% and 99%.

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
[1] Ln (total compensation / GDP)	1.00															
[2] Ln (salary / GDP)	0.86	1.00														
[3] Ln (salary & bonus / GDP)	0.89	0.94	1.00													
[4] Ln (cash compensation / GDP)	0.96	0.92	0.95	1.00												
[5] public	0.11	0.10	0.09	0.09	1.00											
[6] Education	0.15	0.11	0.11	0.11	0.05	1.00										
[7] Female	–0.05	–0.07	–0.07	–0.05	–0.01	0.01	1.00									
[8] Ln (age)	–0.05	0.03	0.05	–0.03	–0.02	–0.05	–0.10	1.00								
[9] Age 65	–0.06	0.04	0.05	–0.04	–0.02	–0.03	–0.08	0.72	1.00							
[10] CEO	0.22	0.23	0.21	0.24	–0.01	0.06	–0.09	0.06	0.06	1.00						
[11] Ln (total assets)	0.45	0.38	0.45	0.43	0.06	0.16	0.00	0.08	0.03	–0.12	1.00					
[12] ROA (%)	0.23	0.23	0.26	0.24	0.03	–0.06	0.01	0.01	0.00	–0.05	0.38	1.00				
[13] Sales growth (%)	0.01	0.00	0.00	0.00	0.02	0.00	–0.01	–0.05	–0.03	0.00	–0.06	0.01	1.00			
[14] CAPEX / assets (%)	0.05	0.06	0.04	0.04	0.00	–0.02	–0.02	–0.03	–0.02	0.02	–0.11	–0.02	0.12	1.00		
[15] Leverage (%)	–0.04	–0.06	–0.06	–0.04	–0.07	0.00	0.01	0.01	0.01	0.00	0.08	–0.03	–0.02	–0.08	1.00	
[16] Ln (firm age)	0.19	0.18	0.20	0.20	0.06	–0.03	–0.01	0.14	0.09	–0.04	0.41	0.22	–0.14	–0.16	0.05	1.00

Panel B–2: Correlations

Panel B–2 presents the Pearson's correlations among the country level variables. All variables are as defined in Appendix E.

Variables	[1]	[2]	[3]	[4]	[5]
[1] Manager deficiency	1.00				
[2] Brain drain	0.75	1.00			
[3] S/H suits	–0.40	–0.42	1.00		
[4] Transparency	–0.06	–0.19	0.08	1.00	
[5] IFRS dummy	0.18	–0.04	0.36	0.05	1.00

Panel C: Firm Level Variables Comparison

Panel C presents the comparison of firm level variables between public and private firms. All variables are as defined in Appendix E. All continuous variables are winsorized at 1% and 99%. Test of mean difference is based on the assumption of unequal variance of two groups. Test of median difference is the Wilcoxon rank–sum test.

Variable	Mean			Median		
	Public (1)	Private (2)	Diff ((1) – (2))	Public (3)	Private (4)	Diff ((3) – (4))
Total assets	4,330.78	3,817.50	513.28***	212.83	141.00	71.83***
ROA (%)	–1.27	–3.50	2.22***	3.27	2.49	0.78***
Sales growth (%)	14.13	12.85	1.28***	10.99	8.46	2.54***
CAPEX / assets (%)	5.57	5.53	0.05	2.90	2.84	0.06
Leverage (%)	118.54	164.11	–45.57***	51.23	64.78	–13.55***
Firm age	41.37	35.95	5.42***	27.00	22.00	5.00***

Table 4–3: Panel Regressions of Ln (total compensation / GDP) on Public Dummy

Table 4–3 presents the results of the panel regressions in which natural log of total executive pays scaled by country's GDP per capita are regressed on public dummies and executives and firm characteristics and fixed effects. The sample includes executive–year observations from 22 countries during 2001–2012. All variables are as defined in Appendix E. All firm level variables are lagged by 1 year. All continuous variables are winsorized at 1% and 99%. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Total Executives			Top 5			CEO	
Public	0.25***	0.24***	0.11***	0.26***	0.23***	0.09**	0.29***	0.25***	0.09**
	(7.87)	(8.23)	(2.87)	(8.22)	(8.22)	(2.33)	(11.01)	(11.92)	(2.36)
Education		0.18***	0.05***		0.22***	0.07***		0.24***	0.06***
		(14.71)	(6.50)		(9.60)	(5.57)		(8.39)	(3.56)
Female		–0.15***	–0.09***		–0.17***	–0.07***		–0.07*	–0.02
		(–11.56)	(–4.92)		(–6.80)	(–2.88)		(–1.75)	(–0.48)
Ln (age)		0.55***	–0.14		0.92***	0.13		0.89***	0.15
		(5.07)	(–1.42)		(7.72)	(1.56)		(7.86)	(1.32)
Age 65		–0.25***	–0.15***		–0.14***	–0.03		–0.11***	–0.02
		(–7.33)	(–3.06)		(–4.84)	(–0.69)		(–3.26)	(–1.10)
CEO		0.50***	0.71***		0.39***	0.50***			
		(12.67)	(22.32)		(11.58)	(17.33)			
Ln (total assets)			0.31***			0.35***			0.36***
			(14.15)			(17.39)			(16.94)
ROA			–0.17			–0.26**			–0.27**
			(–1.43)			(–2.14)			(–2.17)
Sales growth			5.10**			5.00**			4.60**
			(2.75)			(2.58)			(2.28)
CAPEX / Assets			0.24*			0.27			0.25
			(2.02)			(1.57)			(1.24)
Leverage			–1.09**			–1.17***			–1.26***
			(–2.80)			(–3.81)			(–5.26)
Ln (firm age)			0.02			0.01			0.02

			(1.21)			(0.48)			(1.63)
Constant	1.23***	–1.15**	0.49	1.27***	–2.67***	–0.57	1.37***	–2.32***	–0.34
	(13.66)	(–2.72)	(1.18)	(12.48)	(–5.91)	(–1.62)	(12.88)	(–5.58)	(–0.71)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	326,278	326,278	326,278	215,122	215,122	215,122	100,376	100,376	100,376
R^2	0.253	0.315	0.579	0.271	0.338	0.666	0.267	0.306	0.647

Table 4–4: Panel Regressions of Ln (total compensation / GDP) on Public Dummy excluding the U.S.

Table 4–4 presents the results of the panel regressions in which natural log of total executive pays scaled by country's GDP per capita are regressed on public dummies and executives and firm characteristics and fixed effects excluding the U.S. The sample includes executive–year observations from 22 countries during 2001–2012. All variables are as defined in Appendix E. All firm level variables are lagged by 1 year. All continuous variables are winsorized at 1% and 99%. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Total Executives			Top 5			CEO	
Public	0.33***	0.31***	0.20***	0.34***	0.30***	0.19***	0.35***	0.30***	0.18***
	(11.12)	(12.87)	(12.09)	(10.86)	(12.41)	(9.39)	(11.61)	(15.17)	(9.50)
Education		0.18***	0.05**		0.24***	0.07***		0.27***	0.08***
		(6.79)	(2.41)		(6.29)	(3.06)		(7.96)	(3.37)
Female		–0.14***	–0.10***		–0.16***	–0.05		–0.03	0.03
		(–6.01)	(–3.03)		(–3.76)	(–1.34)		(–0.48)	(0.57)
Ln (age)		0.47**	–0.10		0.79***	0.15		0.86***	0.28*
		(2.57)	(–0.56)		(5.90)	(1.09)		(5.24)	(1.89)
Age 65		–0.32***	–0.26***		–0.19***	–0.11**		–0.07	–0.05*
		(–6.68)	(–5.09)		(–3.43)	(–2.66)		(–1.51)	(–1.80)
CEO		0.46***	0.66***		0.36***	0.46***			
		(7.75)	(18.68)		(6.88)	(14.07)			
Ln (total assets)			0.27***			0.31***			0.32***
			(26.45)			(23.86)			(24.91)
ROA			0.05			–0.00			0.01
			(0.24)			(–0.02)			(0.04)
Sales growth			2.69*			2.33*			1.69
			(1.98)			(1.96)			(1.32)
CAPEX / Assets			0.27			0.33			0.33
			(1.24)			(1.17)			(1.00)
Leverage			–0.74*			–0.96**			–1.19***
			(–1.77)			(–2.62)			(–2.95)
Ln (firm age)			0.04***			0.04***			0.05***

			(2.86)			(2.98)			(3.12)
Constant	1.36***	–0.62	0.66	1.42***	–2.01***	–0.44	1.49***	–2.15***	–0.63
	(13.62)	(–0.85)	(0.82)	(10.12)	(–3.85)	(–0.68)	(10.41)	(–3.70)	(–0.96)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	161,965	161,965	161,965	109,311	109,311	109,311	49,147	49,147	49,147
R^2	0.388	0.433	0.600	0.410	0.461	0.679	0.424	0.465	0.684

Table 4–5: Panel Regressions of Ln (total compensation / GDP) on Public Dummy, Manager deficiency, and Brain–drain

Table 4–5 presents the results of the panel regressions in which natural log of total executive pays scaled by country's GDP per capita are regressed on public dummy, manager, brain, and executives and firm characteristics and fixed effects. The sample includes executive–year observations from 22 countries during 2001–2012. All variables are as defined in Appendix E. All firm level variables are lagged by 1 year. All continuous variables are winsorized at 1% and 99%. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Total Executives		Top 5		CEO	
Public	0.45***	0.32***	0.39**	0.29***	0.36***	0.23***
	(3.54)	(4.18)	(2.79)	(3.34)	(4.01)	(3.41)
Manager deficiency	–0.03		–0.01		–0.02	
	(–0.81)		(–0.11)		(–0.31)	
Public × Manager deficiency	0.05**		0.04**		0.04**	
	(2.67)		(2.10)		(2.68)	
Brain–drain		0.10***		0.11***		0.11***
		(3.69)		(2.98)		(3.61)
Public × Brain–drain		0.03**		0.03**		0.02*
		(2.63)		(2.25)		(1.83)
Education	0.05***	0.05***	0.07***	0.07***	0.06***	0.06***
	(6.49)	(6.21)	(5.52)	(5.38)	(3.56)	(3.47)
Female	–0.09***	–0.09***	–0.07***	–0.07***	–0.02	–0.02
	(–4.89)	(–4.93)	(–2.89)	(–2.90)	(–0.48)	(–0.49)
Ln (age)	–0.14	–0.13	0.13	0.14*	0.15	0.16
	(–1.42)	(–1.32)	(1.52)	(1.81)	(1.30)	(1.45)
Age 65	–0.15***	–0.16***	–0.02	–0.04	–0.02	–0.03
	(–3.04)	(–3.31)	(–0.68)	(–1.03)	(–1.08)	(–1.71)
CEO	0.71***	0.71***	0.50***	0.50***		
	(22.30)	(21.91)	(17.32)	(17.24)		
Ln (total assets)	0.31***	0.31***	0.35***	0.35***	0.36***	0.36***
	(14.13)	(14.21)	(17.37)	(17.44)	(16.93)	(17.03)
ROA	–0.17	–0.17	–0.26**	–0.26**	–0.27**	–0.27**
	(–1.44)	(–1.46)	(–2.14)	(–2.17)	(–2.18)	(–2.19)
Sales growth	5.12**	5.01**	4.99**	4.90**	4.60**	4.51**
	(2.76)	(2.78)	(2.59)	(2.61)	(2.28)	(2.30)
CAPEX / Assets	0.25*	0.24*	0.27	0.26	0.25	0.24
	(2.02)	(1.89)	(1.56)	(1.51)	(1.23)	(1.18)
Leverage	–1.10***	–1.14***	–1.18***	–1.21***	–1.27***	–1.30***
	(–2.86)	(–3.10)	(–3.93)	(–4.15)	(–5.40)	(–5.76)
Ln (firm age)	0.02	0.02	0.01	0.01	0.02	0.02
	(1.21)	(1.15)	(0.48)	(0.42)	(1.63)	(1.57)
Constant	0.27	1.12**	–0.60	0.09	–0.46	0.35
	(0.46)	(2.15)	(–0.83)	(0.18)	(–0.54)	(0.52)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	326,278	326,278	215,122	215,122	100,376	100,376
R^2	0.580	0.581	0.666	0.667	0.647	0.648

Table 4–6: Panel Regressions of Ln (total compensation / GDP) on Public Dummy, S/H suits, and Transparency
Table 4–6 presents the results of the panel regressions in which natural log of total executive pays scaled by country's GDP per capita are regressed on public dummy, S/H suits, transparency, and executives and firm characteristics and fixed effects. The sample includes executive–year observations from 22 countries during 2001–2012. All variables are as defined in Appendix E. All firm level variables are lagged by 1 year. All continuous variables are winsorized at 1% and 99%. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Total Executives		Top 5		CEO	
Public	–0.68*	–2.13***	–0.65*	–1.84***	–0.75**	–2.03***
	(–1.97)	(–3.02)	(–2.01)	(–2.93)	(–2.36)	(–3.64)
S/H suits	–0.07		–0.06		–0.06	
	(–1.25)		(–1.00)		(–0.81)	
Public × S/H suits	0.14**		0.14**		0.15**	
	(2.20)		(2.24)		(2.55)	
Transparency		0.04		0.11		0.16
		(0.29)		(0.73)		(0.94)
Public × Transparency		0.35***		0.30***		0.33***
		(3.33)		(3.27)		(4.12)
Education	0.05**	0.08**	0.07**	0.09***	0.07*	0.09**
	(2.13)	(2.83)	(2.41)	(3.02)	(1.87)	(2.55)
Female	–0.16***	–0.11***	–0.12**	–0.07*	–0.12*	–0.06
	(–2.97)	(–3.18)	(–2.50)	(–1.82)	(–2.07)	(–1.35)
Ln (age)	–0.63**	–0.44*	–0.40	–0.17	–0.33	–0.04
	(–2.23)	(–1.85)	(–1.45)	(–0.74)	(–1.46)	(–0.22)
Age 65	–0.06	–0.07	0.07	0.06	0.10*	0.07*
	(–1.21)	(–1.60)	(1.39)	(1.21)	(1.79)	(1.76)
CEO	0.76***	0.74***	0.55***	0.53***		
	(28.68)	(23.32)	(19.46)	(20.32)		
Ln (total assets)	0.27***	0.28***	0.30***	0.31***	0.31***	0.31***
	(6.51)	(7.04)	(6.26)	(7.30)	(5.99)	(6.84)
ROA	0.27	0.16	0.23	0.09	0.18	0.02
	(0.62)	(0.46)	(0.51)	(0.27)	(0.40)	(0.08)
Sales growth	6.04*	4.91*	6.12*	5.21*	6.04*	4.77*
	(1.86)	(1.79)	(2.04)	(2.06)	(2.01)	(2.05)
CAPEX / Assets	1.49*	1.17**	1.52*	1.18**	1.49*	1.11**
	(1.96)	(2.27)	(1.99)	(2.27)	(2.00)	(2.19)
Leverage	–0.95	–1.23*	–1.15	–1.33**	–0.84	–1.10*
	(–1.27)	(–1.91)	(–1.61)	(–2.09)	(–1.21)	(–1.84)
Ln (firm age)	0.02	0.01	0.01	–0.01	0.03	0.01
	(0.77)	(0.32)	(0.26)	(–0.46)	(0.97)	(0.45)
Constant	3.08**	1.67	2.09*	0.11	2.10**	–0.34
	(2.74)	(1.08)	(1.80)	(0.07)	(2.12)	(–0.22)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	326,278	326,278	215,122	215,122	100,376	100,376
R^2	0.381	0.427	0.448	0.503	0.439	0.507

Table 4–7: Panel Regressions of Ln (total compensation / GDP) on Public and IFRS Dummies

Table 4–7 presents the results of the panel regressions in which natural log of total executive pays scaled by country's GDP per capita are regressed on public and IFRS dummies, and executives and firm characteristics and fixed effects. The sample includes executive–year observations from 22 countries during 2001–2012. All variables are as defined in Appendix E. All firm level variables are lagged by 1 year. All continuous variables are winsorized at 1% and 99%. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) Total Executives	(2) Top 5	(3) CEO
Public	0.08***	0.06**	0.06**
	(3.40)	(2.60)	(2.50)
IFRS	–0.32***	–0.40***	–0.36***
	(–3.82)	(–4.06)	(–3.87)
Public × IFRS	0.15***	0.16***	0.15***
	(4.03)	(5.71)	(5.79)
Education	0.05***	0.07***	0.06***
	(6.38)	(5.42)	(3.50)
Female	–0.09***	–0.07***	–0.02
	(–4.96)	(–2.90)	(–0.46)
Ln (age)	–0.15	0.12	0.15
	(–1.43)	(1.44)	(1.26)
Age 65	–0.15***	–0.02	–0.02
	(–3.15)	(–0.67)	(–1.08)
CEO	0.71***	0.50***	
	(22.15)	(17.28)	
Ln (total assets)	0.31***	0.35***	0.36***
	(14.25)	(17.58)	(17.02)
ROA	–0.17	–0.26**	–0.27**
	(–1.45)	(–2.14)	(–2.17)
Sales growth	4.90**	4.76**	4.39**
	(2.68)	(2.53)	(2.22)
CAPEX / Assets	0.24*	0.27	0.25
	(2.01)	(1.57)	(1.21)
Leverage	–1.14***	–1.23***	–1.31***
	(–3.03)	(–4.22)	(–5.74)
Ln (firm age)	0.02	0.01	0.02
	(1.14)	(0.41)	(1.56)
Constant	0.68	–0.32	–0.12
	(1.59)	(–0.87)	(–0.23)
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
No. of Observations	326,278	215,122	100,376
R^2	0.580	0.667	0.648

Table 4–8: Coefficients and t–statistics of Interacted Term of Public Dummy with Manager deficiency, Brain–drain, IFRS, S/H Suits, and Transparency with expanded definition of compensation and executives

Table 4–8 presents coefficients and t–statistics of interacted terms of public dummy with "Manager deficiency," "Brain–drain," "S/H Suits," "Transparency," and "IFRS" with the expanded definition of compensation and executives. Compensation is defined as salary, salary and bonus, and cash compensation. Executives are defined as all executives, top 5 and 3 highest ranking executives, CFOs, and CEOs. The coefficients and t–statistics are based on the results of panel regressions in which natural logarithm of salary, salary and bonus, or cash compensation scaled by country's GDP per capita are regressed on public dummy, its interactions with "Manager deficiency," "Brain–drain," "S/H Suits," "Transparency," and "IFRS" respectively and all executive and firm level characteristics. Industry and year dummies are included in all regressions. Country dummies are included except for the regressions on "S/H Suits" and "Transparency." The sample includes executive–year observations from 22 countries during 2001–2012. All variables are as defined in Appendix E. All firm level variables are lagged by 1 year. All continuous variables are winsorized at 1% and 99%. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

< Compensation >	Coefficients and t–statistics of Interacted Term of Public Dummy with				
Executives	Manager deficiency	Brain–drain	S/H Suits	Transparency	IFRS
< Salary >					
All Executives	0.03***	0.02***	0.13	0.34**	0.11***
	(6.23)	(3.03)	(1.67)	(2.29)	(6.19)
Top 5	0.04***	0.02***	0.13	0.33**	0.11***
	(6.73)	(3.31)	(1.67)	(2.34)	(7.51)
Top 3	0.03***	0.02***	0.14*	0.32**	0.11***
	(5.35)	(2.91)	(1.89)	(2.52)	(6.44)
CFOs	0.03**	0.02*	0.06	0.16	0.08***
	(2.81)	(1.96)	(1.05)	(1.12)	(4.45)
CEOs	0.03***	0.02**	0.15**	0.33***	0.11***
	(5.07)	(2.38)	(2.16)	(3.15)	(6.44)
< Salary + Bonus >					
All Executives	0.05***	0.03**	0.15**	0.35**	0.19***
	(2.95)	(2.82)	(2.14)	(2.64)	(6.65)
Top 5	0.06***	0.03***	0.15**	0.34**	0.18***
	(3.24)	(3.09)	(2.15)	(2.69)	(8.16)
Top 3	0.05***	0.03***	0.16**	0.33***	0.19***
	(2.97)	(2.84)	(2.40)	(2.92)	(8.06)
CFOs	0.05*	0.03*	0.09	0.18	0.14***
	(1.99)	(1.78)	(1.62)	(1.46)	(4.90)
CEOs	0.05**	0.03**	0.17**	0.34***	0.18***
	(2.36)	(2.26)	(2.74)	(3.60)	(8.48)
< Cash Compensation >					
All Executives	0.06***	0.04***	0.15*	0.37**	0.16***
	(3.62)	(3.97)	(1.98)	(2.48)	(4.38)
Top 5	0.06***	0.04***	0.15*	0.36**	0.17***
	(4.67)	(4.74)	(1.91)	(2.42)	(6.19)
Top 3	0.06***	0.04***	0.16*	0.35**	0.18***
	(3.83)	(4.31)	(2.06)	(2.54)	(6.31)
CFOs	0.05***	0.03***	0.08	0.18	0.13***
	(3.62)	(3.09)	(1.30)	(1.28)	(4.84)
CEOs	0.05***	0.03***	0.18**	0.39***	0.18***
	(3.62)	(3.71)	(2.37)	(3.21)	(6.01)

CHAPTER FIVE: SUMMARY AND CONCLUSIONS

This dissertation compiles three independent cross-country studies in corporate finance. Each study has been designed and implemented for me to better understand important issues in financial management in an international setting.

In the second chapter, I study whether stock market development boosts economic growth. Prior studies in the literature have used stock market capitalization over GDP, or the size of a stock market, as a proxy for stock market development. And they have not established a robust relationship between stock market development and economic growth. I challenge that the size measure may not be a good proxy for the functional efficiency of a stock market. I propose a new measure of stock market functionality. I term the new measure as "stock market concentration" and examine its relationship with capital allocation efficiency, initial public offerings (IPOs), innovation, and economic growth, using data from 47 countries worldwide for the period 1989–2013.

The extent of stock market concentration is computed annually as the sum of the stock market capitalizations of the largest five or ten firms divided by the total stock market capitalization of a country's domestic stock exchanges. The idea is that a concentrated stock market dominated by a small number of large firms is likely to indicate the impediment to access to necessary funds for small new firms. My empirical goal for the new measure of stock market functional efficiency is to investigate the relationship between stock market functionality and economic growth, and to examine the channel through which the former affects the latter.

I first find that stock market concentration is negatively correlated with the proxy for capital allocation efficiency, suggesting that a highly concentrated stock market is less likely to allocate necessary capital to young, innovative firms that make efficient use of capital. Second, I find that stock market concentration is a good (negative) predictor of economic growth in the subsequent five or even ten years and has large economic implications. Third, I also examine the relationship of stock market concentration with IPOs and innovation. I hypothesize that stock market concentration adversely affects future economic growth through a negative effect on entrepreneurship by constricting the financing and innovative activities of new, innovative firms. I find that stock market concentration is indeed negatively associated with IPO and innovation proxies.

In the final empirical approach, I employ two-stage regressions to check the link between stock market concentration, access to funds by innovative entrepreneurs, and economic growth. I first estimate IPO and innovation activities at a certain level of stock market concentration by regressing them on concentration. Then I run real per capita GDP growth rates on the estimated IPO and innovation activities, finding that they are significantly correlated with economic growth. These results reaffirm that a dysfunctional stock market prevents small, new, but innovative firms from accessing the funds they require, which in turn hurts economic growth.

The third chapter revisits the finding of Weld, Michaely, Thaler, and Benartzi (2009) that the average nominal price for a share of stock in the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) has been approximately $25 since the Great Depression. The price has not even kept pace with the rate of inflation. They find that 16 other countries did not share this peculiar trait. Hence, they conclude that "the nominal price fixation is primarily a U.S. or North American phenomenon."

We challenge their last conclusion. We term the tendency of stock prices to remain stable as "anchoring" hypothesis. Anchoring is a cognitive bias that describes the common human tendency to rely excessively on the first piece of information offered (the 'anchor') when making decisions. Because anchoring is such a common human trait, we are skeptical that the United States is the only country whose stock markets exhibit this phenomenon. To find out whether the nominal price fixation is indeed a North American phenomenon, we extend the analysis by Weld et al. (2009) to international markets. We collect the nominal stock prices of firms, in both the local currency and the U.S. dollar, at the end of June in each year for 38 countries from 1981- 2010.

We, first of all, find that the median nominal stock price in dollar terms is remarkably flat and stable throughout the sample period for all countries, suggesting that although firms generate positive returns on average, their nominal share prices are held roughly constant. In fact, the level of current nominal stock prices in 2010 was remarkably similar to the level of nominal stock prices 29 years earlier. Second, a firm's nominal stock price has a tendency to revert to its initial stock price level. When we partition our sample firms into tercile groups by their nominal stock price levels every year and keep track of the tercile groups to which they belong, we find that a majority of firms in almost all countries remains in their initial nominal stock price tercile group.

We test this last observation formally using a regression model. We hypothesize that the initial stock price of a listed firm, an IPO price, may well serve as an anchor for future nominal stock prices and may be the most important determinant of nominal share prices. To the extent that investors/managers tend to rely heavily on the first piece of pricing information offered, the anchor price is likely to affect how managers “control” the future nominal stock price with corporate actions such as stock splits, dividend payouts, and reverse stock splits. The cross-sectional regression results show that the IPO price is the single most important variable that explains the current nominal stock price. Our empirical results indicate that the nominal price fixation is a global phenomenon.

Finally, we show that nominal stock prices tend to revert back to their anchors due to corporate actions such as stock splits, dividend payouts, or even reverse stock splits. This suggests that corporate managers seem to manage the nominal stock prices to revert to the anchor. The introduction of the euro in January of 1999 offers a natural experiment that further corroborates this finding. We find a much higher proportion of euro firm managers than non-euro firm managers in Europe taking corporate actions to bring down their nominal share prices just before and after the introduction of the euro. It appears that the introduction of the euro brought in a ‘new’ anchor for euro firms, which triggered euro firm managers to adjust their nominal stock prices.

The fourth chapter investigates the pay gap between public and private firm executives, using a wide–ranging sample for the period of 2001 ~ 2012 for 22 countries that have enough information on both public and private firm executive pays. We test two competing hypotheses related to the agency theory in an international setting.

The first hypothesis is competitive executive labor market hypothesis; If executive labor markets are competitive, those economic and institutional elements executives would well explain the executive pay gap between public and private firms (Abowd and Ashenfelter 1981; Garbaix and Landier, 2008; Kaplan and Minton, 2012; and Peters and Wagner, 2014).

On the contrary, if the labor markets are not competitive and the executive compensation is set by other factors rather than the market forces, the economic and institutional factors would not affect the pay level much or work against an economic equilibrium. For example, the entrenchment hypothesis predicts that powerful and rent–extracting executives make their own way in determining their pays thus the executive compensation mechanism deviates from the equilibrium pay level (Core, Holthausen, and Larcker, 1999; Bebchuk and Fried, 2004; Jensen, Murphy, and Wruck, 2004; and Morse, Nanda, and Seru, 2011).

We test our hypothesis taking advantage of the fact that each country has different economic and institutional environments. Between–country analyses enable us to examine whether these economic, market–driven variables that make public firms hard to hire competent executives and institutional factors that put more burden and risks on public firm executives drive up the pay for public firm executives.

We first find that public firm executives are paid more in terms of total compensation than private firm executives by 11%, controlling for various executive and firm characteristics that may affect the executive pay level. This public pay premium is even higher when we exclude the United States that takes up the largest portion of the sample and has been arguably blamed for exorbitantly high compensation for public firm CEOs. The public pay premium increases to 22% excluding the United States.

We also find that the public pay premium is higher when well–educated, competent senior managers are less available in the labor market, when there exists stronger investor protection and shareholder power, and when improved disclosure requirements (i.e., introduction of International Financial Reporting Standards (IFRS)) are enforced to public firms. These findings are robust whether we define total compensation, salary, salary plus bonus, or cash compensation as the compensation and whether we narrow down the definition of executives to top 5, top 3, chief financial officers (CFOs), or CEOs.

These findings support the view that executive labor markets are competitive and public firm executives receive higher pays when they are harder to be obtained by public firms or they are to assume higher risk. Meanwhile, empirical findings in this chapter is largely inconsistent with the argument of entrenchment hypothesis that public firms are entrenched by powerful executives and CEOs who can control their pays; the pubic pay premium would not be much affected by the labor market situation and decrease under the stronger shareholder power and more stringent disclosure and scrutiny regime with the entrenchment proposition.

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APPENDICES

Appendix A. Data Source and Variable Definitions

"Datastream" refers to Thomson Reuters' Datastream; "IMD WCC" = International Institute for Management Development, World Competitiveness Center; "NBER" = National Bureau of Economic Research's Patent Database; "SDC Platinum" = Thomson Reuters' SDC Platinum Global New Issues; **"**UNIDO" = United Nations Industrial Development Organization, Industrial Statistics; **"**UN IHDI" = United Nations International Human Development Indicators**;** and "WB WDI" = World Bank World Development Indicators.

Variables	Description	Data source	Sample period
(1) Financial Development Measures			
Mkt. Con. (top 5 (10) firms)	Stock market capitalization of the largest 5 (10) firms divided by total stock market capitalization of domestic stock exchanges at the end of the year.	Datastream, WB WDI	1989–2008
Mkt. Cap. / GDP	Market capitalization of domestically incorporated companies listed on domestic stock exchanges at the end of a year divided by GDP during the year.	WB WDI	1989–2008
Turnover / Cap.	Total value of shares traded on domestic stock exchanges during a year divided by stock market capitalization at the end of the year.	WB WDI	1989–2008
Credit / GDP	Total domestic credit provided to private sector divided by GDP during the year.	WB WDI	1989–2008
(2) Dependent Variables			
Per Capita GDP Growth ($\Delta\, ln(y)$)	Growth in real per capita GDP (%) calculated as: $\Delta\, ln(y) = ln(per\ capita\ GDP_t) - ln(per\ capita\ GDP_{t-1}) \times 100$ where *per capita GDP* is in constant 2005 U.S. dollars.	WB WDI	1994–2013
Elasticity of Capital Allocation *(β_c)*	Coefficient estimated from regressions of the growth of I_{cit} on the growth of V_{cit}. Estimated from the following regression: $$ln\,\frac{I_{cit}}{I_{cit-1}} = \alpha_c + \beta_c\, ln\,\frac{V_{cit}}{V_{cit-1}} + \varepsilon_{cit}$$ where I_{cit} and V_{cit}.are the investment and value–added in each country–industry–year, respectively. The industry data are at the 3–digit level.	UNIDO	1991–2010

IPO Amount / Pop.	Logarithm of (1 + amount of IPOs (in million U.S. dollars) in domestic exchanges during the year divided by country's population (in millions)).	SDC Platinum, WB WDI	1994–2013
IPO No. / Pop.	Logarithm of (1 + number of IPOs in domestic exchanges during the year divided by country's population (in millions)).	SDC Platinum, WB WDI	1994–2013
Patent / Pop.	Logarithm of (1 + number of patent applications to USPTO in a year divided by country's population (in millions)).	NBER	1994–2006
Citation / Pop.	Logarithm of (1 + number of citations received by patents in a year divided by country's population (in millions)).	NBER	1994–2006
Generality / Pop.	Logarithm of (1 + generality level of the patents in a year divided by a country's population (in millions)). Generality measures the number of technology classes of patents that cite the given patent.	NBER	1994–2006
Originality / Pop.	Logarithm of (1 + originality level of patents in a year divided by a country's population (in millions)). Originality measures the number of technology classes of patents cited by the given patent.	NBER	1994–2006
(3) Control / Instrumental Variables			
(Initial) Per Capita GDP	Logarithm of real per capita GDP (in 1993).	WB WDI	1994–2013
Initial Education	Logarithm of the average number of years of education received by people ages 25 and older in 1990.	UN IHDI	1990
Gov. Spending / GDP	General government consumption expenditure divided by GDP during the year.	WB WDI	1994–2013
Inflation	Inflation rates, GDP deflator during the year.	WB WDI	1994–2013
Openness / GDP	Sum of exports and imports of goods and services divided by GDP during the year.	WB WDI	1994–2013
Bureaucracy	Index from 0 to 10 based on executive survey on the bureaucracy level of a country in each year, 10 being the lowest level of bureaucracy.	IMD WCC	1995–2013

Corruption	Index from 0 to 10 based on executive survey on the bribery and corruption level of a country in each year, 10 being the lowest level of bribery and corruption.	IMD WCC	1995–2013
Total GDP	Logarithm of total GDP of a country deflated by GDP deflator.	WB WDI	1989–2008
Territory Size	Logarithm of a country's total area in square kilometers.	WB WDI	1989–2008
Export / Pop.	Exports of goods and services in million US dollars during a year divided by country's population.	WB WDI	1989–2008
Legal Origin	Legal origin of a country's commercial law, which could be English common law, French civil law, German civil law, or Scandinavian civil law.	Djankov et al. (2008)	–
Anti–Self–Dealing	Index from 0 to 1 that measures the extent of minority shareholder protections against misappropriation by corporate insiders.	Djankov et al. (2008)	–
Portfolio Inflows / GDP	Net inflows from equity securities in domestic stock exchanges by foreign investors divided by country's total GDP during the year.	WB WDI	1989–2008
Stability	Index from 0 to 1 generated by counting the number of firms that stay in the top 5 (10) in both the current year and 5 years ago and dividing it by 5 (10).	Datastream	1994–2008

Appendix B. Stock Market Concentration and Economic Growth: Robustness Test—Regressions with Concentration at *t*–10

This table presents the results of panel regressions in which per capita GDP growth rates are regressed on stock market concentration at *t*–10. The sample includes country–year observations for 47 countries during 1999–2013. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by both year and country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Mkt. Con. (top 5 firms) at *t*–10	–4.52***				–4.68***	
	(–3.61)				(–3.78)	
Mkt. Con. (top 10 firms) at *t*–10		–3.95***				–4.17***
		(–3.61)				(–3.66)
Mkt. Cap. / GDP at *t*–10			–0.91		–0.93	–1.01
			(–1.26)		(–1.35)	(–1.42)
Turnover / Cap. at *t*–10				0.24	0.30	0.26
				(0.70)	(0.97)	(0.85)
Credit / GDP at *t*–10	–0.82*	–0.83**	0.29	–0.32	–0.34	–0.31
	(–1.90)	(–1.99)	(0.41)	(–0.73)	(–0.63)	(–0.58)
Initial Per Capita GDP	–0.78***	–0.77***	–0.79***	–0.81**	–0.80***	–0.79***
	(–2.65)	(–2.69)	(–2.60)	(–2.44)	(–2.98)	(–3.04)
Initial Education	0.97**	0.82*	1.14**	1.17**	1.14**	0.97**
	(2.13)	(1.78)	(2.54)	(2.47)	(2.38)	(2.02)
Gov. Spending / GDP	–8.80*	–8.20*	–12.67***	–11.57**	–8.82*	–8.25*
	(–1.94)	(–1.79)	(–2.65)	(–2.36)	(–1.89)	(–1.75)
Inflation	–0.00	–0.01	0.00	–0.00	0.00	0.00
	(–0.17)	(–0.20)	(0.12)	(–0.05)	(0.05)	(0.06)
Openness / GDP	0.55***	0.59***	0.49*	0.21	0.92***	0.99***
	(3.08)	(3.28)	(1.65)	(1.12)	(2.66)	(2.69)
Constant	10.47***	10.87***	9.03***	9.10***	10.07***	10.53***
	(6.23)	(6.38)	(5.35)	(5.75)	(7.05)	(7.37)
No. of Observations	623	623	623	620	620	620
R^2	0.227	0.228	0.202	0.190	0.246	0.248

Appendix C. Stock Market Concentration and IPO: Robustness Test—Regressions with Country Fixed–Effects
This table presents the results of panel regressions in which measures of IPO activities are regressed on stock market concentration at *t*–5 with country fixed–effects. The sample includes country–year observations for 46 countries during 1994–2013. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	IPO Amount / Pop.		IPO No. / Pop.	
	(1)	(2)	(3)	(4)
Mkt. Con. (top 5 firms) at *t*–5	–1.09**		–0.24	
	(–2.05)		(–1.63)	
Mkt. Con. (top 10 firms) at *t*–5		–1.20**		–0.29**
		(–2.26)		(–2.13)
Mkt. Cap. / GDP at *t*–5	–0.68***	–0.68***	–0.21***	–0.21***
	(–4.16)	(–4.24)	(–3.56)	(–3.62)
Turnover / Cap. at *t*–5	–0.23**	–0.23**	–0.06*	–0.05
	(–2.03)	(–2.02)	(–1.68)	(–1.66)
Credit / GDP at *t*–5	–1.26***	–1.25***	–0.20**	–0.20**
	(–3.40)	(–3.40)	(–2.07)	(–2.06)
Per Capita GDP	1.21***	1.23***	0.05	0.06
	(3.18)	(3.27)	(0.33)	(0.39)
Gov. Spending / GDP	–27.25***	–26.71***	–4.17***	–4.03***
	(–5.23)	(–5.06)	(–2.83)	(–2.73)
Inflation	–0.02***	–0.02***	–0.00***	–0.00***
	(–5.67)	(–5.73)	(–3.08)	(–3.13)
Openness / GDP	0.36	0.37	0.10	0.10
	(1.03)	(1.04)	(0.65)	(0.66)
Constant	–5.54	–5.71	0.29	0.24
	(–1.58)	(–1.64)	(0.21)	(0.18)
Country Fixed–Effects	Yes	Yes	Yes	Yes
No. of Observations	820	820	820	820
R^2	0.571	0.572	0.725	0.726

Appendix D. Stock Market Concentration and Innovation: Robustness Test—Regressions with Country Fixed–Effects

This table presents the results of panel regressions in which measures of innovation are regressed on stock market concentration at *t*–5 with country fixed–effects. The sample includes country–year observations for 43 countries during 1994–2006. All variables are as defined in Appendix A. The *t*–statistics in parentheses are based on standard errors clustered by country. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	Patent / Pop.		Citation /Pop.		Generality / Pop.		Originality / Pop.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mkt. Con. (top 5 firms) at *t*–5	–2.39**		–4.60***		–2.97***		–2.12**	
	(–2.58)		(–3.04)		(–3.78)		(–2.58)	
Mkt. Con. (top 10 firms) at *t*–5		–2.52***		–4.90***		–3.13***		–2.24***
		(–2.97)		(–3.56)		(–4.46)		(–3.01)
Mkt. Cap. / GDP at *t*–5	–0.40*	–0.40**	–1.05**	–1.03**	–0.85***	–0.84***	–0.41**	–0.40**
	(–2.01)	(–2.10)	(–2.31)	(–2.42)	(–2.91)	(–3.10)	(–2.15)	(–2.24)
Turnover / Cap. at *t*–5	–0.28*	–0.27*	–0.47*	–0.46*	–0.17	–0.17	–0.25*	–0.24*
	(–1.95)	(–1.97)	(–1.84)	(–1.87)	(–1.21)	(–1.21)	(–1.99)	(–2.01)
Credit / GDP at *t*–5	–1.11*	–1.05*	–1.86*	–1.76*	–0.68	–0.61	–0.87	–0.82
	(–1.89)	(–1.85)	(–1.83)	(–1.79)	(–1.36)	(–1.27)	(–1.66)	(–1.61)
Per Capita GDP	–1.68**	–1.67**	–4.73***	–4.72***	–2.83***	–2.82***	–1.19*	–1.19**
	(–2.30)	(–2.44)	(–2.97)	(–3.19)	(–3.06)	(–3.33)	(–1.92)	(–2.02)
Gov. Spending / GDP	4.95	5.98	3.59	5.67	–4.47	–3.19	3.61	4.53
	(0.68)	(0.85)	(0.29)	(0.46)	(–0.52)	(–0.37)	(0.56)	(0.71)
Inflation	–0.01***	–0.01***	–0.02***	–0.02***	–0.01***	–0.01***	–0.01***	–0.01***
	(–2.83)	(–2.88)	(–2.74)	(–2.82)	(–3.33)	(–3.40)	(–2.75)	(–2.80)
Openness / GDP	–0.19	–0.18	–1.05	–1.03	–0.05	–0.04	–0.14	–0.13
	(–0.46)	(–0.44)	(–1.07)	(–1.02)	(–0.10)	(–0.08)	(–0.36)	(–0.34)
Constant	15.20**	15.29**	43.12***	43.25***	26.21***	26.33***	10.94**	11.01**
	(2.48)	(2.65)	(3.16)	(3.41)	(3.28)	(3.57)	(2.11)	(2.24)
Country Fixed–Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	473	473	473	473	473	473	473	473
R^2	0.842	0.845	0.808	0.814	0.765	0.775	0.824	0.827

Appendix E. Data Source and Variable Definitions

Variables	Description	Data source
Ln (total compen–sation / GDP)	Natural log of (sum of all the compensation components of the executive for the year over GDP per capita).	Capital IQ
Ln (salary / GDP)	Natural log of (amount paid as salary to the executive for the year over GDP per capita).	Capital IQ
Ln (salary & bonus / GDP)	Natural log of (amount paid as salary or bonus to the executive for the year over GDP per capita).	Capital IQ
Ln (cash compen–sation / GDP)	Natural log of (amount paid as cash to the executive for the year over GDP per capita).	Capital IQ
Education	The number of educational institutions where this person used to study in, which is counted by the commas in "education" description.	Capital IQ
Female	Dummy variable which is equal to 1 if an executive is a female and zero otherwise.	Capital IQ
Ln (age)	Natural log of (executive's age).	Capital IQ
Age 65	Dummy variable which is equal to 1 if an executive is 65 years or older and zero otherwise.	Capital IQ
CEO	Dummy variable which is equal to 1 if an executive is the CEO or co–CEO of a firm and zero otherwise.	Capital IQ
Ln (total assets)	Natural log of the book value of total assets in 2012 US dollars in the previous year.	Capital IQ
ROA	Return on assets.	Capital IQ
Sales growth	Difference in natural log of sales in the current and previous years.	Capital IQ
CAPEX / assets	Capital expenditure over total assets.	Capital IQ
Leverage	Ratio of long–term debt to shareholder's equity.	Capital IQ
Ln (firm age)	Natural log of firm's age computed by subtracting the year the firm was founded from the current year.	Capital IQ
Public	Dummy variable which is equal to 1 if a firm is a public one and zero otherwise.	Capital IQ

Manager deficiency	Index that ranges from 0 to 10. It is multiplied by –1. A higher score indicates “competent senior managers are less readily available in the country."	IMD
Brain–drain	Index that ranges from 0 to 10. It is multiplied by –1. A higher score indicates "emigration of well–educated and skilled people hinders competitiveness in the economy."	IMD
S/H suits	Easy of shareholder suit index. It ranges from 0 to 10, with higher values indicating greater powers of shareholders to challenge the transaction of executives and sue them for misconduct.	World Bank
Transparency	Corporate transparency index. It ranges from 0 to 10, with higher values indicating the higher level of corporate transparency that lets shareholders monitor executive's compensation and financial prospects with ease.	World Bank
IFRS	Dummy variable which is equal to 1 in the years since a country adopted the IFRS or zero otherwise.	Balsam et al. (2016)

Appendix F. Country–level indices and IFRS Adoption dates by country

"Manager deficiency" and "Brain–drain" are averaged during the sample period for each country. "IFRS Adoption Date" is retrieved from Balsam et al. (2015).

Country	Manager deficiency	Brain–drain	S/H suits	Transparency	IFRS Adoption Date
Australia	–6.53	–5.75	6.00	7.00	12/31/2005
Canada	–6.69	–5.36	7.50	5.50	12/31/2011
China	–4.04	–3.43	3.00	7.00	Never adopted
Denmark	–6.88	–6.50	9.00	7.00	12/31/2005
Finland	–6.39	–7.11	8.50	6.00	12/31/2005
France	–6.21	–5.46	7.50	8.00	12/31/2005
Germany	–6.54	–6.06	9.00	6.50	12/31/2005
Hong Kong	–7.20	–6.44	9.00	6.00	12/31/2005
India	–6.64	–5.63	9.00	8.50	Never adopted
Ireland	–6.87	–6.85	7.50	8.00	12/31/2005
Italy	–5.20	–4.17	9.00	7.00	12/31/2005
Malaysia	–6.70	–5.31	6.00	6.00	Never adopted
Netherlands	–6.80	–6.75	10.50	5.00	12/31/2005
New Zealand	–5.26	–3.31	7.50	7.00	12/31/2007
Norway	–5.97	–7.51	8.50	8.50	12/31/2005
Slovenia	–4.34	–3.58	7.50	5.00	12/31/2005
South Africa	–4.30	–2.15	5.50	6.00	12/31/2005
Sweden	–6.94	–6.50	9.00	6.50	12/31/2005
Switzerland	–6.90	–7.36	10.00	8.00	12/31/2005
Thailand	–5.77	–5.33	7.00	5.00	Never adopted
United Kingdom	–5.87	–5.49	8.00	8.00	12/31/2005
United States	–7.27	–7.66	5.10	6.50	Never adopted