Three Essays on Billionaire Corporate Control

by

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Abstract

This thesis examines the impact of billionaires on their firms, equity markets and their countries' economies. In Chapter 2, I use a hand-collected dataset of billionaire wealth from 1986 to 2015 and document that billionaire wealth over GDP has been increasing substantially around the world. As of 2015, billionaires in all regions, except Africa, own assets worth more than 10% of GDP, while the median number of billionaires per country is only six. A few billionaires controlling vast amounts of corporate assets can both benefit and damage an economy. This is because heir billionaires inherit both corporate control and political connections from their parents, making them likely pursue rent-seeking to set up barriers against new entrants. In contrast, founder billionaires are creative entrepreneurs who invest in innovative projects that can potentially dislodge corrupt incumbents. Consistent with this argument, I find that countries with more founder wealth over GDP grow more rapidly, have lower barriers to entry, and higher IPO activity. In contrast, countries with more heir wealth over GDP are associated with the opposite. The positive impact of founder billionaires wanes after they remain billionaires for longer than 20 years. Arguably, this pattern of results is difficult to explain with other hypotheses than creative destruction brought about by billionaires.

Although the results from Chapter 2 strongly suggest that billionaires can impact their national economies, they still leave causality unresolved. I address this issue in Chapter 3 where I exploit billionaires' sudden deaths as exogenous shocks to their countries' capital markets. I hypothesize that because billionaires control large fractions of their national economies, the sudden loss of these individuals may have an impact not only on the firms they control but also on the entire market. In support of this hypothesis, I show that the

market-wide volatility increases significantly around the day they suddenly lose power. This increase in volatility is larger in less developed countries, suggesting that billionaires are more influential in these countries. Moreover, the average market index drops by approximately 0.3% in response to the sudden loss of these individuals. Cumulative abnormal returns on the market index are more negative in less developed countries, but are positive in countries whose per capita GDPs are higher than 41,738 USD. This result suggests that big business groups are beneficial in less developed economies, but detrimental in more developed ones.

In Chapter 4, my co-author, James Shou, and I explore how the impact of billionaires propagates throughout the stock market. We focus on one particular country, Russia, in order to control for any country-specific characteristics. We then exploit the unanticipated arrests of Russian oligarchs from 2000 to 2019 as exogenous shocks to the equity market. The results show that the average value of all firms significantly declines by 0.4% around the arrest day. Firm value drops the most for firms under the oligarch's control (-15%), less for firms within the oligarch's industries (-0.6%), and the least for the firms outside of the oligarch's industries (-0.3%). These drops in firm value are statistically significant for the first two groups of firms, but insignificant for the third. These results suggest that oligarchs are valuable not only to their firms but also to other firms in the same economy.

Preface

I identified the research topics, performed empirical analyses, and wrote manuscripts for the research projects in Chapters 2 and 3 under the supervision of Professor Randall Morck.

My coauthor, James Shou, and I identified the research topic, performed empirical analyses, and wrote a manuscript for the research project in Chapter 4 under the supervision of Professor Randall Morck.

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Chapter 1

Introduction

Okun (1975) argues in his classic book, "Equality and Efficiency: The Big Tradeoff," that to achieve more efficient economies and higher economic growth, we must accept greater inequality. Yet, several studies (see, for example, Banerjee and Duflo (2003)) have shown that higher inequality is associated with slower economic growth. In this thesis, I reconcile this contradicting evidence using Schumpeter (1942)'s theory of creative destruction and show that higher inequality arising from entrepreneurial wealth indeed accelerates growth, while higher inequality arising from inherited wealth stalls growth.

To elaborate, in most high-income countries, entrepreneurs with creative ideas find capitalists to invest in their projects. When these projects become successful, they create a temporary monopoly that gives both the entrepreneurs and investors tremendous wealth, which in turn leads to greater inequality. At the same time, these projects dislodge incumbents with outdated technologies and replace them with efficient ones, resulting in a more efficient economy and higher economic growth. In contrast, wealth in many low-income countries is passed on from one generation to another. Such inherited wealth allows incapable offspring to take charge of important corporations. Because these corporate heirs, on average, lack entrepreneurial ability but possess connections inherited from their parents, they are more likely to pursue political rent-seeking and set up barriers against new entrants with efficient technologies. This prevent their businesses from competition and preserves their wealth, while impeding economic growth.

Because the creative destruction process explained above involves high-impact entrepreneurs as opposed to small business owners (Henrekson and Sanandaji, 2014), the focus of this thesis is on billionaires who control large corporations. This thesis consists of three essays. Chapter 2 presents the first essay. In this essay, I provide suggestive evidence on how billionaires accelerate or decelerate the pace of creative destruction, hence affecting economic growth. Billionaires have the potential to affect their national economies because, in most countries, they control substantial portions of their countries' corporate sectors. Using a hand-collected dataset from Forbes' lists of billionaires between 1986 and 2015, I find that billionaire wealth as a fraction of GDP has more than doubled in most regions, except the Middle East. As of 2015, billionaires in all regions except Africa own corporate assets worth more than 10% of GDP, while the median number of billionaires per country is as low as six.

Small elite controlling vast amounts of corporate assets can both benefit and damage an economy. Heir billionaires tend to have lower entrepreneurial ability than their founder parents (see, for example, Perez-Gonzalez (2006)). Additionally, they grew up in an elite society, allowing them to reliably inherit both business and political connections (Rajan and Zingales, 2004). With these two reasons, heir billionaires are likely to resort to political rent-seeking to set up barriers against new entrants, ultimately slowing down the pace of creative destruction. Founder billionaires, in contrast, are creative entrepreneurs with high-impact innovations that can potentially dislodge incumbents. More presence of founder billionaires thus suggests less presence of corrupt incumbents and consequently a faster pace of creative destruction.

In support of the above argument, I use a hand-collected panel of billionaire wealth from 73 countries over the period from 1986 to 2016 and find that countries with larger fractions of heir billionaire wealth over GDP grow more slowly in terms of GDP per capita and total factor productivity. In contrast, countries with larger fractions of founder billionaire wealth over GDP grow more rapidly. This finding shows that the results from Morck, Stangeland, and Yeung (2000), which are based on a cross-section of 41 countries in 1993, are permanent and applicable to the global economy. However, with a three-decade long panel, this paper reveals that the positive impact of founder billionaires wanes when they stay in power for longer than 20 years. This suggests that they become incumbents after a long period of time. Powerful billionaires can affect economic growth through hindering or fostering the development of financial and legal systems. Results show that countries with larger fractions of founder billionaire wealth over GDP are more financially developed and have laws that better facilitate doing businesses, while countries with larger fractions of heir billionaire wealth over GDP are associated with the opposite. One of the outcomes of financial or regulatory barriers put in place by billionaires is the level of new entrant activity. I find that countries with larger fractions of founder billionaire wealth over GDP have a greater number of IPOs and raise more capital from domestic and venture-capital-backed IPOs. In contrast, countries with larger fractions of heir billionaire wealth over GDP tend to have fewer IPOs, and firms in these countries tend to raise capital outside of their home countries. Overall, the results in this chapter provides new evidence on creative destruction brought about by billionaires and show that higher inequality arising from entrepreneurial wealth promotes economic growth, while inherited wealth hinders it.

Although several pieces of evidence presented in Chapter 2 strongly suggest that billionaires can affect their countries' economic growth, the endogeneity issues are still left unresolved. I address this concern in the second essay in Chapter 3 using billionaire sudden deaths as exogenous shocks to the equity markets. If billionaires can influence the entire market, the market index should become more volatile in response to the sudden losses of billionaires. Consistent with this hypothesis, I find that the market *index* volatility significantly increases in response to the sudden passing of a billionaire and then subsides three days after the death date. This result suggests that billionaires are not firm-specific risks. In fact, they are systematic risks that cannot be diversified away in some economies. Next, I proxy a billionaire's influence using the market index volatility around his death date and explore where billionaires are more influential. Results reveal that, around the death date, markets become more volatile in lower-income countries. Put another way, billionaires are more influential in lower-income countries than they are in higher-income ones.

Is billionaire influence good or bad for the stock market? To answer this question, I analyze the cumulative abnormal return (CAR) of the market index around the day a billionaire suddenly passes away. CAR of the market index becomes negative (-0.3%) around the death date. This result is consistent with the following two hypotheses. First, the unexpected loss of a billionaire heightens the entire market volatility, which consequently lowers market return. This hypothesis is supported by the earlier results that the entire market becomes more volatile around a billionaire's death date. The second hypothesis is that billionaires, on average, might be valuable to the stock market; thus, their sudden passing causes the market to respond negatively. To explore the value of billionaires in more details, I regress CAR of the market index on a natural logarithm of GDP per capita. Results show that the market index drops more in lower-income countries, but becomes positive in countries with GDP per capita higher than 41,738 USD. Countries in this category include, for example, Switzerland, Canada, United States, and Sweden. These results indicate that billionaires are economic assets to the stock market in lower-income countries, but are economic liabilities in higher-income ones.

Chapter 4 presents the third essay in which my coauthor, James Shou, and I explore how the billionaire impact propagates throughout the stock market. We focus on a single country, Russia, in order to control for any country-specific characteristics that might influence our results. We then exploit the arrests of Russian oligarchs as exogenous shocks to the stock market. To study how the propagation of the billionaire impact, we group firms in the stock market into three groups—a) firms under the billionaire's control, b) firms outside of the billionaire's control but within his industries, c) firms outside of his industries. We find that, in aggregate, average firm value declines by 0.4% in response to the arrest of a Russian oligarch. Firm value drops the most for those under the oligarch's control (-15%), less for firms within the oligarch's industries (-0.6%), and the least for firms outside the oligarch's industries (-0.3%). Such drops in firm value are statistically significant for the first two groups, but insignificant for the third one. These results suggest that, first, in a developing economy such as Russia, the value of the ultimate controlling shareholder is worth as much as 15%, as compared to the US CEO value of approximately 3% (Jenter, Matveyev, and Roth, 2018). If we assume that the US is free of corruption and, thus, the CEO's management value is worth 3%, this result implies that the value of political connections attached to the Russian oligarch is worth as much as 12% of the firm value. Furthermore, the significant drop in firms within the oligarch's industry indicates that these firms, although not controlled by the oligarch, also derive value from them, albeit not as much as the oligarch's firms themselves. This value may come from growth in the industry that the oligarch brings about from his political connections, e.g. growth from regulation spillovers. Overall, the results in this essay signify the importance of an oligarch that goes well beyond his own firms.

Chapter 2

Billionaire Corporate Control and Economic Growth

2.1 Introduction

The number, wealth, and economic influence of billionaires who control large corporations have been growing substantially across the world. Using the hand-collected data from Forbes' lists of billionaires, I document that from 1986 to 2015, the number of billionaires per one million population has increased by approximately 200% in North America and Europe, 300% in South Asia, 40% in East Asia, and 50% in Latin America, while these numbers remain relatively constant in the Middle East and Africa. Total billionaire wealth has also increased over ten folds in all geographical regions. Besides, billionaires' economic influence, as measured by their wealth divided by GDP, has increased by 600% in South Asia, 500% in Africa, 300% in North America and Europe, 150% in Latin America, and 100% in East Asia. As of 2015, billionaires in all regions except Africa owned corporate assets worth more than 10% of GDP, while the median number of billionaires per country is as low as six.

Piketty (2014) also observes similar trends—since the 1980s, wealth has been increasingly concentrated in the hands of the ultra rich around the world. He attributes such rising inequality to the growing rate of return on capital, relative to the economic growth rate. This makes wealth of the ultra-rich, who typically own vast amounts of capital, accumulate at a much faster pace than wealth of the ordinary people. The central question of this paper is weather it is good or bad for the economy to have such rising inequality, i.e., few billionaires controlling substantial portions of the economy. Generally, many scholars have regarded inequality as an impediment to economic growth. For example, Banerjee and Duflo

(2003) and Persson and Tabellini (1994) find that inequality is negatively associated with future economic growth, because inequality can fuel political instability (Alesina and Perotti, 1996) and deter the accumulation of human capital (Galor and Zeira, 1993; de la Croix and Doepke, 2003).

Notwithstanding the previous findings, however, inequality might be both good and bad for the economy, depending on the sources of wealth that creates inequality. Schumpeter (1942) posits that entrepreneurs with innovative ideas find investors to finance their projects. When these projects become successful, they dislodge incumbents with outdated technologies, and at the same time, give the entrepreneurs a temporary monopoly, which makes them and their investors extraordinarily wealthy. This process, dubbed "creative destruction" by Schumpeter (1942), effectively replaces old and inefficient technologies with new and efficient ones, thereby increasing a country's overall productivity and accelerating economic growth. Therefore, inequality arising from entrepreneurs with innovative ideas can, in fact, be beneficial for the economy.

In anticipation of such displacement by creative entrepreneurs, corrupt incumbents with old technology can resort to political rent-seeking to set up barriers against new entrants (Djankov, La Porta, Lopez-de Silanes, and Shleifer, 2002; Rajan and Zingales, 2003). These barriers preserve the incumbents' businesses as well as their outdated technologies and put their host economies in the so-called "middle-income trap" (Morck, Wolfenzon, and Yeung, 2005). As a result, the pace of creative destruction, and hence, economic growth, stalls. This argument implies that inequality arising from incumbents investing in political rent-seeking can be detrimental for economic growth.

To test the above hypothesis, we need the proxies for the two key players in the creative destruction process—a) entrepreneurs with innovative ideas and b) corrupt incumbents with political connections. I rely on the following two arguments to build the proxies. First, according to Rajan and Zingales (2004), heirs to business empires can reliably inherit both business and political connections from their parents because they grow up in elite social circles. Second, heirs to family firms do not reliably inherit entrepreneurial ability from their parents because such ability ought to regress to the population mean, making heir firms underperform founder firms in various metrics (Smith and Amoako-Adu, 1999; Villalonga and Amit, 2006; Perez-Gonzalez, 2006; Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon, 2007; Mehrotra, Morck, Shim, and Wiwattanakantang, 2013). These two arguments suggest that heirs to business empires can inherit political connections more reliably than they do entrepreneurial ability. They are thus more likely to resort to using their connections rather than investing in innovative projects. Using this argument, I proxy creative entrepreneurs with founder billionaires, and politically connected incumbents with heir billionaires.

Morck et al. (2000) has explored this issue using a cross-section of billionaire wealth from 41 countries in 1993. They measure the amount of corporate control billionaires have over their national economies using their wealth divided by their countries' gross domestic product (GDP). Morck et al. (2000)'s results indeed confirm that countries with more corporate control under founder billionaires grow more rapidly, while countries with more corporate control under heir billionaires grow more slowly. Although these results provide novel evidence on the creative destruction brought about by billionaires, a cross-sectional nature of their data may not produce reliable estimates as they cannot control for unobservable characteristics specific to each country or each year. Moreover, the global economy has changed substantially since 1993; thus, these results may not hold in today's global economy. For example, according to World Bank, the world's GDP has doubled, and its sums of imports and exports have tripled over the period from 1993 to 2016. Given the importance of Morck et al. (2000)'s findings, I extend their paper by using the data that cover 73 countries from 1986 to 2016.

In my empirical setting, I hypothesize that because heir billionaires inherit connections more reliably than they do entrepreneurial ability, they are more likely to pursue political rent-seeking to set up barriers against new entrants, thereby slowing the pace of creative destruction. As a result, we should observe that countries with more corporate control under heir billionaires grow more slowly, have higher financial and regulatory barriers, and, as a result of these barriers, have lower activity of new entrants. On the other hand, founder billionaires undertake their innovative projects that eventually dislodge corrupt incumbents. More presence of founder billionaires thus suggests less presence of incumbents, leading to lower financial and regulatory barriers, and more rapid economic growth. Therefore, we should observe that countries with more corporate control under founder billionaires grow more rapidly, have lower financial and regulatory barriers, and, as a result, have higher activity of new entrants.

In my empirical analysis, I focus on three types of economic growth: a) GDP per capita growth, b) Total Factor Productivity (TFP) growth, and c) Capital per capita growth. Consistent with the above hypothesis, I find that growth rates of GDP per capita and TFP are significantly higher in countries with more corporate control under founder billionaires, but significantly lower in countries with more corporate control under heir billionaires.

Although founder billionaires can be beneficial for the economy, as they stay longer in power, they may become entrenched and no longer benefit the economy. In support of this argument, I find that the positive impact of founder billionaires wanes after they remain in the Forbes' lists for 20 years or longer. Despite the concern that the regression specifications may have omitted variables, I argue that this pattern of results is difficult to reconcile with explanations other than the creative destruction brought about by billionaires.

I also find empirical support for the two mechanisms through which billionaires influence their countries' economies. First, billionaires can suppress their competitors by preventing the development of financial institutions, thus making it difficult for their competitors to raise adequate financing. Rajan and Zingales (2003) argue that the stagnant progress of financial development from 1913 to 1980 is because incumbents feared competition brought about by financial development; thus, they lobbied to oppose it. In support of this argument, I find that countries with more corporate control under heir billionaires have less developed banking systems, while countries with more corporate control under founder billionaires have more developed banking systems.

Second, billionaires can lobby for higher regulatory barriers against new entry. Djankov et al. (2002) report that more corrupt countries have higher regulatory barriers to entry, making it difficult for new entrepreneurs to do or start new businesses. I proxy these regulatory barriers using Easy-of-Doing-Business Score and Starting-Business Score from the World Bank Doing Business database. Results show that countries with more corporate control under heir billionaires are more difficult to do or start a business, while the opposite is true for countries with more corporate control under founder billionaires.

One of the outcomes of financial or regulatory barriers imposed or taken down by billionaires is the level of new entrant activity. Higher barriers should be associated with a lower level of new entrant activity. I proxy such activity using Initial Public Offering (IPO) activity, and find that countries with more corporate control under founder billionaires have more IPOs and raise more capital from domestic and Venture Capital (VC)-backed IPOs. In contrast, countries with more corporate control under heir billionaires tend to have fewer IPOs, although this latter result is statistically insignificant. Moreover, firms in countries with weak institutions may decide to go IPO outside of their home countries to enjoy the benefits of better institutions (Doidge, Karolyi, and Stulz, 2013). In support of this view, I find that firms in countries with more corporate control under heir billionaires are more likely to go IPO abroad and thus raise more capital there.

This paper's contributions are three-fold. First, it shows that a cross-sectional finding in Morck et al. (2000) appears to be a lasting characteristic of the global economy. Countries with more corporate control under founder billionaires grow more rapidly, while countries more corporate control under heir billionaires grow more slowly. However, with its long panel, this paper finds that the positive impact of founder billionaires diminishes after they remain in power for longer than 20 years.

Second, while several papers have investigated structural ways to explain economic growth, e.g., the roles of human capital, financial and legal institutions, this paper highlights the importance of a group of elites who control substantial portions of the economy and might also be drivers of growth. Without addressing the direction of causality, this paper provides several pieces of suggestive evidence that supports this claim. Although causality is not rigorously addressed in this paper, I argue that the observed pattern of results is difficult to reconcile with other explanations than billionaires themselves affecting economic growth.

Finally, this paper raises an important point regarding inequality. Consistent with Piketty (2014) who finds that income shares of the ultra-rich have recently been increasing, I show that billionaire wealth relative to GDP has also been increasing in the past three decades. Such rising inequality is generally thought of as negative for economic growth. However, with the novel dataset on sources of wealth of billionaires, i.e. whether they are self-made or inherited, I show that inequality can be beneficial for growth if it arises from self-made wealth, and that inequality can be detrimental for growth if it arises from inherited wealth.

The rest of this paper is organized as follows: Section 2.2 describes the construction process of the billionaire data and reports their summary statistics and simple correlations with other macroeconomic variables. Section 2.3 explains the methods and discusses the main findings. Finally, Section 2.4 concludes.

2.2 Data and Variables

2.2.1 The Billionaire Data

The main focus of this paper is to explore the macroeconomic impact of corporate control concentrated in a small group of economically powerful individuals. To identify these individuals, I compile data from Forbes' lists of billionaires. These lists should contain comprehensive coverage of influential business people, because individuals with a net worth of more than one billion dollars tend to control some of the largest firms in their respective countries.

Forbes started creating an annual list of billionaires around the world in 1987. Its employees interview people familiar with the financial matter in each country in order to gather a list of billionaire candidates. Then, they estimate the net worth of each candidate based on their ownership of publicly-traded and privately-held companies, as well as other miscellaneous holdings, such as real estate, jewelry, and pieces of art. Forbes values the ownership stakes in private firms using valuation metrics of comparable public firms. The billionaire lists do not include fortunes that are dispersed among large multi-generational families such as the United States' Du Pont family, even though their aggregate wealth certainly exceeds one billion USD. However, they do include wealth shared among immediate family members if they have aggregate wealth over one billion USD. Excluding multi-generational business families should not affect the identification of economically powerful people, because these families tend to pass on control to professional managers while family members each hold little ownership. As such, no single family member has absolute control over their family firms, let alone over their country's economy.

The following are the steps used to construct the billionaire data:

Step 1: Gather the lists of billionaires and classify them as founders or heirs.

I gathered Forbes' lists of billionaires from 1987 to 2016 to form a panel of billionaire wealth. This panel covers 73 countries and contains over 20,000 billionaire-year observations. I then classified each billionaire in the Forbes' panel as a founder or an heir, using the following steps.

1. A billionaire was classified as a founder if their family has no business background; in other words, if their family is working- or middle-class. To verify this, I checked to see if their biography mentions: a) a difficult past, or the fact that their business was started with a small sum of money, b) that their parents' careers were not business-related (for instance, Mark Zuckerburg's parents are doctors), and c) that while their parents started a small mom-and-pop shop, they turned it into a business empire.

2. If the family background was not available, I used their career path to make the classification. A founder billionaire must have started their career as a blue- or white-collar worker (e.g., a truck driver, engineer, banker or lawyer) and then worked their way up to become a CEO or broke away to found their own firm.

3. If the information on the family background or career path was not available, I followed Forbes' classifications.[1] Forbes provides three categories in their classification scheme: a)

[1]All of the billionaires in this case are founders. The majority of them are billionaires from China. Using Forbes' classifications in this case is, therefore, reliable because China has recently opened its economy, and its billionaires started to appear in 2005. Many of them are likely founders.

self-made, b) inherited, and c) inherited and growing. However, their classifications are sometimes inconsistent with the criteria given in the above steps. For example, Forbes classifies Cher Wang, the founder of Taiwan's HTC Corporation, as self-made. However, she is, in fact, a daughter of a late Taiwanese billionaire, Wang Yung-ching. With the criteria given above, Cher Wang must be classified as an heir because it is highly plausible that she started her company with seed money from her billionaire father.

4. If a billionaire is not a founder, I classified them as an heir.

Classifying billionaires with the steps above was sometimes ambiguous and subject to the researcher's opinions. Ambiguity may arise in cases where billionaires built their business empires from a business that their parents started. If their parents' business was relatively small, the billionaire should be classified as a founder. However, if it was relatively large, the billionaire should be an heir. Therefore, the size of their parents' business can be a source of ambiguity. As a robustness check, I flagged these ambiguous cases and will show in Section 2.3.3 that including or excluding them does not affect the results.

Step 2: Exclude politician billionaires.

Schumpeter's theory of creative destruction involves the dynamic of innovative firms emerging as stagnant ones wane. Therefore, only billionaires who control corporations, as opposed to wealthy politicians, are relevant to this theory. In the sample, I exclude politician billionaires who have amassed their wealth mainly through politics, such as Iraq's Saddam Hussein and Indonesia's Suharto. I also exclude billionaires who gained wealth from illegal businesses, such as the Colombian and Mexican drug lords Pablo Escobar and Joaquin Guzman Loera.

Step 3: Assign a country to each billionaire.

This step determines the country in which a sample billionaire has the most influence. Most billionaires in the Forbes' list control a firm or a group of firms within one country. In such cases, their assigned countries are simply those in which their firms operate. However, some billionaires control firms with operations in more than one country. They may also list their firms in one country, while the firms operate in another. In such cases, the country in which a billionaire has the most influence is the one in which their firms operate. For example, even though Jack Ma's Alibaba is listed on the New York Stock Exchange, its business mainly operates in China. Therefore, I assigned China as his country.

Assigning a country to a billionaire can sometimes be ambiguous. For example, Singapore's Ng Teng Fong owned a group of firms which are headquartered and operate in both Singapore and Hong Kong. Therefore, his influence may be present in both countries. Again, I flag these ambiguous cases involving locating their countries of influence for robustness checks in Section 2.3.3.

Step 4: Aggregate wealth of billionaires who belong to the same family.

At this stage, I have formed a panel of billionaire wealth around the world from 1987 to 2016. All *individual* billionaires are classified as either founders or heirs. They are also assigned countries in which they are influential. Existing research shows that many of these individuals are often part of a wealthy family that makes corporate decisions as a group (La Porta, de Silanes, and Schleifer, 1999; Faccio and Lang, 2002; Claessens, Djankov, and Lang, 2000). Classification at an individual level, therefore, does not reflect this nature.

To incorporate the nature of family businesses, I grouped billionaires who belong to the same family as one entity and assigned a classification at a family level. The criteria for classifying billionaires as founders or heirs at a family level is as follows:

1. I classified a billionaire family that consists of *at least one founder* as a founder family because this type of family generally consists of a self-made billionaire (usually a father) and his children who have partially inherited ownership of his firms. In such a family, the self-made father usually wields undisputed control over his children and his business group. An example is the family of Li Ka-shing who is the founder of the largest business group in Hong Kong. I have grouped Li and his son, Richard, as the Li family and classified them as a founder family.

2. I classified a billionaire family that consists *only of heirs* as an heir family.

3. If a billionaire does not belong to the same family as other billionaires in the sample, they were counted as one family, and their family classification was the same as their individual classification.

Step 5: Impute missing billionaire wealth.

At this point, the billionaire data at hand are at a family level. Family wealth is the sum of wealth of all family members. Each family was assigned a classification as explained above. This dataset, however, contains missing data problems. For instance, a billionaire's wealth in a particular year may be unreported even though they were still running a corporation large enough to give them the ability to influence the economy. This unreported wealth should be considered missing, as opposed to zero, in the panel of billionaire wealth and must be imputed before we analyze and draw any conclusions from the data.

There are a few reasons why Forbes sometimes does not report wealth for some high-net-worth individuals even though they were still controlling sizeable assets and thus had the potential to impact the economy. The most common reason is that, in certain years, their wealth temporarily dropped below one billion USD. Forbes also excludes individuals whose wealth is temporarily affected by uncertainty because it cannot confidently value their wealth. For example, Saudi Arabian investor Prince Alwaleed bin Talal, who had an $18.7 billion fortune in 2018, was dropped from the list because he was under arrest. This event caused uncertainty in ownership of his assets because Forbes was uncertain about how many of his assets might be confiscated.

[Insert Figure 2.1 about here.]

Figure 2.1 (top) shows a time series of hypothetical wealth with missing data problems. The white circles represent the missing values of billionaire wealth, and the black circles represent the billionaire wealth reported in Forbes' lists. Whenever a billionaire's wealth is below one billion USD, which revokes him a billionaire status, his wealth is not reported in the lists. This creates the missing data problems because, in those unreported years, the billionaire was still running a business empire that could potentially give him enough economic influence to affect his country's economy.

To impute the missing values of billionaires, first, I recognize that imputing missing data generally involves a regression model in which the left-hand side variable contains missing data points (billionaire wealth in this paper), and the right-hand side variables are those with explanatory power on the left-hand-side variable. The resulting regression estimates are then used to predict the missing values. To yield reasonably accurate imputed values, this technique requires a large sample size with a few missing data points. Unfortunately, this requirement cannot be met in the billionaire data because there are several cases in which a family's wealth is available for only a few observations. Running a regression with a few observations is not plausible or would result in unreliable estimates. Therefore, I propose the following imputation method, which requires a few observations and is illustrated in Figure 2.1 (bottom).

This method assumes that the mean of a family's wealth over their country's GDP is constant over time. Morck et al. (2000) used a billionaire's wealth over GDP to proxy for his economic influence over his country's economy. If this influence is approximately constant over time, the assumption used in this imputation method is plausible. With this assumption, we can find the substituted values for the missing wealth as follows. First, suppose that for each billionaire family, their wealth data are missing in years $t \in T_m$ and available in years $t \in T_a$. We then calculate the mean of the family's wealth over GDP as follows:

$$\mu = \frac{1}{N_a} \sum_{t \in T_a} \frac{W_t}{\text{GDP}_t} \tag{2.1}$$

where N_a is the number of available wealth, and W_t is available wealth in year t. Next, assuming μ is constant over time, we can back out the missing wealth in years T_m as follows:

$$W_t = \mu \times GDP_t, \text{ where } t \in T_m. \tag{2.2}$$

This imputation method is applicable even when only a few observations are available. However, it comes at the cost of assuming that the family's influence on the economy is constant over time.

One potential drawback of this method is that it infuses the information of $1/GDP$ into the sample. Consequently, if billionaire wealth were merely noises, the correlations we observe in the econometric analysis would be from $1/GDP$, as opposed to billionaire wealth itself. Therefore, in examining the robustness of the results in Section 2.3.3, I substitute the missing wealth with one billion USD, because one billion dollars is free of GDP information. With this imputation method, the results remain qualitatively unchanged.

Step 6: Compute three measures of billionaire corporate control

This paper uses billionaire wealth divided by GDP as a proxy for the amount of corporate control concentrated in the hands of powerful billionaires. I focus on three types of such proxy. First, Total Wealth/GDP is the sum of *all* billionaires' wealth in each country and each year divided by GDP. This summation makes Total Wealth/GDP a country-level variable. With the billionaire classifications made in earlier steps, I break down Total Wealth/GDP into Founder Wealth/GDP and Heir Wealth/GDP. Founder Wealth/GDP is the sum of all founder billionaires' wealth in each country-year divided by GDP. Heir Wealth/GDP is the sum of all heir billionaires' wealth in each country-year divided by GDP.

It is important to note that when Forbes reports the wealth of a billionaire in 2000, for example, it uses his information from 1999 to value his assets. Therefore, the wealth reported in 2000, in fact, reflects the assessment of wealth in 1999. This observation suggests that the billionaire wealth variables must be lagged by one year. That is, for example, the Founder Wealth/GDP as of 2000 in the original Forbes' list must become the Founder Wealth/GDP as of 1999 in the finalized billionaire data. Since the original Forbes' lists I used to construct the data run from 1987 to 2016, the finalized billionaire data starts from 1986 and ends in 2015.

[Insert Table 2.2 about here.]

Table 2.2 provides an overview of the billionaire data. The data cover 73 countries from 1986 to 2015. A large variation of the three variables across countries is apparent. Most Asian countries tend to have significant portions of their economies controlled by billionaire families. More developed countries tend to have more Founder Wealth/GDP, while less developed countries tend to have more Heir Wealth/GDP. There are, on average, 375 billionaires in a given year in the United States, more than in any other country. However, their wealth over GDP is relatively modest at approximately 10%. Although Canada's billionaire wealth over GDP is 9%, which is close to that of the United States, its average number of billionaires is ten times lower, implying that a billionaire family in Canada controls a much larger fraction of the economy than does a billionaire family in the United States. Additionally, smaller economies such as Monaco, Hong Kong, and Macau tend to have higher billionaire wealth over GDP.

2.2.2 Macroeconomic Data

The macroeconomic data are from Penn World Table (PWT) 9.1 (Feenstra, Inklaar, and Timmer, 2015). The main variables are as follows: a) GDP, which is real GDP on the expenditure side (variable 'rgdpe' in PWT 9.1). This variable is in constant 2011 USD at PPP and measures the size of a country's economy; b) GDP per capita, which is computed as real GDP on the expenditure side ('rgdpe') divided by population ('pop'). This variable is in constant 2011 USD at PPP and measures the level of economic development; c) Real TFP ('rtfpna'), which is adjusted for inflation such that its value is one in 2011 for every country. This variable measures the level of productivity; d) Capital per capita, which is computed as real capital stock ('rnna') divided by population ('pop'). This variable is in constant 2011 USD and measures a country's amount of cumulative physical stock. Feenstra et al. (2015) estimate the capital stock using the perpetual inventory method which is based on accumulating and depreciating past investments. They classify investments in physical assets into six classes, each with a different depreciation rate. The cumulative physical stock is then computed as:

$$K_{ait} = K_{ai,t-1} - \delta_a K_{ai,t-1} + I_{ait} \tag{2.3}$$

where K is the amount of capital stock, δ is a depreciation rate, a, i and t index asset class, country and year, respectively.

I consider three types of economic growth: a) GDP per capita growth, b) TFP growth, and c) Capital per capita growth. Each growth rate is computed as a percentage difference based on the previous year value. For example, TFP growth$_{it}$ = $(\text{TFP}_{i,t+1}/\text{TFP}_{i,t} - 1) \times 100\%$. Table 2.1 summarizes the definitions and data sources of the variables used in this paper.

2.2.3 Summary Statistics and Correlations

Table 2.3 reports the summary statistics and correlations of the main variables described in Sections 2.2.1 and 2.2.2. In Panel A, an average billionaire wealth over GDP (Total Wealth/GDP) is 19%. Since there is an average of 19 billionaire families in a given country-year, this number shows that, on average, approximately 19% of a given country's economy is controlled by 19 families. Founder Wealth/GDP and Heir Wealth/GDP have substantial mean values of 7% and 13%, respectively. Additionally, the data cover a wide range of countries with substantial variations in other macroeconomic variables. Growth rates of GDP per capita, TFP, and Capital per capita are on average 2 to 3%. Mean values of GDP per capita, capital per capita, human capital index and GDP are 16,500 USD, 64,300 USD, 2.25 and 527 billion USD, respectively.

Panel B in Table 2.3 reports Pearson correlations between a pair of billionaire corporate control measures and the above main variables. These correlations measure linear relationships between two variables. Coefficients in boldface are statistically significant at 10% or better. Corporate control under billionaires in general is higher in more developed countries and in countries with more cumulative capital stock per capita, but lower in larger economies. Corporate control under founder billionaires is statistically unrelated to the size and level of development of the economy. It is, however, higher in countries with a more educated workforce and faster growth rates of GDP per capita and Capital per capita. Finally, corporate control under heir billionaires is higher in more developed countries and countries with more cumulative capital stock per capita, but lower in larger economies and countries with lower growth rates of GDP per capita and TFP.

2.3 Main Findings

In this section, I document the growing importance of billionaires around the globe and how they affect their host countries' economies and institutions. The number, wealth, and economic influence of billionaires have been growing substantially over the period from 1986 to 2015, especially in North America, Europe, and East Asia. As of 2015, billionaires from all geographical regions except Africa owned assets worth more than 10% of GDP, while the median number of billionaires was only six. Substantial amounts of corporate assets controlled by a small group of elites such as this can be both detrimental and beneficial for the economy. In support of this argument, I show that countries with more corporate control under founder billionaires: a) grow more rapidly in terms of GDP per capita and TFP, b) are more financially developed, c) have a higher quality of legal institutions and d) have more IPO activity. In contrast, countries with more corporate control under heir billionaires are associated with the opposite. Firms in these countries are also more likely to go IPO abroad and raise more capital there. Lastly, I show that the effects of billionaire corporate control on GPD per capita growth are more pronounced in high-income countries than low-income ones. However, these effects on TFP growth are present in both high- and low-income countries.

2.3.1 The Growing Importance of Billionaires

Recent decades have seen a growing number of billionaires around the world. The rate of growth varies substantially across different regions. Following the World Bank definition, I group countries in the sample into seven regions: East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, North America, South Asia, and Sub-Saharan Africa. Figure 2.2 (left) shows the number of billionaires around the world by region. The number of billionaires in East Asia, Europe, and North America has been growing exponentially—from approximately 150 billionaire families in each region in 1986 to approximately 700 billionaire families in 2015, a nearly fivefold increase in less than three decades. Moreover, the number of billionaire families in Latin America, the Middle East, South Asia, and Africa have been strikingly stable.

One may be concerned that billionaires are primarily a result of pure luck. As such, they should not carry any relevant information about the states of the economy. If this were the case, the proportion of billionaires to population would be constant over time. Figure 2.2 (right) proves otherwise for North America and Europe. These two regions have produced an increasing number of billionaire families per population over time, with North America producing billionaires at a much higher rate than Europe. The number of billionaires per one million population in East Asia started to slowly increase in 1996. For the rest of the world, however, these numbers have been relatively stable.

[Insert Figure 2.2 about here.]

Not only has the number of billionaires been steadily growing, their wealth and economic influence have also been increasing. Figure 2.3 (left) shows the total wealth of billionaires by region. Again, billionaire wealth in North America, Europe, and East Asia has been growing exponentially. The aggregate wealth of billionaires in North America, for example, grew from approximately 250 billion USD in 1986 to 4000 billion USD in 2015, a 16-fold increase over three decades. In contrast, Latin America, the Middle East, South Asia, and Africa see much slower growth in billionaire wealth.

[Insert Figure 2.3 about here.]

To observe the billionaire influence over the economy, I divide their wealth by GDP. I calculate the regional ratio of billionaire wealth to GDP as an average ratio weighted by national GDP. Figure 4 (right) plots these average ratios by region. All regions, except the Middle East, exhibit an increasing trend of this ratio. Billionaires in North America, for example, went from owning assets worth approximately 4% of the GDP in 1986, to 17%

in 2015, an over four-fold increase over three decades. Unlike other regions, billionaires in the Middle Eastern countries appear to have a stable ratio of wealth to GDP that hovers around a mean of 18% of GDP. Overall, billionaires in most regions own substantial portions of their respective economies. Specifically, in 2015, they owned assets worth more than 10% of GDP in all regions except Africa, despite the median number of billionaires per country being as low as six. The historical trend suggests that this number is likely to increase in the future. It is also important to note that these statistics are derived from the value of the assets billionaires *own*; thus, they likely understate the value of the assets they *control* [2].

A small elite controlling substantial portions of the economy such as this can have significant implications for a country's economic growth and institutions. In the following subsections, I show how different types of billionaires affect economic growth in different ways. Then, I provide an empirical support for the previously identified mechanisms through which these billionaires affect growth, i.e., through altering financial and legal institutions. Finally, I provide novel evidence on how billionaires influence the level of new entry using IPO activity as a measure.

2.3.2 Billionaire Corporate Control and Economic Growth

With control of vast corporate assets shown in the previous subsection, billionaires can potentially drive their host economies to any directions they wish. From the perspective of Schumpeter's creative destruction (Schumpeter, 1942), this can be both beneficial for and detrimental to the economy. To elaborate, new innovative entrepreneurs find capitalists to finance their projects. When these projects become successful, they dislodge incumbents with old technology, and at the same time, give the entrepreneurs a temporary monopoly that makes them tremendously wealthy. This process increases overall productivity, thereby accelerating the pace of creative destruction and economic growth. In anticipation of their displacements by creative entrepreneurs, corrupt incumbents can use their political connections to set up regulatory or financial barriers against new entrants, making it difficult for

[2] For example, if a billionaire owns 50% of a firm valued at 1 billion USD, he is said to own 0.5 billion USD but controls 1 billion USD worth of corporate assets—double of what he owns.

these new entrants to undertake their projects. Such high barriers to entry, in turn, slow the pace of creative destruction and economic growth. This argument suggests that countries with more creative entrepreneurs should: a) grow more rapidly, b) be more financially developed, c) have better legal institutions, and 4) have higher new entrant activity. In contrast, countries with more corrupt incumbents should be associated with the opposite.

To test the above hypothesis, we need proxies for the two key players in the creative destruction process—a) entrepreneurs with innovative ideas and b) corrupt incumbents with political connections. I rely on the following two arguments to construct the proxies. First, according to Rajan and Zingales (2004), heirs to business empires tend to grow up among elites themselves. This allows them to inherit political connections from their parents reliably. Second, firm-level results from the family firm literature show that firms run by heirs underperform those run by founders because heirs cannot reliably inherit their parents' entrepreneurial ability. These two arguments imply that heir billionaires can inherit political connections more reliably than they can entrepreneurial ability. Therefore, they are more likely to pursue political rent-seeking instead of investing in innovative projects. Using these arguments, I proxy innovative entrepreneurs with founder billionaires, and politically connected incumbents with heir billionaires. I measure their corporate control over their host economies using their wealth divided by GDP.

To observe how different types of billionaire corporate control affect economic growth, I use the standard growth regression model proposed by Mankiw (1995). The dependent variables are growth rates of GDP per capita, TFP and Capital per capita. The explanatory variables include the billionaire corporate control variables, log(GDP per capita), log(Human Capital Index), log(Capital per capita) and log(GDP). Billionaire corporate control variables are either Total Wealth/GDP or a pair of Founder Wealth/GDP and Heir Wealth/GDP. log(GDP per capita) controls for countries' levels of economic development. log(Human Capital Index) controls for countries' levels of human capital—a higher value of Human Capital Index indicates a more educated workforce. log(Capital per capita) countries' levels of cumulative physical stock per capita. I also include log(GDP) as an additional control variable to capture the information of GDP infused in the earlier imputation process and to control for the fact that billionaires are less important in larger economies. Year fixed effects are also included to rule out any unobservable characteristics specific to a particular year that may affect economic growth. For example, economic growth may be rapid in certain years due to the rise in global trades. Finally, to control for the persistence in economic growth, I cluster standard errors by country. The following is the final regression model:

$$\begin{aligned}\text{Growth}_{it} = \alpha + &\beta_1 \text{Billionaire Corporate Control}_{it} + \beta_2 \ln(\text{GDP PC})_{it} \\ &+ \beta_3 \ln(\text{Human Capital})_{it} + \beta_4 \ln(\text{Capital PC})_{it} + \beta_5 \ln(\text{GDP})_{it} \\ &+ \text{Year Fixed Effects}_t + \epsilon_{it}\end{aligned} \tag{2.4}$$

where i and t index country and year, respectively.

[Insert Table 2.4 about here.]

Table 2.4 shows coefficient estimates from equation (2.4). Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. In columns (1) to (3), the coefficients of Total Wealth/GDP are insignificant. This suggests that more corporate control under billionaires, in general, does not affect economic growth of any type, e.g. growth of GDP per capita, TFP, or capital per capita. However, when Total Wealth/GDP is broken down to Founder Wealth/GDP and Heir Wealth/GDP, we can observe the results consistent with the notion of Schumpeter's creative destruction. That is, when the dependent variables are GDP per capita growth and TFP growth, the coefficient on Founder Wealth/GDP is significantly positive, while that on Heir Wealth/GDP is significantly negative. This result suggests that countries with more corporate control under founder billionaires grow more rapidly in terms of GDP per capita and TFP. In contrast, those with more corporate control under heir billionaires grow more slowly in terms of GDP capita and TFP. Capital per capita growth, on the other hand, is not significantly affected by any measures of billionaire corporate control. The impact of billionaires on growth is also economically significant. One standard deviation increase in Founder Wealth/GDP (10.11%) is associated with 0.60% and 0.47% increase in

GDP per capita and TFP growth, respectively. Also, one standard deviation increase in Heir Wealth/GDP (46.65%) is associated with 0.23% and 2.89% decrease in GDP per capita and TFP growth, respectively.

Not only do these results provide novel empirical support for the celebrated theory of creative destruction by Schumpeter (1942), they also shed light on the debate on inequality. To elaborate, inequality has generally been regarded as an impediment to welfare and economic growth. Piketty (2014) observes an increasing share of wealth of the ultra-rich and attributes such soaring inequality to the relatively declining living standards of the ordinary. Banerjee and Duflo (2003) and Persson and Tabellini (1994) find a negative relationship between inequality and future economic growth. In this paper, however, I show that inequality arising from creative entrepreneurs implementing their ideas and dislodging incumbents with old technology is, in fact, good for economic growth. On the other hand, inequality arising from incumbents investing political rent-seeking to suppress new innovative entrants is detrimental to economic growth.

2.3.3 Robustness Checks

In this subsection, I test the robustness of the results shown in Table 2.4. I show that first, the results are robust to excluding ambiguous cases that arise during the construction of the billionaire data. Second, the positive effects of founder billionaires are robust to an alternative imputation method in which all missing values of billionaire wealth are replaced with one billion USD. The effects of heir billionaires remain negative but lose the statistical significance when this imputation method is used. Finally, I use the Generalized Method of Moments (GMM) to control for biases associated with simultaneity and unobserved country-specific characteristics and yield similar results.

[Insert Table 2.5 about here.]

In the first robustness check, I recognize that ambiguous cases sometimes arise during the construction of the billionaire data. These cases require judgments that may be subject to the researcher's opinions. There are two types of ambiguity. First, ambiguity in classifying billionaires as founders or heirs. According to the definition given in Section 2.2.1, founders are those who have built their business empires themselves. However, they may have had inherited a "small" family business and turned it into a much larger national corporation. The ambiguity in this case lies in the size of business a billionaire inherited. If it is truly small, he should be classified as a founder. But, if it is large, he should be classified as an heir. Second, ambiguity can also arise when locating countries in which billionaires are influential. This is because some billionaires control firms in more than one country, making it difficult to locate the countries in which they have influence. To address this ambiguity concern, I exclude these ambiguous cases involving classifying billionaires and locating their countries of influence and then rerun the same regression models as in Table 2.4. Columns (1)-(3) in Table 2.5 report the results. The signs and magnitudes of coefficients on Founder Wealth/GDP and Heir Wealth/GDP remain relatively unchanged when ambiguous cases are excluded. This shows that the results shown in Table 2.4 are not affected by the ambiguity in the data construction process.

The next robustness check considers an alternative missing data imputation method. In the original panel data of billionaire wealth from Forbes, wealth of certain billionaires is not reported in certain years. This is because their wealth might have decreased below one billion USD, which revoked their billionaire status. The unreported values of these billionaires' wealth are considered missing because, in those years, they were still controlling large corporations that could potentially influence the economy. I impute these missing values of wealth by first assuming that their economic influence, proxied by their wealth divided by GDP, is constant over time. With this assumption, I can back out the missing values of these billionaires' wealth. This method, however, may infuse the information of GDP into the billionaire data. With this infusion of GDP information, one may be concerned that the correlations observed in the regressions may be those of GDP, instead of billionaire wealth. To address this concern, I replace all the missing values of billionaire wealth by one billion USD. I choose the substituted value of one billion USD because it is free of GDP information, yet it gives billionaires sufficient wealth to influence the economy. Columns (4)-(6) in Table 2.5 report the results. The magnitude and significance of the coefficient on Founder Wealth/GDP are relatively unchanged. On the other hand, with this alternative imputation method, the coefficient on Heir Wealth/GDP loses its statistical significance, and its magnitude decreases in the model where GDP PC growth is the dependent variable. This might be a result of the reduced accuracy of the alternative imputation method. When TFP growth is the dependent variable, the coefficient on Heir Wealth/GDP retains its sign and magnitude, although its statistical significance slightly wanes (p-value goes from 0.039 to 0.101).

In the final robustness check, I address the concern that the coefficient estimates obtained using OLS regressions might be biased due to simultaneity and unobserved country-specific effects. To control for these biases, I follow Beck, Levine, and Loayza (2000) and Beck and Levine (2004) and use the GMM estimation technique. This technique uses internal instrumental variables to extract exogenous components of the explanatory variables. Specifically, it assumes that the explanatory variables are weakly exogenous; that is, they can be correlated with past and current values of growth, but are not correlated with its future shocks. This assumption is not particularly stringent because it allows an economic agent, i.e. the market, to react to anticipated information on growth. However, it does require that unanticipated information on growth does not affect the current values of explanatory variables.

The GMM assumption is particularly suitable for this paper's variable of interest, i.e., billionaire wealth. This is because, generally, a billionaire's wealth depends on the value of his firms, and, in turn, part of this value depends on how the market anticipates the growth prospects of the economy. Allowing an economic agent to take into account anticipated growth is thus a practical assumption. Despite this advantage, however, the GMM estimation cannot account for another part of the firm value that depends on the future prospects of the firm itself. Therefore, it must be emphasized that this estimation technique does not completely solve endogeneity issues.

Columns (7)-(9) in Table 2.5 report the results. In the models whose dependent variables are GDP PC and TFP growth, the coefficient estimates of Founder Wealth/GDP and Heir Wealth/GDP retain their signs, magnitudes and statistical significance. Interestingly, when Capital per capita growth is the dependent variable, both of these coefficient estimates become positive and statistically significant. If these estimates are reliable, this result implies that both types of billionaire corporate control are beneficial for capital per capita growth. According to Bena and Ortiz-Molina (2013), this might be because billionaires use their internal resources, e.g., a group of firms, to finance capital-intensive projects that would have been difficult to finance externally. However, the reason why we observe that founder billionaires positively affect overall GDP per capita and TFP growth, while heir billionaires negatively affect these types of growth could be because of the following reason. Founder billionaires finance capital-intensive projects that increase overall productivity. In contrast, heir billionaires finance capital-intensive projects that advance their empire-building agenda (Masulis, Zein, and Pham, 2019).

2.3.4 Incumbent Founder Billionaires and Economic Growth

Results from the previous subsections show that founder billionaires have a positive impact on economic growth. However, as these billionaires stay longer in power, they might become incumbents themselves and, thus, pursue political rent-seeking to set up barriers against new entrants. If this were the case, it would undermine the positive impact they have on growth. This phenomenon is discussed extensively at the firm level in the management entrenchment literature that stems from Morck, Shleifer, and Vishny (1988), but is rarely studied at the country level (Morck et al., 2005). In this subsection, I explore the possibility that founder billionaires might become entrenched and turn into incumbents as they stay longer in power.

To explore how long it takes for the founder billionaire to become an incumbent, I define *incumbent* founder billionaires as founder billionaires who remain in the Forbes' lists for T years or longer, where T is 10, 15, ..., 30 years. I then sum up their wealth and divide it by GDP in order to measure their economic influence. In Table 2.6, the variable "Incumbent Founder Wealth (10)/GDP", for example, is the summation of wealth of founder billionaires who stay in the Forbes' lists for 10 years or longer divided by GDP.

[Insert Table 2.6 about here.]

Table 2.6 reports the results. The coefficient of Incumbent Founder Wealth/GDP remains significantly positive when the founder billionaires stay in the Forbes' lists for less than or equal to 15 years. However, it loses its statistical significance when the founder billionaires stay in the lists for longer than 20 years. This result provides support for the above hypothesis that, as a founder billionaire stays longer in power, he or she becomes entrenched and no longer benefits growth of the economy.

Arguably, the results from subsections 2.3.2 to 2.3.4 provide evidence that is difficult to reconcile with explanations other than creative destruction brought about by billionaires themselves. In the rest of this section, I provide empirical evidence on the mechanisms through which billionaires influence economic growth and their outcomes on the level of new entry.

2.3.5 Billionaire Corporate Control and Financial and Legal Institutions

One of the many ways in which business elite can influence the economy is through setting up or taking down barriers to entry. Incumbent billionaires can use their political connections to set up barriers against new innovative entrants in order to curb competition. In contrast, founder billionaires can dislodge these incumbents by investing in their high-impact innovative projects that can displace the incumbents, hence weakening the barriers to entry. In this section, I discuss the following two types of barriers documented in the literature and provide their empirical evidence, which is by no means *causal*.

First, Rajan and Zingales (2003) document that most countries were more financially developed in 1913 than in 1980. They contend that such stagnant development in financial sectors is due to incumbents' fear of competition brought about by financial development, causing them to oppose it. Entrepreneurs with great ideas who can find capitalists to finance their projects can oust corrupt incumbents with old technology and, in turn, weaken the presence of financial barriers to entry. These entrepreneurs, when in power and in need of public capital to finance their projects, may also push for more developed financial institutions and further propel the pace of creative destruction. Based on this argument, we should expect to see that countries with more corporate control under founder (heir) billionaires are associated with more (less) developed financial institutions. It should be noted that these correlations do not prove causality. The reverse causality might be as follows. More developed financial institutions can generate tremendous wealth for entrepreneurs, while weakening the importance of incumbents. In contrast, less developed financial institutions starve entrepreneurs of adequate financing, while preserving wealth of the incumbents.

I focus on four financial development indicators: a) Credit to Private Sector (% GDP), b) Bank Z-Score, and c) Bank Deposits (% GDP) and d) Stock Market Capitalization (%). Definitions and data sources of these variables are provided in Table 2.1. For all of these financial development indicators, a higher value indicates higher financial development. I merge these financial development data with the billionaire data and Penn World Table 9.1. Then, I run the regressions in which the dependent variables are financial development indicators, and the explanatory variables are a) billionaire corporate control measures, i.e., Founder Wealth/GDP and Heir Wealth/GDP, b) log(GDP per capita) as a control for countries' levels of economic development, c) log(GDP) as a control for the fact that billionaires are less important in larger economies, and d) Year Fixed Effects as a control for unobserved year-specific effects. I account for the persistence in financial development indicators by clustering standard errors by country.

[Insert Table 2.7 about here.]

Columns (1) to (4) in Table 2.7 report the results. Consistent with the argument above, columns (1)-(3) show that countries with more corporate control under founder billionaires have more developed banking systems. That is, they provide more credit to the private sectors and have more deposits in the banks. In contrast, countries with more corporate control under heir billionaires provide less credit to the private sectors, and their banks have lower Z-Score, i.e., higher probability of insolvency. Interestingly, column (4) shows that both types of billionaire corporate control are associated with more developed stock markets, suggesting that billionaires, both founders and heirs, prefer more developed stock markets. This can be because more developed stock markets give billionaires access to public capital. Founder billionaires with great ideas might push for more developed stock markets in order to raise more public capital to finance their productivity-enhancing projects (Bena and Ortiz-Molina, 2013). Meanwhile, heir billionaires, after taking into account future costs of competition, still prefer more developed stock markets, because they can raise more capital to expand their business empires (Masulis et al., 2019), which can, in turn, lessen the impact of competition (Boutin, Cestone, Fumagalli, Pica, and Serrano-Velarde, 2013).

In addition to financial barriers, incumbents can set up legal barriers by lobbying for law that makes it difficult for new entrepreneurs to start or conduct their businesses. Djankov et al. (2002) report systematic evidence of corruption and regulatory barriers. They measure regulatory barriers using the number of procedures an upstart needs to comply with to obtain legal status and operate as a legal entity. They document that countries with higher levels of corruption have higher regulatory barriers to entry. For example, a start-up business in Canada has to comply with only two government procedures in order to operate as a legal entity, while in Dominican Republic, a start-up needs to comply with as many as 21 procedures. Using the similar argument on financial barriers, we should expect to see that countries with more corporate control under founder billionaires have lower regulatory barriers, while countries with more corporate control under heir billionaires should be associated with the opposite.

I employ two measures of the quality of legal institutions, namely, Ease-of-Doing-Business Score and Starting-Business Score. Because Ease-of-Doing-Business Score is cross-sectional, and the Starting-Business Index has minimal variation, I use the mean values of all time-series variables from the latest five years in the data, i.e. from 2011 to 2015, as the representatives of the sample. Moreover, because the data to be analyzed are now cross-sectional and has a small sample size, they are prone to outlier effects. To reduce such effects, I delete the observation with the highest Cook's distance, i.e. Brunei, before running the regressions. In all regression models, I include log(GDP per capita) to control for countries' levels of economic development. log(GDP) is also included to control for the fact that billionaires are less important in larger economies. To take into account the heteroscedasticity across countries, I use heteroscedasticity-consistent standard errors when testing null hypotheses of zero coefficients.

Columns (5) and (6) in Table 2.7 report the results. Consistent with the argument above, countries with more corporate control under founder billionaires have a higher quality of legal institutions. That is, they have laws that facilitate doing and starting businesses. In contrast, countries with more corporate control under heir billionaires have laws that deter doing and starting businesses.

2.3.6 Billionaire Corporate Control and IPO Activity

In this subsection, I provide empirical evidence on the outcome of billionaire influence on the level of new entrants, which is measured by IPO activity. Countries with more corporate control under founder billionaires who press for more developed financial and legal institutions should see higher activity of new entrants or, in this setting, higher IPO activity. In contrast, countries with more corporate control under heir billionaires who oppose better financial and legal institutions should see lower IPO activity. Note that these correlations are not causal. The reverse causality may run as follows. High activity of new entrants can displace incumbents, while making successful entrants extremely wealthy. In contrast, low activity of new entrants can preserve incumbents' businesses, while making it difficult for new entrants to be successful.

I obtain IPO data from the SDC database on global new issues. Following Doidge et al. (2013), I take the following steps to process the data: 1) Download all transactions on common stocks with the "Original IPO" flag set to "Yes" from January 1990 to December 2018. The sample begins during the period from January 1990 because, prior to that, SDC has limited coverage of IPOs outside the U.S. This step yields 60,985 IPO transactions on common stocks; 2) Delete transactions that SDC classifies as "Private Placement." This step yields 60,380 transactions; 3) SDC sometimes lists duplicate transactions. Most of these transactions are international IPOs, i.e., those offered inside and outside the issuers' domestic markets. I consolidate the duplicate transactions that occur within the 30 days or longer as one transaction. This step yields 49,353 transactions; 4) Exclude IPOs from Real Estate Investment Trusts (REITs) and Investment Funds, i.e., those with the following SIC codes: 6722, 6726, 6798, 6799. This step yields 43,043 transactions; 5) Exclude IPOs with no information on the amounts of proceeds. This step yields 42,811 transactions; 6) Merge these IPO data with PWT 9.1 and the billionaire data. This step yields the final sample of 38,147 IPOs from 67 countries.

Next, I classify each IPO as Domestic, Global, or VC-backed. Domestic IPOs are those offered within the issuers' domestic markets. Global IPOs are those offered outside the issuers' domestic markets. VC-backed IPOs are those backed by Venture Capitals, as indicated by the SDC database. I then aggregate these IPOs into country-level data. I focus on two IPO activity measures—IPO proceeds (% GDP) and IPO counts (% listed firms). In each measure, there are four types of aggregate IPO activity—Domestic IPOs, Global IPOs, VC-backed IPOs[3], and All IPOs, which include both domestic and global IPOs. Domestic IPOs represent the activity of new entrants that raise capital in their domestic markets. Global IPOs represent the activity of new entrants that raise capital outside of their domestic markets. All IPOs represent the activity of new entrants in general. Lastly, since VC-backed firms are responsible for most of the job-creation and innovation according to Kerr and Nanda (2011), VC-backed IPOs thus represent the activity of high-impact innovative new entrants. To compute IPO proceeds (% GDP) of, say, all IPOs, I sum all proceeds from both domestic and global IPOs in each year and each country and divide them by GDP. To compute IPO counts (% listed firms) of all IPOs, I count the number of all IPOs, both domestic and global, in each year and each country and divide it by the number of listed firms. Other types of IPO activity measures are computed in a similar fashion. The

[3]Note that VC-backed IPOs can be both domestic and global.

definitions of these measures are provided in Table 2.1.

To observe how different types of billionaire corporate control affect IPO activity, I run the regressions in which dependent variables are IPO activity measures and the explanatory variables are billionaire corporate control measures and control variables. Control variables include a) log(GDP per capita) as a control for countries' levels of economic development, b) log(GDP) as a control for the fact that billionaires are less important in larger economies, c) GDP per capita growth as a control for countries' growth opportunities, and d) year fixed effects as a control for unobserved year-specific effects. I account for the persistence in the dependent variables by clustering standard errors by country. Finally, I lag all explanatory variables by one period to account for the fact that firms make IPO decisions well before the offer dates.

[Insert Table 2.8 about here.]

Table 2.8 shows the results. Consistent with the above argument, countries with more corporate control under founder billionaires have a higher level of IPO activity. To elaborate, these countries raise more total IPO proceeds. Many of these proceeds are raised in the issuers' domestic markets. They also have higher activity level of highly innovative new entrants as indicated by more IPO proceeds from the VC-backed firms. Moreover, there are more IPOs in general and more domestic IPOs in countries with more corporate control under founder billionaires. On the other hand, more corporate control under heir billionaire is negatively associated with most IPO activity measures, although its effect is statistically insignificant.

2.3.7 Billionaire Corporate Control and Firm Choice between Domestic vs Global IPOs

Firms are more likely to raise capital in their domestic markets if the institutions in their home countries facilitate. However, with the recent financial globalization phenomenon, they have a choice to raise capital outside of their domestic markets and enjoy the benefits of the institutions in more developed countries (Doidge et al., 2013). As shown earlier, financial and legal institutions are more developed in countries with more corporate control under founder billionaires, but less developed in countries with more corporate control under heir billionaires. Therefore, we should expect to see that firms in the former countries are more likely to go IPO in their home countries and thus raise more capital there. In contrast, firms in the latter countries are more likely to go IPO outside of their home countries and thus raise more capital there as well.

To test the hypothesis above, I run the regressions on the sample of 38,147 IPOs from 67 countries in the period from 1990 to 2016. This sample is obtained in the previous subsection. Each IPO is classified as Domestic, Global or VC-backed. The definitions of these IPOs are provided in Table 2.1. The dependent variables are the amount of proceeds each IPO raises. These proceeds are adjusted for inflation and PPP and shown in constant 2011 million USD at PPP. I also run a logistic regression in which the dependent variable is one if the IPO is global and zero otherwise. This regression thus tests the factors that contribute to the firm's propensity to go IPO outside of its domestic market. The explanatory variables are a) billionaire corporate control measures, i.e. Founder Wealth/GDP and Heir Wealth/GDP, b) log(GDP per capita) as a control for countries' levels of economic development, c) log(GDP) as a control for the fact that billionaires are less important in larger economies, and d) GDP per capita growth as a control for countries' growth opportunities. All explanatory variables are lagged by one year to take into account the fact that IPO decisions are made well before the offer dates. Standard errors are clustered by country to control for persistence in the dependent variables.

[Insert Table 2.9 about here.]

Table 2.9 reports the results. Columns (1)-(3) show results from OLS regressions where dependent variables are a) All IPO Proceeds, b) Domestic IPO Proceeds, and c) VC-backed IPO Proceeds, respectively. The significantly positive coefficients on Founder Wealth/GDP in these regressions suggest that in countries with more corporate control under founder billionaires, firms raise more total IPO proceeds. They also raise more proceeds domestically and more proceeds in VC-backed IPOs. Column (4) shows results from a logistic regression where the dependent variable is one if the IPO is global, and zero otherwise. Column (5) shows results from an OLS regression where the dependent variable is Global IPO Proceeds. The significantly positive coefficients on Heir Wealth/GDP in these two regressions suggest that firms in countries with more corporate control under heir billionaires are more likely to go IPO outside of their home countries and thus raise more capital there. Overall, the results are consistent with the hypothesis that firms in countries with more corporate control under founder billionaires enjoy better financial and legal institutions; thus, they tend to raise more capital in their domestic markets. In contrast, firms in countries with more corporate control under heir billionaires suffer from poor financial and legal institutions; thus, they tend to go IPO outside of their home countries and raise more capital there.

2.3.8 Billionaire Corporate Control and Economic Growth in High- and Low-Income Countries

According to Aghion, Angeletos, Banerjee, and Manova (2010), creative destruction is more important in developed countries because growth in these countries requires productivity-enhancing technologies which are primarily a result of the creative destruction process. In developing countries, however, growth mainly requires capital accumulation. Therefore, if the effects of billionaire corporate control on growth are the manifestation of creative destruction, we should observe that these effects are more significant in high-income countries than they are in low-income countries.

Nonetheless, billionaires might also be an important driving force of economic growth in lower-income countries. Khanna and Yafeh (2007) argue that billionaires behind big business groups can be seen as both economic assets and liabilities, especially in developing countries. They can be deemed as economic assets because they can use their vast resources, e.g., a group of firms, political connections, and financial capital, to solve several economic problems. For example, in countries where law and capital markets are dysfunctional, arm's-length transaction costs can be too high. This, in turn, deters two independent firms from trading with each other. Firms ultimately controlled by a single controlling shareholder can lower such costs because they can be trusted not to cheat one another. Morck and Nakamura (2007) provide a vivid example of how big business groups controllers propelled economic growth in Japan during the late 19^{th} and early 20^{th} centuries. In contrast to this positive view, billionaires can be deemed economic liabilities because they can turn their tremendous economic influence into political one and pursue political rent-seeking, ultimately putting their host countries in the so-called "middle-income trap" (Morck et al., 2005).

Based on the two arguments above, the relationship between billionaire corporate control and economic growth in low-income countries might be different than that in high-income ones. To explore this issue, I divide the sample into subsamples of high- and low-income countries. Following the World Bank definition, I classify countries with income per capita in 1990 more than 7,620 USD as high-income, and the rest as low-income. I then run regressions as in equation (2.4) where dependent variables are growth rates of GDP per capita, TFP, and capital per capita.

[Insert Table 2.10 about here.]

Table 2.10 reports the results. Columns (1)-(3) show results that are consistent with Aghion et al. (2010). The effects of billionaire corporate control on GDP per capita growth are significant only in a subsample of high-income countries. In low-income countries, however, the coefficients of Founder Wealth/GDP and Heir Wealth/GDP retain the same signs but are statistically insignificant.

On the other hand, columns (4)-(6) show results that support the view that billionaires are important drivers of productivity growth in both high- and low-income countries. Because it requires both high- and low-income subsamples for the coefficients of Founder Wealth/GDP and Heir Wealth/GDP to be significant, we can infer that the effects of these measures are present in both high- and low-income countries. The signs of the coefficients are also consistent throughout different sets of the sample; that is, countries with more corporate control under founder (heir) billionaires are associated with faster (slower) TFP growth. Moreover, results in column (6) show that the negative effect of heir billionaires is especially significant in low-income countries.

Finally, columns (7)-(9) show results from regressions where the dependent variable is capital per capita growth. Thus far, results from a full sample suggest no relation between billionaire corporate control and capital per capita growth. However, when the sample is divided into high- and low-income subsamples, the effect of heir billionaires on capital per capita growth becomes significant in high-income countries.

Overall, I find empirical support for the view by Aghion et al. (2010) that creative destruction is more important in more developed economies, though this support is valid only when economic growth is measured by GDP per capita growth. When economic growth is measured by TFP growth, however, I find that creative destruction brought about by billionaires matter in both high- and low-income countries. This result is consistent with Khanna and Yafeh (2007); Morck and Nakamura (2007); Morck et al. (2005) and others who posit that powerful billionaires can be both economic assets and economic liabilities, especially in developing economies.

2.4 Conclusions

The findings in this paper shed light on the ever-growing importance of billionaires who control large corporations, how they affect economic growth through influencing their countries' institutions, and the outcome of their influence on the activity of new entrants.

Over the period from 1986 to 2015, the number, wealth, and economic influence of billionaires who control large corporations have grown considerably. As of 2015, billionaires in all regions except Africa owned assets worth more than 10% of GDP, while the median number of billionaires per country is only six.

Such a concentration of corporate control under a few billionaires can be both beneficial and detrimental to economic growth. Politically connected billionaires with low entrepreneurial ability will resort to political rent-seeking in order to set up barriers against new entrants, thereby slowing the pace of creative destruction. Creative billionaires who can find investors to finance their high-impact projects can dislodge these corrupt billionaires, ultimately weakening the entry barriers and propelling the pace of creative destruction. To test this creative destruction story, I proxy politically connected billionaires using heir billionaires, and creative billionaires using founder billionaires. I find that the growth rates of GDP per capita and TFP are faster in countries with more corporate control under founder billionaires, but slower in countries with more corporate control under heir billionaires. However, after the founder billionaires stay in power longer than 20 years, they become incumbents and thus lose their positive impact on economic growth.

Billionaires influence their host countries' economies by altering financial and legal institutions. Results show that countries with more corporate control under founder billionaires are generally more financially developed. They also have better legal institutions, i.e., easier to do or start a business and stronger shareholder protection. In contrast, countries with more corporate control under heir billionaires are associated with the opposite.

Underdeveloped financial and legal institutions are put in place to fend off competition from new entrants. I measure the level of new entry using IPO activity. Results show that countries with more corporate control under founder billionaires have more IPOs, raise more capital, both in total and domestically, and raise more proceeds in VC-backed IPOs. On the other hand, firms in countries with more corporate control under heir billionaires suffer from poor institutions in their home countries and are thus more likely to go IPO abroad and raise more capital there.

My findings show that inequality can spur growth if it arises from self-made wealth and that it can hinder growth if it arises from inherited wealth. This point is essential for the debate on inequality, which is generally regarded as an impediment to growth. These findings also go one step beyond the family firm literature in that successions in large family firms not only damage their organizations but also their countries' economies. Although this paper does not address the direction of causality, its results are arguably difficult to explain by other hypotheses and are useful in that they provide novel supports for Schumpeter's creative destruction.

Figures

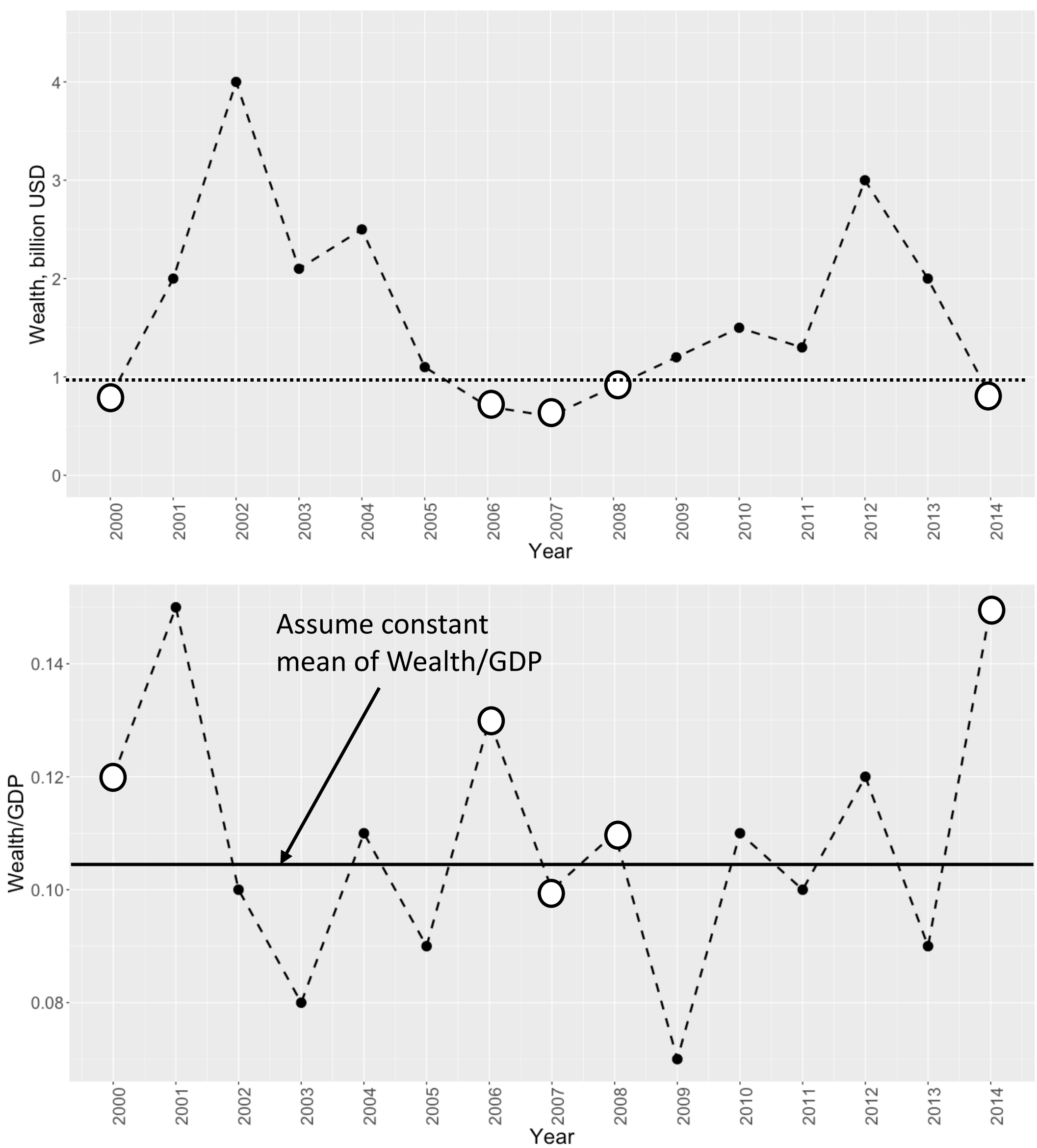
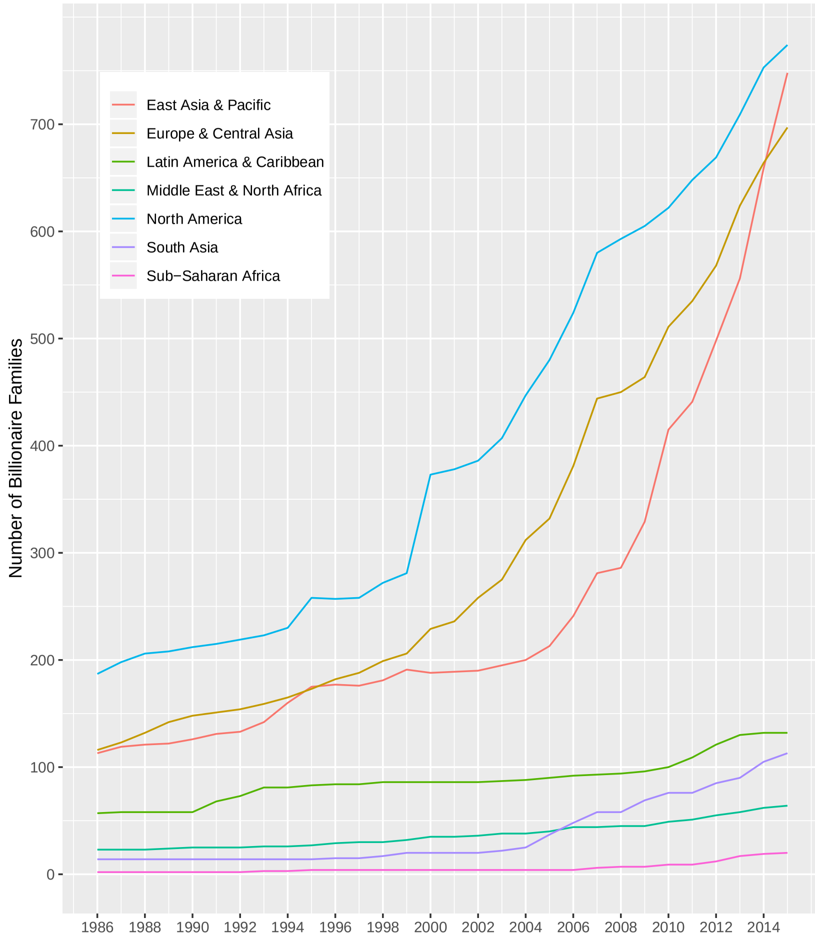


Figure 2.1: An Illustration of Missing Data Problems and the Proposed Solution

The top figure illustrates the missing data problems in billionaire wealth. Whenever a billionaire's wealth is below one billion USD, as marked by white circles, it is not reported in the Forbes' list of billionaires. This causes missing data problems because, in the years the billionaire is missing from the Forbes' lists, they were still controlling a business empire that could potentially influence the economy. To impute these missing values of their wealth, I assume that the mean of their economic influence (μ) is constant over time, as shown in the below figure. That is, $\mu = \sum_t (W_t/GDP_t)$ where t is in reported years. The missing values of the billionaire's wealth is then obtained as follows: $W_t = \mu \cdot GDP_t$ where t is in missing years.



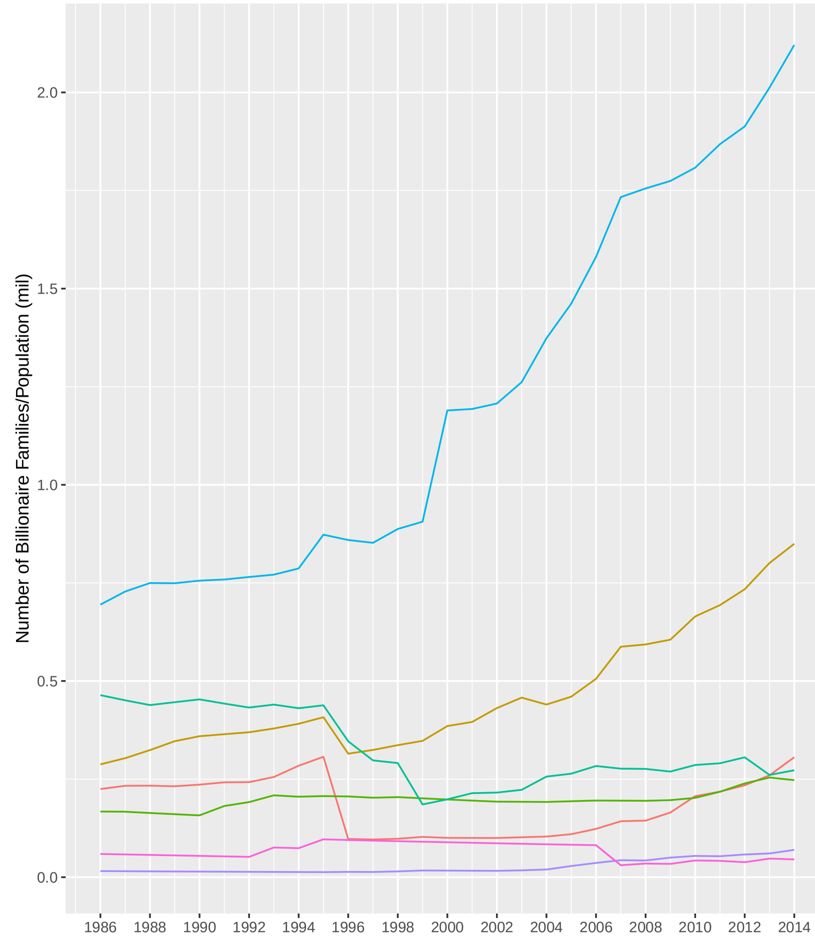


Figure 2.2: Number of Billionaire Families by Region

East Asia & Pacific include Australia, Brunei Darussalam, China, Hong Kong, China, Indonesia, Japan, Korea, Rep., Macao, China, Malaysia, New Zealand, Philippines, Singapore, Thailand, Taiwan, Vietnam. **Europe & Central Asia** include Austria, Belgium, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Georgia, Greece, Ireland, Iceland, Italy, Kazakhstan, Liechtenstein, Lithuania, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Sweden, Turkey, Ukraine. **Latin America & Caribbean** include Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, Guatemala, Mexico, Peru, Venezuela. **Middle East & North Africa** include United Arab Emirates, Bahrain, Algeria, Egypt, Iraq, Israel, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Syria. **North America** includes Canada, United States. **South Asia** includes India, Nepal, Pakistan. **Sub-Saharan Africa** includes Angola, Congo, Nigeria, Tanzania, Uganda, South Africa.

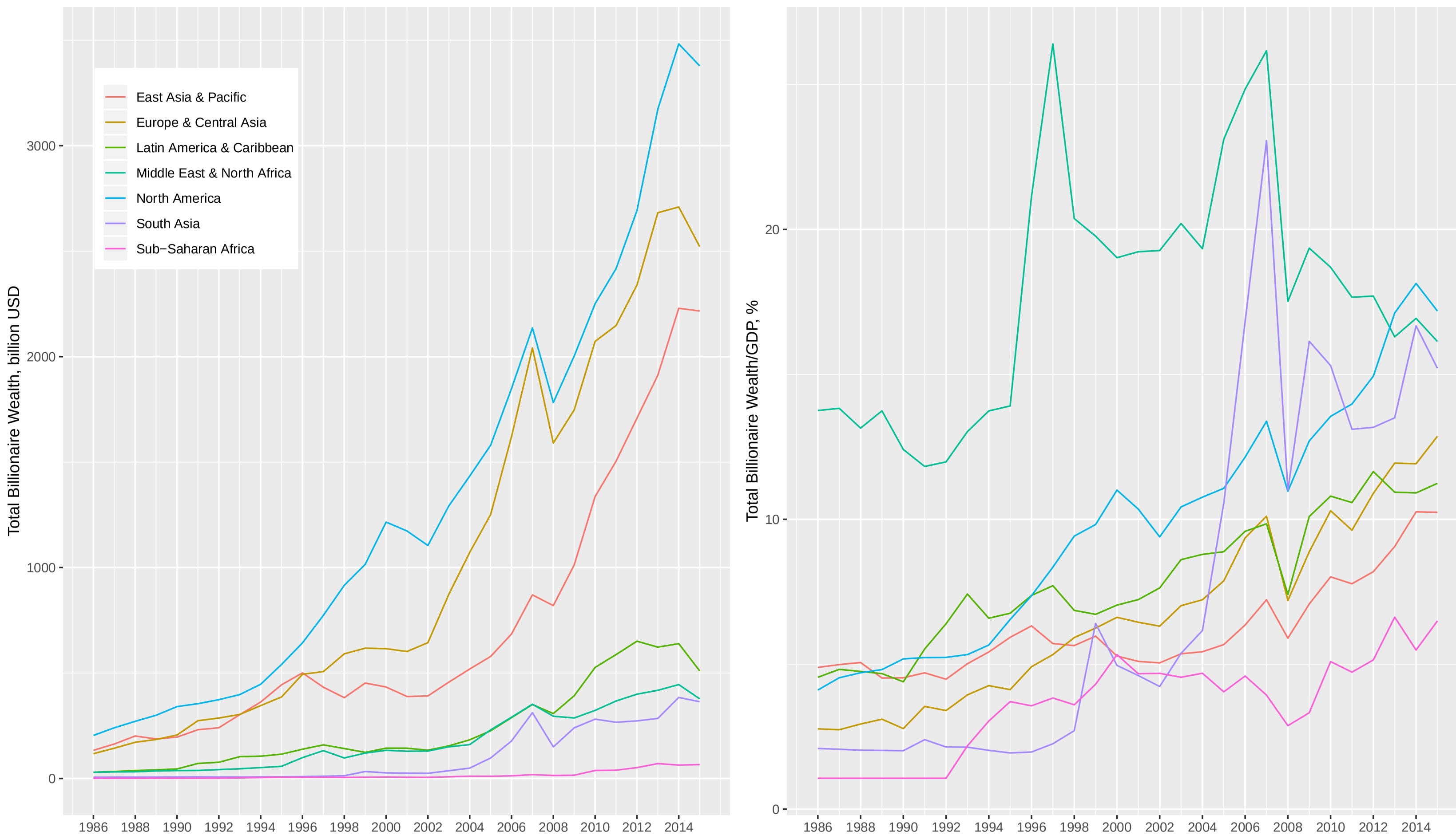


Figure 2.3: Total Billionaire Wealth by Region

East Asia & Pacific include Australia, Brunei Darussalam, China, Hong Kong, China, Indonesia, Japan, Korea, Rep., Macao, China, Malaysia, New Zealand, Philippines, Singapore, Thailand, Taiwan, Vietnam. **Europe & Central Asia** include Austria, Belgium, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Georgia, Greece, Ireland, Iceland, Italy, Kazakhstan, Liechtenstein, Lithuania, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Sweden, Turkey, Ukraine. **Latin America & Caribbean** include Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, Guatemala, Mexico, Peru, Venezuela. **Middle East & North Africa** include United Arab Emirates, Bahrain, Algeria, Egypt, Iraq, Israel, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Syria. **North America** includes Canada, United States. **South Asia** includes India, Nepal, Pakistan. **Sub-Saharan Africa** includes Angola, Congo, Nigeria, Tanzania, Uganda, South Africa.

Tables

Table 2.1: Variable Definitions and Data Sources

Variable	Definition and Data Source
I. Billionaire Corporate Control	
Total Wealth/GDP	Summation of all billionaires' wealth as a percentage of GDP. Source: Forbes' lists of billionaires 1987-2016. See Section 2.2.1 for the construction.
Founder Wealth/GDP	Summation of founder billionaires' wealth as a percentage of GDP. Source: Forbes' lists of billionaires 1987-2016. See Section 2.2.1 for the construction.
Heir Wealth/GDP	Summation of heir billionaires' wealth as percentage of GDP. Source: Forbes' lists of billionaires 1987-2016. See Section 2.2.1 for the construction.
II. Control and Growth Variables	
GDP PC	GDP per capita defined as real GDP on the expenditure side in constant 2011 USD at Purchasing Power Parity divided by population. Source: Penn World Table 9.1.
TFP	Total Factor Productivity defined as real Total Factor Productivity in constant national price where its 2011 value is equal to 1. Source: Penn World Table 9.1.
Capital PC	Capital per capita defined as real capital stock in constant national price 2011 USD divided by population. Source: Penn World Table 9.1.
GDP	Real Gross Domestic Product on the expenditure side in constant 2011 US dollars at Purchasing Power Parity. Source: Penn World Table 9.1.
Human Capital Index	Human Capital Index based on average years of schooling (Barro and Lee, 2013) and returns to investment in education (Psacharopoulos, 1994). A higher value indicates a more educated workforce. Source: Penn World Table 9.1.
Growth	Three types of economic growth are considered: a) GDP PC growth, b) TFP growth, and c) Capital PC growth. TFP growth, for example, is calculated as $(\text{TFP}_{i,t+1}/\text{TFP}_{i,t} - 1) \times 100\%$. Other growth variables are computed in a similar fashion.
III. Financial and Legal Institutions	
Credit to Private Sector (% GDP)	Domestic credit to private sector is the financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. This variable is shown as a fraction of GDP. Source: World Bank Database.
Bank Z-Score	Bank Z-Score is estimated as (ROA+Equity/Assets)/sd(ROA) where sd(ROA) is the standard deviation of ROA. A higher value of Z-Score indicates lower probability of insolvency, thereby higher financial development. Source: Bankscope and Orbis Bank Focus databases.
Bank Deposits (% GDP)	Demand, time and saving deposits in deposit money banks as a share of GDP. Source: Bankscope and Orbis Bank Focus databases.
Stock Market Capitalization (% GDP)	Value of listed shares in the stock market as a fraction of GDP. Source: Financial Structure Database.

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Table 2.1 – *Continued from previous page*

Variable	Definition and Data Source
Ease-of-Doing-Business Score	The ease-of-doing-business score is the simple average of the scores for each of the Doing Business topics: starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency. Source: World Bank Doing Business Database.
Starting-Business Score	The starting-business score is the simple average of the scores for each of the component indicators: the procedures, time and cost for an entrepreneur to start and formally operate a business, as well as the paid-in minimum capital requirement. Source: World Bank Doing Business Database.
IV. Initial Public Offerings	
All IPO Proceeds	All proceeds raised from an IPO. Two types of this variables are considered: a) All IPO Proceeds in constant 2011 million USD at PPP, and b) All IPO Proceeds as a percentage of GDP. Source: SDC Database.
Domestic IPO Proceeds	Total proceeds raised domestically from an IPO. Two types of this variables are considered: a) Domestic IPO Proceeds in constant 2011 million USD at PPP, and b) Domestic IPO Proceeds as a percentage of GDP. Source: SDC Database.
Global IPO Proceeds	Total IPO proceeds raised outside of the issuer's domestic market. Two types of this variables are considered: a) Global IPO Proceeds in constant 2011 million USD at PPP, and b) Global IPO Proceeds as a percentage of GDP. Source: SDC Database.
VC-backed IPO Proceeds	Total proceeds raised from a VC-backed IPO. Two types of this variables are considered: a) VC-backed IPO Proceeds in constant 2011 million USD at PPP, and b) VC-backed IPO Proceeds as a percentage of GDP. Source: SDC Database.

Table 2.2: Billionaire Corporate Control by Country

This table provides an overview of billionaire wealth by countries. The data on net worths of billionaires are from Forbes' lists of billionaires from 1987 to 2016. Each billionaire or billionaire family is classified as a founder or an heir. Founder billionaires are those who have built their fortune from scratch. Heir billionaires are those who inherited assets from their parents or forerunners. Total Wealth/GDP is the summation of all billionaires' wealth as a percentage of GDP. Founder Wealth/GDP is the summation of founder billionaires' wealth as a percentage of GDP. Heir Wealth/GDP is the summation of heir billionaires' wealth as a percentage of GDP.

Country	Average Number of Billionaires	Total Wealth / GDP		Founder Wealth / GDP		Heir Wealth / GDP	
		Mean(%)	SD	Mean(%)	SD	Mean(%)	SD
North America							
Canada	30.7	8.6	(2.0)	4.1	(1.6)	4.6	(0.9)
United States	375.0	9.9	(4.4)	5.8	(3.2)	4.1	(1.2)
Latin America & Caribbean							
Argentina	6.2	3.4	(0.9)	1.3	(0.5)	2.1	(0.7)
Brazil	39.1	7.7	(2.2)	3.8	(1.5)	3.9	(0.9)
Chile	5.4	12.9	(5.8)	4.3	(2.7)	8.5	(4.7)
Colombia	3.3	5.3	(2.6)	3.3	(1.7)	2.0	(1.2)
Ecuador	1.0	4.9	(0.2)	0.0	(0.0)	4.9	(0.2)
Guatemala	1.0	1.7	(0.0)	1.7	(0.0)	0.0	(0.0)
Mexico	26.3	10.6	(3.9)	5.3	(2.4)	5.2	(1.6)
Peru	4.0	4.8	(1.7)	2.5	(0.9)	2.3	(1.0)
Venezuela	1.9	4.5	(2.3)	0.1	(0.2)	4.4	(2.3)
Europe & Central Asia							
Austria	6.2	4.3	(1.8)	2.3	(1.6)	2.0	(0.4)
Belgium	1.1	0.7	(0.3)	0.7	(0.3)	0.0	(0.0)
Cyprus	1.0	4.6	(0.6)	4.6	(0.6)	0.0	(0.0)
Czech Republic	3.2	5.8	(2.6)	5.5	(2.2)	0.3	(0.4)
Denmark	3.8	5.0	(2.5)	0.5	(1.0)	4.5	(1.5)
Finland	1.4	1.9	(1.5)	0.2	(0.5)	1.7	(1.2)
France	28.3	5.3	(2.9)	1.8	(1.0)	3.5	(1.9)
Georgia	1.0	44.0	(12.9)	44.0	(12.9)	0.0	(0.0)
Germany	71.2	9.6	(3.4)	2.9	(1.3)	6.7	(2.2)
Greece	7.0	9.4	(1.9)	2.1	(1.0)	7.4	(2.4)
Iceland	1.3	13.9	(5.7)	13.9	(5.7)	0.0	(0.0)
Ireland	2.6	3.0	(1.8)	3.0	(1.8)	0.0	(0.0)
Italy	19.7	3.9	(2.4)	2.6	(1.7)	1.3	(0.9)
Kazakhstan	7.0	12.7	(5.1)	12.7	(5.1)	0.0	(0.0)
Liechtenstein	2.1	152.9	(15.1)	26.0	(32.7)	126.9	(35.9)
Lithuania	1.0	2.1	(0.0)	2.1	(0.0)	0.0	(0.0)
Monaco	2.8	96.8	(29.2)	4.1	(14.4)	92.8	(24.6)
Netherlands	8.0	4.7	(0.9)	0.5	(0.5)	4.2	(0.5)
Norway	6.0	3.6	(2.6)	2.7	(2.0)	0.8	(0.7)
Poland	7.2	2.8	(0.9)	2.7	(0.8)	0.1	(0.2)
Portugal	3.2	3.6	(2.1)	0.9	(0.8)	2.7	(1.3)
Romania	2.6	2.1	(0.5)	2.1	(0.5)	0.0	(0.0)
Russia	69.2	19.9	(12.6)	19.7	(12.4)	0.3	(0.2)

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Table 2.2 – *Continued from previous page*

Country	Average Number of Billionaires	Total Wealth / GDP Mean(%)	Total Wealth / GDP SD	Founder Wealth / GDP Mean(%)	Founder Wealth / GDP SD	Heir Wealth / GDP Mean(%)	Heir Wealth / GDP SD
Serbia	1.0	3.3	(0.0)	3.3	(0.0)	0.0	(0.0)
Spain	13.1	4.4	(3.3)	3.2	(2.7)	1.1	(0.7)
Sweden	6.8	11.9	(6.7)	3.3	(2.7)	8.6	(4.5)
Switzerland	17.9	14.6	(4.8)	5.0	(2.8)	9.6	(2.3)
Turkey	17.4	6.9	(2.3)	3.8	(1.3)	3.0	(1.4)
Ukraine	9.4	16.9	(7.5)	16.9	(7.5)	0.0	(0.0)
United Kingdom	31.7	3.8	(2.2)	1.5	(1.6)	2.3	(0.7)
East Asia & Pacific							
Australia	13.7	3.4	(1.6)	2.1	(1.1)	1.2	(0.6)
Brunei	1.0	323.1	(123.1)	0.0	(0.0)	323.1	(123.1)
China	79.9	2.3	(2.6)	2.2	(2.5)	0.1	(0.1)
Hong Kong	29.0	51.7	(22.8)	30.6	(16.2)	21.1	(7.3)
Indonesia	18.9	13	(4.2)	8.4	(2.9)	4.6	(1.4)
Japan	66.9	3.7	(0.5)	1.9	(0.4)	1.8	(0.2)
Macau	1.1	27.6	(13.4)	24.1	(16.7)	3.5	(7.1)
Malaysia	10.1	18.5	(8.2)	16.7	(7.6)	1.8	(1.2)
New Zealand	1.7	4.0	(2.9)	2.1	(2.9)	1.9	(0)
Philippines	9.6	18.9	(8.0)	14.4	(7.6)	4.5	(1.0)
Singapore	7.0	14.6	(5.3)	7.5	(2.9)	7.1	(3.1)
South Korea	10.4	3.8	(1.1)	1.6	(1.0)	2.2	(1.3)
Taiwan	18.8	12.3	(4.4)	8.4	(3.4)	3.9	(1.3)
Thailand	15.2	15.1	(3.9)	6.4	(2.5)	8.7	(1.7)
Vietnam	1.0	0.9	(0.0)	0.9	(0.0)	0.0	(0.0)
South Asia							
India	36.5	8.4	(7.0)	3.3	(2.8)	5.1	(4.4)
Nepal	1.0	5.7	(0.6)	0.0	(0.0)	5.7	(0.6)
Pakistan	1.0	0.6	(0.0)	0.0	(0.0)	0.6	(0.0)
Middle East & North Africa							
Algeria	1.0	1.6	(0.2)	1.6	(0.2)	0.0	(0.0)
Bahrain	1.0	24.9	(1.7)	0.0	(0.0)	24.9	(1.7)
Egypt	1.7	8.3	(6.2)	7.4	(6.6)	0.9	(1.4)
Israel	8.1	7.8	(6.4)	6.1	(4.8)	1.8	(2.4)
Kuwait	4.4	18.5	(5.4)	6.4	(3.4)	12.2	(6.8)
Lebanon	2.4	43.8	(17.7)	33.1	(15.1)	10.7	(18.5)
Morocco	1.6	3.7	(2.5)	0.6	(1.3)	3.1	(1.3)
Oman	2.3	2.3	(1.2)	2.3	(1.2)	0.0	(0.0)
Qatar	1.0	0.0	(0.2)	0.0	(0.2)	0.0	(0.0)
Saudi Arabia	12.2	21.3	(8.3)	9.3	(2.3)	12.0	(7.5)
UAE	2.3	13.1	(2.6)	0.1	(0.3)	13.0	(2.5)

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Table 2.2 – *Continued from previous page*

Country	Average Number of Billionaires	Total Wealth / GDP		Founder Wealth / GDP		Heir Wealth / GDP	
		Mean(%)	SD	Mean(%)	SD	Mean(%)	SD
Sub-Saharan Africa							
Angola	1.0	2.6	(0.6)	0.0	(0.0)	2.6	(0.6)
Congo	1.0	5.7	(2.2)	0.0	(0.0)	5.7	(2.2)
Nigeria	3.3	4.1	(2.0)	1.2	(0.8)	2.9	(1.3)
South Africa	4.3	4.0	(2.2)	1.3	(1.1)	2.7	(1.5)
Tanzania	2.0	4.6	(0.2)	2.1	(0.0)	2.6	(0.2)
Uganda	1.0	4.3	(0.2)	4.3	(0.2)	0.0	(0.0)

Table 2.3: Summary Statistics and Simple Correlations

This table shows summary statistics and simple correlations of the main variables. Net worths of billionaires are from Forbes' lists from 1987 to 2016. The billionaire data are then merged with Penn World Table 9.1. To reduce the effects of serial correlation, the merged data are collapsed to 15 two-year periods, e.g., 1986-87 is the first period, 1988-89 the second, and so on. The mean value of each variable in each period is the representative value of that period. Panel A of this table provides summary statistics of the main variables. Panel B provides Pearson correlation coefficients between a pair of these variables. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero correlation coefficients. All variables are defined in Table 2.1.

Panel A: Summary Statistics

	N	Mean	SD	p5	p25	p50	p75	p95
Total Wealth/GDP (%)	902	18.68	48.72	0.60	3.23	6.10	14.84	72.17
Founder Wealth/GDP (%)	902	5.67	10.11	0.00	0.53	2.29	5.91	23.72
Heir Wealth/GDP (%)	902	13.01	47.65	0.00	0.79	2.91	5.88	31.60
GDP per capita (USD)	1,271	21,583	19,657	1,287	6,255	16,478	32,572	54,554
GDP (billion USD)	1,271	808.21	1948.81	14.40	84.29	250.92	660.94	294.79
Capital per capita (USD)	1,271	98,064	85,676	5,562	29,072	75,207	155,616	240,908
Human Capital Index	1,223	2.56	0.66	1.42	2.05	2.62	3.11	3.56
GDP per capita growth (%)	1,271	2.89	7.34	-6.92	0.16	2.96	5.68	12.50
TFP growth (%)	1,058	0.55	4.45	-4.56	-0.65	0.54	1.81	4.79
Capital per capita growth (%)	1,271	1.98	2.62	-1.90	0.60	1.67	3.07	6.75

Panel B: Simple Correlations

	Total Wealth/GDP		Founder Wealth/GDP		Heir Wealth/GDP	
	Correlation	(p-Value)	Correlation	(p-Value)	Correlation	(p-Value)
GDP per capita	**0.206**	(0.000)	-0.046	(0.178)	**0.217**	(0.000)
GDP	**-0.066**	(0.054)	-0.014	(0.675)	**-0.063**	(0.063)
Capital per capita	**0.202**	(0.000)	**-0.076**	(0.026)	**0.219**	(0.000)
Human Capital Index	-0.014	(0.682)	**0.096**	(0.006)	-0.029	(0.400)
GDP PC growth	-0.035	(0.299)	**0.107**	(0.002)	**-0.057**	(0.096)
TFP growth	-0.020	(0.585)	0.020	(0.585)	**-0.064**	(0.077)
Capital PC growth	-0.003	(0.925)	**0.081**	(0.017)	-0.019	(0.573)

Table 2.4: Billionaire Corporate Control and Economic Growth

This table shows the differential effects of corporate control under founder and heir billionaires on economic growth. Specifically, countries with more corporate control under founder billionaires grow more rapidly, while those with more corporate control under heir billionaires grow more slowly. The data on net worths of billionaires are from Forbes' lists of billionaires from 1987 to 2016. Each billionaire or billionaire family is classified as a founder or an heir. Founder billionaires are those who have built their fortune from scratch. Heir billionaires are those who inherited assets from their parents or forerunners. The billionaire data are then merged with Penn World Table 9.1. Dependent variables are economic growth which is calculated as, for example, TFP $\text{growth}_{it} = (\text{TFP}_{i,t+1}/\text{TFP}_{i,t} - 1) \times 100\%$, where i and t index country and year, respectively. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	GDP PC growth (1)	TFP growth (2)	Capital PC growth (3)	GDP PC growth (4)	TFP growth (5)	Capital PC growth (6)
Total Wealth/GDP	-0.004	0.007	0.001			
	(0.182)	(0.567)	(0.611)			
Founder Wealth/GDP				**0.059**	**0.046**	0.033
				(0.056)	(0.041)	(0.168)
Heir Wealth/GDP				**-0.005**	**-0.062**	0.001
				(0.068)	(0.039)	(0.756)
log(GDP PC)	**-2.618**	**-1.347**	**1.798**	**-2.671**	**-1.435**	**1.771**
	(0.002)	(0.048)	(0.016)	(0.001)	(0.028)	(0.014)
log(GDP)	**-0.439**	-0.052	0.192	**-0.428**	-0.053	0.197
	(0.037)	(0.600)	(0.310)	(0.033)	(0.579)	(0.288)
log(Human Capital Index)	**3.342**	**3.105**	-0.644	**3.187**	**2.621**	-0.723
	(0.027)	(0.000)	(0.658)	(0.029)	(0.000)	(0.614)
log(Capital PC)	**1.107**	0.547	**-2.141**	**1.169**	0.777	**-2.108**
	(0.096)	(0.315)	(0.001)	(0.063)	(0.165)	(0.001)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by	Country	Country	Country	Country	Country	Country
R^2	0.168	0.087	0.164	0.173	0.098	0.173
N	828	770	828	828	770	828

Table 2.5: Robustness Checks

This table shows the robustness of the results in Table 2.4. Columns (1) to (3) exclude: a) billionaires whose classifications into founders or heirs are ambiguous and b) billionaires whose countries of influence are ambiguous. Columns (4) to (6) employ an alternative missing data imputation method in which all missing values of billionaire wealth are replaced with one billion USD. Columns (7) to (9) employs an alternative estimation technique, GMM, to control for biases arising from simultaneity and unobserved country-specific effects. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	Exclude Ambiguous Cases			Alternative Imputation Method			GMM Estimation Technique		
	GDP PC growth (1)	TFP growth (2)	Capital PC growth (3)	GDP PC growth (4)	TFP growth (5)	Capital PC growth (6)	GDP PC growth (7)	TFP growth (8)	Capital PC growth (9)
Founder Wealth/GDP	**0.054**	**0.046**	0.033	**0.061**	**0.043**	0.037	**0.049**	**0.053**	**0.036**
	(0.072)	(0.049)	(0.185)	(0.075)	(0.067)	(0.160)	(0.000)	(0.000)	(0.000)
Heir Wealth/GDP	**-0.005**	**-0.062**	0.001	-0.001	-0.055	0.001	**-0.008**	**-0.068**	**0.003**
	(0.058)	(0.043)	(0.803)	(0.828)	(0.101)	(0.780)	(0.000)	(0.007)	(0.000)
log(GDP PC)	**-2.681**	**-1.418**	**1.737**	**-2.765**	**-1.418**	**1.767**	**-3.436**	**-2.052**	**2.775**
	(0.001)	(0.031)	(0.016)	(0.001)	(0.027)	(0.012)	(0.000)	(0.000)	(0.000)
log(GDP)	**-0.460**	-0.059	0.171	**-0.380**	-0.043	0.198	**-0.856**	-0.107	**0.588**
	(0.021)	(0.546)	(0.325)	(0.045)	(0.635)	(0.258)	(0.000)	(0.329)	(0.000)
log(Human Capital Index)	**3.258**	**2.626**	-0.682	**3.286**	**2.780**	-0.750	**4.399**	**3.130**	**-2.120**
	(0.027)	(0.000)	(0.633)	(0.024)	(0.000)	(0.596)	(0.000)	(0.001)	(0.000)
log(Capital PC)	**1.143**	0.767	**-2.073**	**1.206**	0.699	**-2.095**	**1.986**	**1.228**	**-2.821**
	(0.072)	(0.174)	(0.001)	(0.055)	(0.190)	(0.001)	(0.000)	(0.001)	(0.000)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by	Country	Country	Country	Country	Country	Country	-	-	-
R^2	0.174	0.097	0.169	0.171	0.093	0.173	-	-	-
N	824	768	824	828	770	828	828	770	828

Table 2.6: Incumbent Founder Billionaires and Economic Growth

This table shows that when the founder billionaires remain in the Forbes' lists for longer than 20 years, they may become incumbents, and hence their positive impact on economic growth becomes statistically insignificant. The variable "Incumbent Founder Wealth (T)/GDP" is calculated as summation of wealth of founder billionaires who remain in the Forbes' lists for T years or longer then divided by GDP. The dependent variable is economic growth which is calculated as GDP PC growth$_{it}$ = (GDP PC$_{i,t+1}$/GDP PC$_{i,t}$ − 1) × 100%, where i and t index country and year, respectively. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	GDP Per Capita Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Founder Wealth/GDP	**0.059**					
	(0.056)					
Incumbent Founder Wealth (10)/GDP		**0.099**				
		(0.089)				
Incumbent Founder Wealth (15)/GDP			**0.130**			
			(0.048)			
Incumbent Founder Wealth (20)/GDP				0.068		
				(0.266)		
Incumbent Founder Wealth (25)/GDP					0.051	
					(0.274)	
Incumbent Founder Wealth (30)/GDP						0.038
						(0.687)
Heir Wealth/GDP	**-0.005**	**-0.006**	**-0.006**	**-0.006**	**-0.006**	**-0.006**
	(0.068)	(0.044)	(0.037)	(0.035)	(0.037)	(0.038)
log(GDP PC)	**-2.671**	**-2.659**	**-2.650**	**-2.599**	**-2.600**	**-2.598**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
log(GDP)	**-0.428**	**-0.459**	**-0.467**	**-0.462**	**-0.455**	**-0.451**
	(0.033)	(0.026)	(0.025)	(0.029)	(0.031)	(0.032)
log(Human Capital Index)	**3.187**	**3.368**	**3.428**	**3.329**	**3.312**	**3.297**
	(0.029)	(0.025)	(0.023)	(0.027)	(0.028)	(0.029)
log(Capital PC)	**1.169**	**1.116**	**1.101**	1.092	**1.099**	**1.106**
	(0.063)	(0.084)	(0.093)	(0.101)	(0.100)	(0.096)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by	Country	Country	Country	Country	Country	Country
R^2	0.173	0.174	0.175	0.169	0.169	0.168
N	828	828	828	828	828	828

Table 2.7: Billionaire Corporate Control and Financial and Legal Institutions

This table shows the differential effects of corporate control under founder and heir billionaires on financial and legal institutions. Specifically, countries with more corporate control under founder (heir) billionaires have more (less) developed financial and legal institutions. Interestingly, corporate control under both types of billionaires are associated with more developed stock markets. The development of financial institutions is measured by: a) Credit to Private Sector (% GDP), b) Bank Z-Score, c) Bank Deposits (% GDP) and d) Stock Market Capitalization (% GDP). The development of legal institutions is measured by Ease-of-doing-business Score and Starting-business Score. A higher value of these measures indicates more developed institutions. Because all measures of legal institution quality, except Starting Business Index, are cross-sectional and the Staring Business Index has minimal variation, the mean values of all time-series variables from the latest five years in the data, i.e. 2011 to 2015, are used as representatives of the sample. Moreover, because the sample size is now small and is therefore prone to outlier effects, to reduce such effects, the observation with the highest Cook's distance, i.e. Brunei, is deleted. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	Financial Institutions				Legal Institutions	
	Credit to Private Sector (% GDP)	Bank Z-Score (% GDP)	Bank Deposits (% GDP)	Stock Market Capitalization (% GDP)	Ease-of-Doing-Business Score	Starting Business Score
	(1)	(2)	(3)	(4)	(5)	(6)
Founder Wealth/GDP	**1.101**	0.078	**2.158**	**5.214**	**0.306**	**0.338**
	(0.010)	(0.461)	(0.010)	(0.069)	(0.001)	(0.001)
Heir Wealth/GDP	**-0.111**	**-0.027**	-0.003	**5.206**	**-0.273**	**-0.388**
	(0.049)	(0.019)	(0.964)	(0.052)	(0.064)	(0.013)
log(GDP PC)	**25.104**	1.421	**20.012**	**27.640**	**8.307**	**7.842**
	(0.000)	(0.197)	(0.000)	(0.001)	(0.000)	(0.000)
log(GDP)	**9.071**	0.124	0.739	**8.889**	0.084	-0.590
	(0.012)	(0.855)	(0.847)	(0.064)	(0.875)	(0.339)
Constant	**-294.520**	-1.300	**-154.328**	**-359.645**	-14.684	11.177
	(0.000)	(0.929)	(0.030)	(0.004)	(0.206)	(0.454)
Year Fixed Effects	Yes	Yes	Yes	Yes	-	-
Standard Errors	Clustered by Country	Clustered by Country	Clustered by Country	Clustered by Country	Heteroscedasticity-consistent	Heteroscedasticity-consistent
R^2	0.336	0.043	0.341	0.449	0.560	0.505
N	761	619	800	734	72	72

Table 2.8: Billionaire Corporate Control and IPO Activity

This table shows the differential effects of corporate control under founder and heir billionaires on IPO activity. Specifically, countries with more corporate control under founder billionaires have more IPOs and raise more capital as a fraction of GDP. In contrast, countries with more corporate control under heir billionaires have fewer IPOs, though this latter effect is statistically insignificant. IPO data are from the SDC database. An initial IPO sample includes 42,654 IPOs from 1990 to 2018. It is then merged with the billionaire data and Penn World Table 9.1. The final sample includes 38,147 IPOs from 67 countries. Each IPO is classified as Domestic, Global, or VC-backed. Domestic IPOs are those offered within the issuers' domestic markets. Global IPOs are those offered outside the issuers' domestic markets. VC-backed IPOs are those backed by Venture Capitals as indicated by the SDC database. Data on net worths of billionaires are from Forbes' lists of billionaires from 1987 to 2016. Each billionaire or billionaire family is classified as a founder or an heir. Founder billionaires are those who have built their fortune from scratch. Heir billionaires are those who inherited assets from their parents or forerunners. The billionaire data are then merged with the IPO data. All explanatory variables are lagged by one period to account for the fact that firms make decisions to go IPO well before the offer date. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	IPO Proceeds (% GDP)				IPO Counts (% Listed Firms)			
	All	Domestic	Global	VC-backed	All	Domestic	Global	VC-backed
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Founder Wealth/GDP	**0.0227**	**0.0207**	0.0020	**0.0015**	**0.0393**	**0.0406**	0.0102	-0.0040
	(0.006)	(0.005)	(0.243)	(0.046)	(0.092)	(0.076)	(0.264)	(0.340)
Heir Wealth/GDP	0.0016	0.0016	-0.0000	-0.0001	-0.0193	-0.0158	-0.0049	-0.0033
	(0.822)	(0.791)	(0.974)	(0.798)	(0.426)	(0.515)	(0.470)	(0.282)
log(GDP PC)	**0.1093**	**0.0872**	**0.0221**	0.0043	0.5198	0.4702	**0.2171**	**0.1137**
	(0.003)	(0.012)	(0.005)	(0.204)	(0.103)	(0.133)	(0.005)	(0.034)
log(GDP)	-0.0388	-0.0418	0.0030	0.0050	**0.5644**	**0.5719**	0.0630	**0.1779**
	(0.208)	(0.165)	(0.575)	(0.134)	(0.014)	(0.009)	(0.266)	(0.013)
GDP PC growth	**0.0107**	**0.0096**	0.0010	0.0003	**0.0759**	**0.0770**	0.0095	0.0038
	(0.066)	(0.073)	(0.366)	(0.560)	(0.023)	(0.019)	(0.108)	(0.566)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by	Country	Country	Country	Country	Country	Country	Country	Country
R^2	0.161	0.152	0.153	0.113	0.187	0.188	0.185	0.230
N	701	701	701	701	632	632	632	632

Table 2.9: Billionaire Corporate Control and Firm Choice between Domestic and Global IPO

This table shows the differential effects of corporate control under founder and heir billionaires on firm choice to raise capital domestically or internationally. Specifically, firms in countries with more corporate control under founder billionaires raise more total IPO proceeds. They also raise more proceeds domestically as well as more proceeds from VC-backed IPOs. In contrast, firms in countries with more corporate control under heir billionaires are more likely to raise capital outside of their countries and raise more capital there. IPO data are from the SDC database. An initial IPO sample includes 42,654 IPOs from 1990 to 2018. It is then merged with the billionaire data and Penn World Table 9.1. The final sample includes 38,147 IPOs from 67 countries. Each IPO is classified as Domestic, Global, or VC-backed. Domestic IPOs are those offered within the issuers' domestic markets. Global IPOs are those offered outside the issuers' domestic markets. VC-backed IPOs are those backed by Venture Capitals as indicated by the SDC database. The data on net worths of billionaires are from Forbes' lists of billionaires from 1987 to 2016. Each billionaire or billionaire family is classified as a founder or an heir. Founder billionaires are those who have built their fortune from scratch. Heir billionaires are those who inherited assets from their parents or forerunners. All variables are winsorized at the 2.5th and 97.5th percentiles. Columns (1)-(3) and (5) are OLS regressions where dependent variables are different types of IPO proceeds in constant 2011 million USD at PPP. Column (4) is a logit regression where a dependent variable equals one for global IPOs and zero otherwise. All explanatory variables are lagged by one year to account for the fact that firms make decisions to go IPO well before the offer date. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	All IPO Proceeds (mil USD) (1)	Domestic IPO Proceeds (mil USD) (2)	VC-backed IPO Proceeds (mil USD) (3)	Global IPO Propensity (4)	Global IPO Proceeds (mil USD) (5)
Founder Wealth/GDP	**3.559**	**3.536**	**0.650**	-0.014	-0.084
	(0.081)	(0.055)	(0.025)	(0.593)	(0.669)
Heir Wealth/GDP	-0.343	-0.680	-0.232	**0.082**	**0.428**
	(0.880)	(0.742)	(0.401)	(0.008)	(0.034)
log(GDP PC)	4.127	1.469	**1.501**	**0.440**	1.781
	(0.805)	(0.922)	(0.036)	(0.029)	(0.119)
log(GDP)	**22.446**	**20.403**	**7.498**	-0.043	0.588
	(0.013)	(0.019)	(0.000)	(0.692)	(0.468)
GDP PC growth	**8.959**	**7.759**	**0.896**	**0.065**	**0.469**
	(0.007)	(0.009)	(0.059)	(0.067)	(0.020)
Constant	**-317.996**	-270.903	**-119.543**	**-6.610**	-21.086
	(0.100)	(0.133)	(0.000)	(0.017)	(0.196)
R^2	0.046	0.050	0.120	-	0.008
N	38,147	38,147	38,147	38,147	38,147

Table 2.10: Billionaire Corporate Control in High- and Low-income Countries

This table shows the differential effects of corporate control under founder and heir billionaires in subsamples of high- and low-income countries. Specifically, the differential effects of corporate control under founder and heir billionaires on GDP per capita growth are more pronounced in high-income countries. These effects on TFP growth are present in both high- and low-income countries[1]. Finally, more corporate control under heir billionaires is associated with slower Capital per capita growth. Following the World Bank definition, countries with income per capita in 1990 more than 7,620 USD are classified as high-income. The rest are classified as low-income. Net worths of billionaires are from Forbes' lists from 1987 to 2016.Each billionaire or billionaire family is classified as a founder or an heir. Founder billionaires are those who have built their fortune from scratch. Heir billionaires are those who inherited assets from their parents or forerunners. The billionaire data are then merged with Penn World Table 9.1. Coefficients in boldface are statistically significant at 10% level or better. Numbers in parentheses are p-values for rejecting null hypotheses of zero coefficients. All variables are defined in Table 2.1.

	GDP PC growth			TFP growth			Capital PC growth		
	All Sample	High-income	Low-income	All Sample	High-income	Low-income	All Sample	High-income	Low-income
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Founder Wealth/GDP	**0.059**	**0.053**	0.074	**0.046**	0.024	0.109	0.033	0.011	0.014
	(0.056)	(0.030)	(0.487)	(0.041)	(0.109)	(0.153)	(0.168)	(0.368)	(0.787)
Heir Wealth/GDP	**-0.005**	**-0.005**	-0.082	**-0.062**	-0.056	**-0.084**	0.001	**-0.004**	-0.083
	(0.068)	(0.056)	(0.492)	(0.039)	(0.110)	(0.070)	(0.756)	(0.023)	(0.462)
log(GDP PC)	**-2.671**	**-1.784**	**-2.863**	**-1.435**	-0.538	**-1.808**	**1.771**	**4.005**	1.041
	(0.001)	(0.092)	(0.015)	(0.028)	(0.467)	(0.047)	(0.014)	(0.000)	(0.206)
log(GDP)	**-0.428**	**-0.298**	-0.536	-0.053	-0.123	-0.054	0.197	0.103	0.638
	(0.033)	(0.024)	(0.310)	(0.579)	(0.128)	(0.842)	(0.288)	(0.472)	(0.134)
log(Human Capital Index)	**3.187**	0.871	3.159	**2.621**	**2.789**	1.217	-0.723	**-4.863**	0.397
	(0.029)	(0.639)	(0.226)	(0.000)	(0.000)	(0.335)	(0.614)	(0.000)	(0.857)
log(Capital PC)	**1.169**	0.270	**1.680**	0.777	0.622	1.171	**-2.108**	**-3.762**	-1.428
	(0.063)	(0.826)	(0.092)	(0.165)	(0.270)	(0.197)	(0.001)	(0.010)	(0.120)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by	Country	Country	Country	Country	Country	Country	Country	Country	Country
R^2	0.173	0.214	0.199	0.098	0.156	0.125	0.173	0.357	0.209
N	828	447	381	770	432	338	828	447	381

[1] Because it requires both high- and low-income subsamples for the coefficients on Founder Wealth/GDP and Heir Wealth/GDP to be significant, the effects of billionaire corporate control on TFP growth are present in both subsamples.

Chapter 3

The Market-Wide Impact of Billionaire Sudden Deaths

3.1 Introduction

Powerful tycoons or families control large fractions of most national economies through their business groups (La Porta et al., 1999; Claessens et al., 2000; Faccio and Lang, 2002; Morck et al., 2005; Masulis et al., 2011). With control over such vast amounts of assets, these individuals may be able to extend their influence well beyond the firms they control, rendering them a systematic risk which cannot be diversified away. This hypothesis stands in contrast to a conventional belief in finance that a controlling shareholder should only be regarded as a firm-specific or diversifiable risk, and thus should have no impact to the market as a whole.

This paper shows that this conventional belief may not be correct under certain circumstances. That is, some controlling shareholders can be regarded as systematic or non-diversifiable risks. I identify these potentially powerful controlling shareholders using the Forbes' lists of billionaires from 1987 to 2017, because billionaires are at the apex of the national wealth distribution and often control some of the largest companies or groups of companies in their respective economies. Using sudden death and major hospitalization events as exogenous shocks to the entire market, I show that the volatility of a country's market index significantly increases in response to the sudden loss or incapacitation of billionaires. This increase in market index volatility is larger for lower-income countries, suggesting that billionaires are more influential in these countries than they are in higher-income countries. One potential reason is that billionaires exploit a corrupt system to set up legal or financial barriers to new and innovative entrants (Djankov et al., 2002; Rajan and Zingales, 2003). I test this hypothesis by regressing the measure of billionaire influence (cumulative abnormal volatility) on the interaction term between a corruption index (higher value indicates more corruption) and per capita GDP. The result shows that the coefficient on the interaction term is positive and significant, suggesting that corruption indeed magnifies a billionaire's economic influence.

To examine whether billionaires' economic impact is positive or negative, I compute the cumulative abnormal returns (CARs) of the country market index around the event date. Findings reveal that CARs are negative and significant, suggesting that, on average, billionaires are valuable to the equity market. Family succession also plays an important role in this effect. Specifically, I consider the following two heir-related characteristics: a billionaire's number of sons, and heirs' science education. Multiple sons should be associated with business group's underperformance because they compete for control over its assets, which leads to a race to the bottom (Bertrand, Johnson, Samphantharak, and Schoar, 2008). If business groups set up barriers against new entrants, their demise should imply lower barriers, which are beneficial to the entire market. Science-related education serves as a proxy for an heir's capability (Perez-Gonzalez, 2006); a less capable heir should rely more on their political connections, while a more capable heir should rely less. Heirs with science education should therefore imply lower barriers, which are again favorable to the entire market. Results show that both the fact that a billionaire has more than one son as well as his heirs' science-related education are associated with an increase in the market index.

Using a regression analysis, I also identify areas where billionaires are considered economic assets (have positive impacts) or economic liabilities (have negative impacts) to the entire market. If these individuals are economic assets, the market should react negatively when they lose power. On the other hand, if they are economic liabilities, the market should react positively when they lose power. To test these hypotheses, I regress CARs of country market indexes on log(GDP per capita). My findings reveal that billionaires are more valuable to lower income countries. In addition, CARs are positive in countries with per capita

GDPs greater than 41,738 USD. This result suggests that billionaires or large business group controllers are considered economic assets in countries with incomes under 41,738 USD, but are considered economic liabilities in countries with incomes over or equal to 41,738 USD. This finding lends support to the long-debated hypothesis that big business groups are economic assets in early stages of economic development; however, as they grow larger and more powerful, they become economic liabilities in more developed economies (Morck et al., 2005).

Finally, I examine the differential value of billionaires on firms under their control and the rest of the market. Regressing CARs of these two portfolios on a variety of country- and family-level characteristics reveals that billionaires are more valuable to their own firms when their business groups operate in countries with higher shareholder protection and more developed financial markets. They are more valuable to the rest of the market when they are founders of their groups. In addition, they are less valuable to the rest of the market when their groups are large relative to the size of the economy.

The rest of this paper is organized as follows. Section 3.2 reviews the related literature and develops the main hypothesis to be tested in the paper. Section 3.3 describes the data construction process. Section 3.4 explains the methodology. Section 3.5 shows the main results. Finally, Section 3.6 concludes.

3.2 Related Literature

The argument that management actions are merely a firm-specific risk seems to be true in the present-day United States. With its economy so large relative to the size of any single firm, any CEO or controlling shareholder is unlikely to be powerful enough to impact the whole market. However, for most other parts of the world, wealthy families or powerful tycoons often control several landmark businesses such as South Korea's Samsung, India's Reliance, and Denmark's Maersk, which account for a significant portion of their host countries' economies (See, for example, La Porta et al. (1999); Claessens et al. (2000); Faccio and Lang (2002); Morck et al. (2005); Masulis et al. (2011)). With control over such vast amounts of assets, these individuals might be able to extend their economic influence to reach all corners of the economy.

[Insert Figure 3.1 about here.]

To illustrate the size of family business groups, Figure 3.1 from Masulis et al. (2011) plots the fractions of total market capitalization held by family business groups from 45 countries around the world against GDP per capita. In approximately two thirds of the sample, family business groups control about 10% or more of the total market capitalization of their respective countries. Moreover, in approximately one third of the sample countries, they control over 30% of the total market capitalization. The downward-sloping fitted line shown in the figure suggests that family business groups tend to be more prevalent in lower-income countries. However, in some high-income countries such as South Korea, Singapore or Taiwan, family business groups are also ubiquitous as they control more than 40% of these countries' total market capitalization.

Despite several findings on the importance of big business groups, there is little direct evidence on how people behind them are able to impact their countries' economies, especially through the control of their organizations. Anecdotal evidence on the existence of powerful tycoons dates back to October 1907 when the panic took place in the banking industry of the United States, causing runs in several banks and trust companies all over the nation. J.P. Morgan, the most powerful banker at the time, put a vast sum of his own money to shore up the banking system and persuaded several presidents of other banks to do the same. His actions successfully put an end to the panic and eventually led to the establishment of the Federal Reserve System. With such economic power and political influence, J.P. Morgan can be considered a tycoon, the type of rich and powerful individuals ubiquitous in many of today's developing economies.

Some studies have found that a small group of elites or tycoons *may* have an impact on the entire economy. Morck et al. (2000) find that countries with more self-made billionaire wealth relative to GDP tend to grow more rapidly, while those with more inherited billionaire wealth relative to GDP grow more slowly. Morck et al. (2005) review possible explanations to this finding. They contend that wealthy individuals often wield control over a group of several firms, called *business group* through a control pyramid—a corporate structure in which a firm controls another firm, which controls yet another firm and so on. The control pyramid allows these wealthy individuals to turn their already immense wealth into control over a towering amount of corporate assets which can account for a significant portion of the economy. With command over assets of such size, individuals behind them can pose as either economic assets or economic liabilities to the entire economy (Khanna and Yafeh, 2007; Morck et al., 2005).

Business group controllers can be economic assets if they use their large business groups to overcome market frictions which are most prevalent in developing economies. Much empirical and theoretical evidence has proven that in countries where financial markets are underdeveloped, business groups can use resources within their organizations to make difficult-to-finance projects possible by providing seed money required to start the projects (Bena and Ortiz-Molina, 2013; Almeida and Wolfenzon, 2006; Masulis, Pham, and Zein, 2016). Additionally, in countries with dysfunctional legal systems, arm's-length transactions between two independent firms can be costly. Billionaires who control business groups can overcome this problem by exchanging labor and capital within their groups with much lower transaction costs. This is because firms ultimately controlled by the same shareholder are unlikely to cheat one another (Khanna and Yafeh, 2007).

Billionaires can be economic liabilities if they use their economic and political influence to benefit themselves at the expense of others. With vast resources at their disposal, they can exploit a corrupt system to set up legal or financial barriers to new entrants in order to prevent competition (Djankov et al., 2002; Rajan and Zingales, 2003), thereby slowing the pace of creative destruction. Their strong ties to politics also allow them to obtain several state favors such as government bailouts (Faccio, Masulis, and McConnell, 2006), lower taxation (Faccio, 2006), direct subsidies (Chen, Li, Su, and Sun, 2011), favorable government policies (Bunkanwanicha and Wiwattanakantang, 2009) and tariffs (Lenway, Morck, and Yeung, 1996).

This paper studies the market-level value of billionaires using their sudden departures (deaths, major hospitalizations, etc.) as exogenous shocks to the market. Perhaps the closest in spirit to this study is that of Fisman (2001) who examines the value of political connection in Indonesian listed firms under the regime of former president Suharto. His findings reveal that the Jakarta stock exchange index dropped whenever the rumors of Suharto's declining health hit the market. Furthermore, firms with closer ties to Suharto suffered more value losses, while some firms with no ties to Suharto indeed gained value. Fisman (2001)'s finding serves as evidence that politically connected firms derive their value from their political connection to set up barriers against competitors. Thus, the loss of their connection damages their value, and at the same time, allows the competing firms to compete more fairly and subsequently gain value.

This paper differs from Fisman (2001) in that, first, it examines the impact of billionaires or big business group controllers who are not heads of states. The sudden loss of this type of individuals lets us observe their impact on the entire market through their firms, rather than through the government body they are running. Second, while Fisman (2001) uses six events in one country, the sample used in this paper covers 65 events about billionaire departures from 31 countries around the world. Using several events lets us estimate the billionaire impact more precisely because noises in each of the events are supposed to cancel out as the sample size increases. Lastly, a cross-country variation in the data allows us to explore the relationship between billionaire impact and country-level characteristics such as law, corruption and financial development.

3.3 Data and Variables

This section provides the definitions of billionaire and the event examined in this paper. It then describes the data construction process, and reports the summary statistics of the sample.

3.3.1 Definition of billionaire

The main objective of this paper is to explore if there exist controlling shareholders who are economically powerful enough to impact not only the firms they control but also the entire market. As several findings in the literature have demonstrated how important big business groups are to their host national economies, individuals who control these business groups seem most likely to have the potential to impact the entire economy. Forbes' lists of billionaires provide a good starting point to search for the individuals of our interest because big business group controllers are often very wealthy individuals or families and, therefore, tend to have net worths more than one billion USD.

Forbes started creating an annual list of billionaires around the world since 1987. It deploys its employees to interview people familiar with the matter in each country in order to gather a list of candidates. A net worth of each candidate is then estimated from their ownership in publicly-traded and privately-held companies as well as other miscellaneous properties such as real estate, and pieces of art and jewelry. Ownership in private firms is valued using valuation metrics of comparable public firms. Forbes' lists do not include fortune that is dispersed among large multi-generational families such as the Du Pont family of the United States, even though their aggregate wealth certainly exceeds one billion USD. However, they do include the wealth shared among immediate family members. Excluding multi-generational business families should not affect the identification of economically powerful people because these families tend to pass control onto professional managers while family members each hold little ownership. As such, no single family member has absolute control over their family firms, let alone their country's economy.

Considering only billionaires listed in the Forbes' lists might lead us to overlook some powerful tycoons who may have transferred their wealth to their children before Forbes started the list and thus do not appear on it. To uncover these business tycoons, I look for billionaires who have inherited firms from their parents and include their parents in the sample.

Rich and powerful political figures such as Lebanon's Rafic Hariri, Iraq's Saddam Hussein, Cuba's Fidel Castro and Syria's Hafez Al-Assad also make the Forbes' lists of billionaires. Since this paper studies how big business group controllers, rather than rich political figures, affect the market, I exclude billionaires who belong to a royal family, or are heads of states. In addition, some billionaires control business empires that are inextricably tied to politics, and are hence considered comparable to political figures. Examples of these billionaires include Colombian drug lord Pablo Escobar whose illegal business had been plaguing the Colombian government, and Russian oligarchs, Vladimir Yevtushenkov and Mikhail Khodorkovsky, whose arrests may have caused political uncertainty. These billionaires are excluded in the sample.

I also exclude billionaires from the United States because its economy is so large relative to the size of any single firm and also contains mostly freestanding firms as opposed to business groups. As a result, any single firm or controlling shareholder is unlikely to be powerful enough to influence the entire economy (Morck et al., 2005).

In summary, economically powerful individuals, to be referred to as *billionaires* hereafter, must meet the following criteria: a) appear on one of the Forbes' lists of billionaires from 1987 to 2017 or are parents of billionaires who inherited businesses from them, b) do not belong to a royal family, are not heads of states, or their deaths or arrests do not cause political uncertainty, and c) are not from the United States.

3.3.2 Definition of the event

To test whether or not billionaires have an impact on the entire market, I look for the events in which they unexpectedly lose power. The hypothesis is that, in such events, if billionaires matter to the whole market, we should observe abnormal reactions of the *market index* around the event dates. I define the *event* as the first trading day the market learns that a billionaire suddenly dies or becomes *incapacitated*, i.e. loses power and likely never assumes the same position again. I consider three main scenarios in which such an event occurs. First, a billionaire dies suddenly of a cause such as heart attack, accident, suicide or assassination. Second, he is hospitalized due to major illnesses. Finally, he is arrested or steps down from power due to unexpected allegations such as bribery or fraud. From here on, such death, incapacitation, hospitalization and arrest are collectively called *departure*.

Endogeneity problems may still persist in some unexpected events because certain events can be a result of other incidents, and are thus considered endogenous. For example, an event in which a billionaire committed suicide may not convey the information on his departure but, rather, on his business facing financial troubles which in turn caused the billionaire to commit suicide. Thus, market reactions to this event are reactions to his business's financial troubles, rather than his departure. To alleviate this concern, I categorize the events into three groups: a) sudden death, b) major hospitalization and c) others. Sudden death and major hospitalization cases are reliably exogenous, whereas, the *others* category, which includes cases such as arrest, suicide, and assassination may not be. For these potentially endogenous cases, I ensure that the news of billionaire departure mainly contains the information on his departure by checking if the news content includes any additional concerns other than the loss of billionaires themselves. For instance, in the case of a billionaire's suicide due to his company's financial distress, I check that news on his firm's distress has come out before he committed suicide; therefore, the news on his unanticipated suicide should contain information mainly on his departure.

3.3.3 Data construction

This subsection outlines the data construction process. The main objective is to find the events in which billionaires, as defined in Section 3.3.1, suddenly lose power. The steps to constructing the data are as follows.

First, I looked for billionaire candidates to be included in the sample. They must meet the following criteria: a) appear on one of the Forbes' lists of billionaires from 1987 to 2017 or are parents of billionaires who inherited businesses from them, b) do not belong to a royal family, are not heads of states, or their deaths or arrests do not cause political uncertainty, c) are not from the United States, and d) were still in control of their business groups at the time of their departures. To check if they were still in control, they must meet one of the following criteria: a) they were holding an important position such as CEO, Chairman, or Honorary Chairman; b) the news article reports that they were still active in running their firms; c) they were on the apex of the management chains; that is, they did not have, for example, a brother or sister who held a higher position than them in the management hierarchy.

Second, I checked if the billionaires obtained in the first step have suddenly passed away. I used Google's search engine, Forbes Magazine, corporate websites, annual reports and Factiva to gather information on billionaire deaths. I then looked for keywords such as "accident", "assassinated", "unexpected [death]", "stroke", "collapse", "heart attack", "heart failure" and "cardiac arrest." Some deaths such as heart attack or cardiac arrest can be caused by old age or other ongoing medical conditions, making the death non-sudden. For these cases, I checked the circumstances under which the billionaire died to ensure the suddenness of the death. Such circumstances, for example, include: a) the billionaire was still participating in day-to-day operations or a company's event a few days before he died; b) the billionaire was on vacation or a business trip; c) a news article reported that the billionaire's death was unexpected. This step yields 43 sudden-death events.

Third, in addition to the 43 sudden-death events, I included events about major hospitalization, arrest and unexpected resignation. To collect these events, I relied on search engines such as Google and Factiva. The keywords I used included "billionaire", "tycoon", "oligarch", "patriarch", "heart attack", "stroke", "bribe", "fraud", "hospitalized", "hospital", "crash" and "accident." To ensure that billionaires involved in cases obtained in this step are truly powerful business individuals, I checked if they have appeared on the Forbes' lists of billionaires and then excluded those who have never been on the list. This step yields another 27 events. There are now 70 events in total.

Next, I ensured that there are no confounding events on the event dates of the 70 events obtained from the previous steps. Confounding events are macro-level events that typically involve political or major economic activities. To search for the confounding events, I put a billionaire's country name and event date as search inputs in Google and Factiva. The search engines then returned news reports in that country on that day. By ranking these reports by their relevance, major economic or political news appears on the first few pages of the search results. I found the following four cases that contain major confounding events: a) a crash in the financial market which was fueled by an unexpected cut of governmental aid; b) the stock market speculation of the government's adoption of socialist policy; c) a sudden increase in oil demand, which is the country's major commodity, and d) reports of GDP growth which was much lower than anticipated. This step leaves 66 events.

Finally, I dropped a Bolivian billionaire, Max Fernandez Rojas, who died in a plane crash in 1995 because his country's equity market index was not available at the time of his death. The above data collection procedures yield the final sample of 65 events from 31 countries.

[Insert Table 3.1 about here.]

Table 3.1 summarizes the causes of deaths and incapacitations of the sample billionaires. The majority of causes are heart attack, heart failure, and cardiac arrest, which account for more than 30% of the sample. Potentially endogenous causes such as arrest, assassination and suicide in Panel C constitute 13% of all cases.

[Insert Table 3.2 about here.]

Table 3.2 shows the sample by country. The sample covers most regions in the world except Africa. Most of the sample billionaires are from Asia and Oceania, which account for over 40% of the sample. Billionaires from Europe constitute about 35%, South America 14%, and North America 8%.

[Insert Table 3.3 about here.]

Table 3.4 reports the summary statistics of the sample. Definitions and data sources of the variables are provided in Table 3.3. The sample covers a wide range of economy size and economic development. Real GDP ranges from 50.3 billion USD (at Purchasing Power

Parity, constant at 2011) to 10,500 billion USD. The minimum GDP per capita is 2,171 USD (at PPP), the maximum of 80,892 USD, and the median of 31,797 USD. There are also substantial variations in other institutional variables. The anti-director-rights index ranges from 1 (lowest shareholder protection) to 5 (highest). The country market capitalization as a percentage of GDP goes from as low as 2.56% to 1,078.3%.

[Insert Table 3.4 about here.]

Family characteristics also exhibit considerable variations. About half of the sample billionaires are founders of their business groups. An average number of a billionaire's sons is 2 and approximately half of the heirs hold degrees in science-related fields. The mean for a billionaire's family wealth is 1.3% of GDP and the maximum is as high as 7%. A business group's sales are approximately 5% of GDP and a group's equity is about 5% of country market capitalization. The maximums of both metrics are as high as 30% of the economy size. These statistics show that some billionaires in the sample do control a significant portion of their host national economies.

3.4 The Methodology

This section explains the event study methodology used in this paper. It then describes the computation of returns on the portfolio of a billionaire's group firms and the portfolio of firms in the rest of the market. Finally, it discusses the null hypotheses.

3.4.1 The global-market benchmarking model

This paper conducts an event study on a global scale. As such, its methodology slightly deviates from that of a typical event study on a single national market. Specifically, a typical event study with a market model requires two sets of return data—market index and individual stocks. In this study, however, Morgan Stanley Capital International (MSCI) *world* index serves as a market index, and *country* market indexes as individual stocks. Conducting an event study this way lets the returns on a country market index be benchmarked by the MSCI world index. Hence, this model is called a *Global-Market Benchmarking Model*. We need to benchmark country index returns on the world index returns because of the effects of globalization which cause the movements in the world market to affect indexes of individual countries. For instance, when the S&P 500 was down by 9% on October 15, 2008, the Taiwanese stock market index (TWSE) also went down by 3% the next day.

The MSCI world index is a free-float weighted equity index that includes both developed and emerging markets. The index started on December 31, 1987 with a base value of 100, and is compiled by MSCI. This index is based on prices and thus does not include dividends or other payouts. I use this index, instead of the total return index which includes dividends and payouts, because it covers a much longer period of time, while the correlation between the two indexes is as high as 90%. I retrieve this index through Datastream with a ticker code "MSWRLD$" and a field code "MSPI." Country market indexes are from Datastream Total Market Index and are retrieved using a ticker code "TOTMKXX" where "XX" is a 2-digit country code from Datastream. These indexes include dividends and other types of payout. I use these indexes instead of countries' major market indexes such as FTSE100 and NIKKEI because they cover all firms in the market, while most major market indexes cover only large firms. Country index returns are computed as follows:

$$R_{it} = \frac{P_{it}}{P_{i,t-1}} - 1 \tag{3.1}$$

where i and t index the country and day, respectively; R_{it} is a simple return on the market index and P_{it} is a level of the market index.

Using the world and country indexes to run a market model poses a problem due to differences in time zones. That is, for example, a shock on the New York stock exchange on day t will affect the stock exchange of Thailand on day $t + 1$ because Thailand is 11 hours ahead of New York. On the other hand, a shock in oil prices in Kuwait on day t can affect the New York stock exchange on day $t - 1$ because New York is eight hours behind Kuwait. I mitigate this problem by including the world market returns on one day before ($R_{w,t-1}$)

and one day after ($R_{w,t+1}$) in the model as follows:

$$R_{it} = \alpha_i + \beta_i^{TDY} R_{wt} + \beta_i^{YDA} R_{w,t-1} + \beta_i^{TMR} R_{w,t+1} + \epsilon_{it} \tag{3.2}$$

where R_{wt} is a return on MSCI world index on day t; $\alpha_i, \beta_i^{TDY}, \beta_i^{YDA}$ and β_i^{TMR} are market model parameters, and ϵ_{it} an error term. Using the estimation window from days -155 to -35, where day 0 is the event day, I estimate the market model with an Ordinary Least-Squares regression to obtain $\hat{\alpha}_i$, $\hat{\beta}_i^{TDY}$, $\hat{\beta}_i^{YDA}$, and $\hat{\beta}_i^{TMR}$.

Because some countries may not be well integrated into the world market, movements in the world market do not affect movements of those countries' indexes. To check if this is the case for each sample country, I test if $\hat{\beta}_i^{TDY}$, $\hat{\beta}_i^{YDA}$, and $\hat{\beta}_i^{TMR}$ are simultaneously equal to zero. If they are, I use the following model which assumes a constant mean of country market returns:

$$R_{it} = \bar{R}_i + \epsilon_{it} \tag{3.3}$$

where $\bar{R}_i$ is the mean return of a market index of country i over the estimation period.

Once the necessary parameters are obtained, I calculate abnormal returns, AR_{it}, around the event day as follows:

$$AR_{it} = \begin{cases} R_{it} - \bar{R}_i, \text{ if } \hat{\beta}_i^{TDY} = \hat{\beta}_i^{YDA} = \hat{\beta}_i^{TMR} = 0 \\ R_{it} - \hat{\alpha}_i - \hat{\beta}_i^{TDY} R_{wt} - \hat{\beta}_i^{YDA} R_{w,t-1} - \hat{\beta}_i^{TMR} R_{w,t+1}, \quad \text{otherwise.} \end{cases} \tag{3.4}$$

I then use abnormal returns obtained in (3.4) to test the null hypothesis that a billionaire departure has no impact on the entire stock market.

3.4.2 Computing returns on portfolios of group firms and non-group firms

In order to understand the differential impact of billionaires on the firms they control and the rest of the market, I divide the market portfolio into two portfolios—a) a portfolio of firms controlled by the billionaire and b) a portfolio of the rest of the market. A portfolio of all firms controlled by the billionaire is to be referred to as *group-firms portfolio*. The control cutoff is set to 10%. That is, for example, if firm A owns more than 10% of firm B, firm A is said to control firm B.

[Insert Figure 3.2 about here.]

Figure 3.2 illustrates a hypothetical ownership structure. The billionaire directly controls firms A and D because he owns more than 10% of each of these firms. Since firm B owns more than 10% of firm C, firm B controls firm C. This control chain allows the billionaire to control firms A, B, C and D. These firms are called *group firms*. To calculate daily returns on the portfolio of these group firms, first, I sum up market values of all group firms on day t:

$$MV_t^G = \sum_{j=1}^{N} MV_{jt} \tag{3.5}$$

where N is the total number of group firms; MV_t^G is a market value of group-firms portfolio on day t, and MV_{jt} is a market value of group firm j on day t. The data on market value are retrieved from Datastream with a field code "MV." Daily returns on the group-firms portfolio are then computed as follows:

$$R_t^G = \frac{MV_t^G}{MV_{t-1}^G} - 1 \tag{3.6}$$

where R_t^G is a return on the group-firms portfolio on day t. Daily returns calculated this way are thus value-weighted. Because the market value used here does not include dividends and other payouts, these returns are simple returns, as opposed to total returns.

A portfolio of all firms in the market other than the billionaire's firms is to be referred to as a *non-group-firms portfolio*. To compute the daily market values and returns of this portfolio, I start with retrieving market value data of the entire market from Datastream. The ticker code used is "TOTMK<u>XX</u>" where "<u>XX</u>" is a 2-digit country code from Datastream and the field code is "MV." A market value of the non-group-firms portfolio on day t, MV_t^{NG} is then computed as follows:

$$MV_t^{NG} = MV_t^{MKT} - MV_t^G \tag{3.7}$$

where MV_t^{MKT} is a market value of the entire market on day t and MV_t^G is a market value of the group-firms portfolio on day t which is obtained from (3.5). With data on daily market values of non-group-firms portfolio, its daily returns can be calculated in the same fashion as those of the group-firms portfolio. That is,

$$R_t^{NG} = \frac{MV_t^{NG}}{MV_{t-1}^{NG}} - 1 \tag{3.8}$$

where R_t^{NG} is a return on the non-group-firms portfolio on day t.

3.4.3 The null hypotheses

Now that we have the tools to measure market reactions, we move on to using them to answer the central question of this paper: "can a billionaire impact the entire market?" The main null hypothesis of this study is that billionaires do not carry a systematic risk and thus their departures do not affect the entire market. To test if the null hypothesis is true, I adopt two types of market reaction measures. The first type is the two typical measures used in most event studies—daily abnormal returns and cumulative abnormal returns. Daily abnormal returns are defined in (3.4). Cumulative Abnormal Returns (CAR) of country i over an event window $[\tau_1, \tau_2]$ are defined as:

$$CAR_i = \sum_{t=\tau_1}^{\tau_2} AR_{it}. \tag{3.9}$$

If a billionaire departure has no effect on the market, average daily and cumulative abnormal returns around the event should not be significantly different from zero. The test statistics for these two measures are given in Appendix 3.7.

While measuring the market reactions with daily and cumulative abnormal returns can provide the information on an average *value* of billionaires to the market, it may not be able to detect the systematic market reactions to a billionaire departure. This is because the market reactions to billionaire departure can potentially be positive or negative. Averaging these reactions may result in them cancelling out, thus going undetected. To take into account both positive and negative reactions, I use daily and cumulative abnormal volatility to measure the market reactions. Abnormal Volatility (AV) of country i on day t is defined as:

$$AV_{it} = AR_{it}^2. \tag{3.10}$$

Cumulative Abnormal Volatility (CAV) of country i over an event window $[\tau_1, \tau_2]$ is defined as:

$$CAV_i = \sum_{t=\tau_1}^{\tau_2} AV_{it}. \tag{3.11}$$

The null hypothesis is that if a billionaire departure does not affect the entire market, we should not observe a significant increase or decrease of daily and cumulative abnormal volatility around the event date.

To examine an abnormal increase or decrease in daily volatility, I benchmark it with its historical values observed in the estimation period. Specifically, I standardize the daily abnormal volatility from the estimation period such that its value is equal to one and compare it with the standardized daily abnormal volatility around the event window. If the standardized daily abnormal volatility around the event window is significantly greater (lower) than one, the abnormal volatility is said to increase (decrease) on that day.

The same procedures apply for cumulative abnormal volatility. Since the cumulative abnormal volatility is the sum of daily abnormal volatilities, its standardized value over the event window $[\tau_1, \tau_2]$ is equal to $\sum_{t=\tau_1}^{\tau_2} 1 = \tau_2 - \tau_1 + 1$. If the standardized cumulative abnormal volatility over the event window $[\tau_1, \tau_2]$ is significantly greater (lower) than $\tau_2 - \tau_1 + 1$, the cumulative abnormal volatility is said to increase (decrease) during the event window. Appendix 3.7 provides derivations of the test statistics for daily and cumulative abnormal volatility.

3.5 Main Findings

This section presents systematic evidence on the market reactions to a sudden loss of a billionaire and the determinants of these reactions. Market reactions are measured by both abnormal returns and abnormal volatility.

3.5.1 Can a billionaire impact the entire market?

The central question in this paper is whether or not there exist controlling shareholders who are powerful enough to impact the whole market. If such shareholders indeed exist, we should observe a significant increase in market-wide volatility around the day they suddenly lose power.

[Insert Table 3.5 about here.]

Table 3.5 reports an average Standardized Abnormal Volatility (SAV) minus its expected value around the event date. I report this value due to its simple interpretation; that is, a positive value means an increase in volatility, while a negative value means a decrease. In order to attenuate the effects of outliers, I winsorize SAV for each day at 5% level (2.5% on each side of the distribution). Panel A shows that, leading up to day -2, there is not a significant increase or decrease in market volatility. However, on day -1, the volatility heightens substantially and then decreases to its historical norm (as indicated by insignificant abnormal volatility) from day 0 onward. This result indicates that, on average, the entire market indeed responds to a sudden loss of billionaires.[1]

[Insert Table 3.6 about here.]

Table 3.6 presents an average Cumulative Standardized Abnormal Volatility ($CSAV$) minus its expected value. As with SAV, I report this value because of its simple interpretation, i.e., a positive value means an increase in volatility during the event window, while a negative value means a decrease. I report $CSAV$ for three different event windows, namely, [-1, 0], [-1, 1], [-1, 2]. Day -1 is included because national news, on which we rely, sometimes lags behind local news. Therefore, even though the national news reports the event on day 0, the actual event might have happened and been reported in the local news on day -1. Day +1 is included because it is possible that a billionaire departure may occur after the market is closed; therefore, the market reacts to the news on the next trading day. Day +2 is included to incorporate a possible delay of market reactions or additional information that might unfold after the event. To reduce the effects of outliers, I winsorize $CSAV$ for each

[1] The reason why we observe a significant market reaction one day before the event date is likely because the event dates in the sample are from national news media, which sometimes lag reports by local media (Johnson, Magee, Nagarajan, and Newman, 1985).

event window at 5% level (2.5% at each side of the distribution). The first column in Table 3.6 reports the result from a full sample. During the event windows [-1, 0] and [-1, 2], the market volatility increases significantly in response to the loss of powerful billionaires. The event window [-1, 1] also exhibits an increase in volatility; however, its statistical significance is marginal. Consistent with Table 3.5, results from Table 3.6 confirm that billionaires can impact the entire market.

To explore which group of firms contributes to this observed increase in market volatility, columns (2) to (4) of Table 3.6 present the market reactions from three different portfolios: a) the entire market portfolio which includes all firms in the market, b) the *non-group-firms* portfolio which contains firms that are not controlled by the billionaire, and c) the *group-firms* portfolio which include firms under the billionaire's control as defined in Section 3.4.2. Because the market reactions of group firms can be observed only if they are publicly listed, the sample in this part of the analysis is constrained to billionaires with public firms. This subsample makes up around 60% of the full sample. Similar to the full sample result, the entire market portfolio (column (2)) becomes significantly more volatile in all three windows. However, the portfolio of firms that are not controlled (column(3)) by the billionaire does not experience an increase in volatility. This statistical insignificance can be due to either a) non-group firms do not respond to the losses of billionaires, or b) a decrease in sample size by almost half reduces statistical significance. For these reasons, we are unable to conclude that the billionaires do not impact non-group firms. On the other hand, the portfolio of firms under billionaire control becomes significantly more volatile when they lose power. Overall, the results from columns (2) to (4) in Table 3.6 indicate that the significant increase in the whole market-wide volatility during the event comes mainly from the billionaires' firms.

3.5.2 Where are billionaires more influential?

In the previous subsection, Tables 3.5 and 3.6 establish that billionaires or big business group controllers can impact the whole market mainly through the firms they control. This subsection explores the type of countries in which these individuals are more influential. To measure a billionaire's influence, I use CAV of the market index around the day he departs, because more influential billionaires should spur higher market volatility.

Since billionaires can exploit weak institutions to set up barriers to entry from new and innovative competitors (Djankov et al., 2002; Rajan and Zingales, 2003), I hypothesize that they should be more influential in less developed countries where institutions are weaker. In other words, I expect to observe higher market volatility during billionaire sudden departures in less developed countries. To test this hypothesis, I utilize a cross-section of market reactions to the sudden losses of billionaires. I measure a billionaire's influence using the market volatility over the event window $[\tau_1, \tau_2]$ as $\log(\sum_{t=\tau_1}^{\tau_2} AV_{it})$, where AV_{it}, as defined in (3.10), is abnormal volatility of country i on day t. I measure a country's overall economic development using its log(GDP per capita). To test the afore-mentioned hypothesis, I regress the market volatility measure on log(GDP per capita) using an OLS technique. Because billionaires may be less important in bigger economies, the regression also includes economy sizes, measured by log(GDP), as a control variable. To alleviate the concern that the regression results may be driven by a few outliers due to small sample size, I delete three data points (approximately 5% of the sample) with the highest values of Cook's distance.[2]

[Insert Table 3.7 about here.]

Table 3.7 presents the results on three different event windows. In every event window, the coefficient of log(GDP per capita) is strongly and significantly negative, even after controlling for log(GDP). $p-$values of residual normality test for all event windows are also greater than 0.10, suggesting that residuals are normally distributed and that the confidence intervals of the coefficient estimates are reliable. Overall, this evidence supports the hypothesis that billionaires are more influential in less developed countries.

[2]Cook's distance measures an observation's influence on the outcome predicted by a regression model. An observation with higher Cook's distance means that deleting it will have a greater impact on the changes of predicted values.

3.5.3 Does corruption help increase billionaire influence?

Results from the previous subsection indicate that billionaires have greater influence in less developed countries. But what are the tools they use to enhance their influence? In this section, I test a well documented notion that these powerful individuals use a corrupt system as a tool to benefit themselves, often times at the expense of others. Examples of such practice include government bailouts (Faccio et al., 2006), direct subsidies (Chen et al., 2011), tax advantages (Faccio, 2006), and favorable government policies (Bunkanwanicha and Wiwattanakantang, 2009).

This subsection further explores this issue by investigating how corruption helps increase billionaire influence over their countries' economies. If corruption does help billionaires increase their influence, we should expect that they are more influential in more corrupt countries than they are in less corrupt countries with similar levels of economic development. As before, I measure a billionaire's influence using $\log(\sum_{t=\tau_1}^{\tau_2} AV_{it})$, because the more influential the billionaire, the more volatile the market should become when he loses power. The level of corruption is proxied by the corruption index from Transparency International. In the original index, higher index value indicates less corruption. However, for simple interpretation of the results, I adjust the index as follows: Adjusted Corruption Index = 100 − Original Corruption Index. With this adjusted index, its higher value now indicates more corruption. A country's level of economic development is proxied by log(GDP per capita). Three observations (approximately 5% of the sample) with the highest values of Cook's distance are deleted to mitigate the concern on outliers.

[Insert Table 3.8 about here.]

Table 3.8 reports the results for three event windows [-1, 0], [-1, 1] and [-1, 2]. Columns (1) to (3) show the results in which $\log(\sum_{t=\tau_1}^{\tau_2} AV_{it})$ is regressed on the corruption index. The coefficients on the corruption index are significantly positive for all event windows. This result indicates that billionaires are more influential in more corrupt countries.

Columns (4) to (6) utilize the heterogeneity of corruption in countries with similar level of economic development. For example, a high income country such as Italy might be much more corrupt than a country with a similar income such as New Zealand. To explore the effect of such heterogeneity on the billionaire influence, I add an interaction term, Corruption Index $\times$ log(GDP per capita), as an explanatory variable. Columns (4) to (6) in Table 3.8 show that the coefficient of the interaction term is positive in all event windows, and statistically significant in two out of three event windows. The coefficients on the corruption index, however, become negative and statistically significant in two out of three event windows. This result indicates that the effect of corruption on billionaire influence is in fact non-monotonic and is given by:

$$\frac{\partial \log(\sum_{t=\tau_1}^{\tau_2} AV_{it})}{\partial \text{Corruption}} = -0.498 + 0.0432 \cdot \log(\text{GDP per capita}). \tag{3.12}$$

More corruption leads to more billionaire influence only when GDP per capita exceeds 24,883 USD at PPP constant 2011 ($24,883 = e^{0.498/0.0432}$). Overall, the results from Table 3.8 suggest that a corrupt system allows billionaires to increase their influence over the market.

3.5.4 Are billionaires good or bad for the market?

Results so far have shown that billionaires do impact the entire market because their departures cause a significant increase in market-wide volatility. But, is their influence good or bad for the market? To answer this question, I examine CARs around billionaire sudden departures [3] from three portfolios—entire market, group firms, and non-group firms.[4] CAR has an advantage over CAV in that the former can indicate the direction of reactions, i.e. positive or negative, while the latter cannot.

If billionaires are good for the market, we should observe negative CARs on the entire market portfolio when they lose power. If billionaires are bad for the market, i.e. they

[3] CAR over the event window $[\tau_1, \tau_2]$ is defined as $\sum_{t=\tau_1}^{\tau_2} AR_{it}$ where AR_{it} is Abnormal Return of country i on day t.

[4] The group-firms portfolio contains firms that are controlled by the billionaire, while the non-group-firms portfolio contains the rest of the firms in the market that are not controlled by the billionaire. Definitions of group firms and non-group firms, and the computation of their returns are provided in Section 3.4.2.

extract resources to benefit themselves at the expense of others, the group-firms portfolio should exhibit negative CARs while the non-group-firms portfolio should exhibit positive CARs. If billionaire departures cause uncertainty in the entire market, all three portfolios should exhibit negative CARs due to an increased systematic risk.

[Insert Table 3.9 about here.]

Column (1) in Table 3.9 reports CARs around billionaire departures from the full sample. In all three event windows, CARs are negative; and in two out of three windows, they are statistically significant. This result implies that, on average, billionaires are valuable to the market. However, it should be noted that more than half of billionaires in the sample are from developing nations and that this result likely applies only to these countries. I will explore this issue further in Section 3.5.5.

Columns (2) to (5) in Table 3.9 show the comparison of CARs around billionaire departures from three portfolios—entire market, group firms and non-group firms. As before, the sample is constrained to billionaires with public firms because their reactions are observable. In columns (2) and (3), average reactions of the entire-market and the non-group-firms portfolios are negative but not statistically significant in all three event windows. This can be due to a substantially smaller sample size that lowers the statistical power. The group-firms portfolio exhibits significantly negative reactions in two out of three event windows, suggesting that billionaires are beneficial to their own firms. The last column in Table 3.9 shows that, on average, market value of group firms drops more than that of non-group firms when a billionaire loses power; however, the difference is not statistically significant. This result thus lends some support to the hypothesis that billionaires are more valuable to their own firms than they are to the rest of the market.

3.5.5 Where are billionaires valuable to the market?

The previous subsections show that on average the market index falls in response to the sudden losses of billionaires. However, this finding may result from the sample being composed of mainly billionaires from developing countries. This subsection explores the differential values of billionaires on the market and asks where they are valuable to the market and where they are not.

(Khanna and Yafeh, 2007) posit that in underdeveloped economies where corruption is high, markets and legal systems are dysfunctional, transactions between two independent firms can be costly. A group of firms under control of the same ultimate controlling shareholder can circumvent such problems because they can be trusted not to cheat one another. However, as that same group of firms grows larger and becomes economically powerful, it can turn its economic influence into a political one, putting its host country in a so-called "middle income trap" (Morck et al., 2005). Therefore, billionaires who own big business groups may be considered an economic asset in emerging economies and, in contrast, an economic liability in developed economies.

[Insert Table 3.11 about here.]

If billionaires are less valuable in more developed economies, the markets in more developed countries should react more positively when they suddenly lose power. To test this hypothesis, I utilize the variation in market reactions to the sudden losses of billionaires by regressing a cross-section of CARs on log(GDP per capita), a measure of economic development. As before, I delete three observations with the highest values of Cook's distance to attenuate the effects of outliers. Table 3.11 reports the results from three different event windows. The coefficient on log(GDP per capita) is positive in all event windows, and statistically significant in two out of three. Consistent with the above hypothesis, this result indicates that the market reacts more positively to the sudden losses of billionaires in more developed countries. Therefore, billionaires are of less value in more developed economies.

Focusing on column (1) in Table 3.11, the resulting coefficients imply that billionaires are considered economic assets ($CAR < 0$) when a country's GDP per capita is lower than 41,738 USD at PPP constant 2011 ($41,738 = e^{5.16/0.485}$). Countries in this category are mainly lower- and middle-income such as Poland, Mexico, China, Thailand, Brazil, Malaysia, and Turkey. On the other hand, billionaires are considered economic liabilities ($CAR > 0$) when a country's GDP per capita is higher than 41,738 USD. Countries in this category include, for example, Switzerland, Canada, United States, and Sweden. Overall, the result in this subsection indicates that the market deems billionaires in low- and middle-income countries as economic assets, while it deems billionaires in high-income countries as economic liabilities.

3.5.6 Family succession and the market reactions

Theory suggests that the sudden decline of the market index reflects the value of billionaires *relative* to their heirs. This brings up the issue of family succession to our analysis. In this subsection, I investigate how family succession affects the market reactions to the sudden losses of billionaires. Firm-level results from the literature suggest the following two variables that can be used to study how family succession in a big business group may play a role in the observed market-level reactions. The first variable is a billionaire's multiple sons dummy which equals one if the billionaire has more than one son, and zero otherwise. This variable provides the information on potential family feud over the business group's assets. Bertrand et al. (2008) find that a higher number of sons is associated with lower firm performance, especially when the founder is dead. This is because equally powerful heirs to the business group creates a "race to the bottom" in which they compete to siphon off firm resources. If business groups set up barriers against new entrants in order to prevent competition, their demise or underperformance brought about by multiple heirs should be beneficial to the market. Therefore, the market should react more positively when the departing billionaire has multiple sons. To test this hypothesis, I regress a cross-section of CARs on the billionaire's multiple sons dummy and present the result in columns (1) to (3) in Table 3.10. The coefficient on this dummy variable is positive for all three event windows; and in an event window [-1, 2], the coefficient is positive and statistically significant. This result lends support to the hypothesis that succession in a big business group matters at the market level.

[Insert Table 3.10 about here.]

The second variable is an indicator variable which equals one when the successor's education is science-related. This variable is modified from the finding on a successor's capability and firm value by Perez-Gonzalez (2006). His study shows that US family firms underperform after their founders step down and pass on their control to family successors. However, such underperformance is only observed in firms whose successors do not hold a degree from elite institutions in the United States. In other words, successors who hold elite degrees are capable and do not cause the firm underperformance. Because *elite institution* is difficult to define in a global context, I use degrees in science-oriented disciplines, namely science, engineering, economics, management and law to proxy the successor's capability. More capable successors should invest less in their inherited political connection, implying lower market barriers to other non-group firms. Thus, the market should react more positively when highly capable heirs are succeeding. To test this hypothesis, I regress a cross-section of CARs around billionaire departures on the successor's education dummy variable and report the result in columns (4) to (6) in Table 3.10. The coefficient on the dummy variable is positive in all event windows and statistically significant in two out of three windows. This result indicates that the market index in fact drops less when the successor is more capable and that business group succession matters to the entire market.

3.5.7 Reactions of group and non-group firms to sudden losses of billionaires

The previous subsection shows that the reactions of a country's market portfolio to billionaire departures vary across different levels of economic development. In this subsection, I further explore the differential impact of billionaires on the firms they control and the rest of the market. I divide a country's market portfolio into two sub-portfolios—a) firms under a billionaire's control (group-firms portfolio), and b) the rest of the market (non-group-firms portfolio). To explore what factors might affect these two portfolios, I use the following variables as factors that may be able to determine the differential reactions of group firms and non-group firms. The first variable is the anti-director-rights index (Spamann, 2010), which proxies for the level of shareholder protection. Higher values of this index indicate stronger shareholder protection. The second variable is country market capitalization as a percentage of GDP, which proxies for stock market development (Djankov, La Porta, de Silanes, and Shleifer, 2008). The third variable is a founder dummy variable which equals one if the departing billionaire is a founder of the business group and zero otherwise. This variable is a proxy for a billionaire's entrepreneurial capability (Morck et al., 2000). Finally, I use family wealth (%GDP), group's sales (%GDP) and group's equity (%country market capitalization) as proxies for the size of the billionaire's business group relative to that of his host economy. Table 3.3 provides definitions and data sources of these variables.

To explore if the above variables affect the reactions of group firms and non-group firms, I regress a cross-section of CARs around billionaire departures from the two portfolios on each of the above variables. As before, the sample used in this analysis is constrained to only billionaires with public firms because their reactions are observable. The sample size is reduced from 65 to 38 billionaire departures. To reduce the effect of outliers, I delete three observations with the highest values of Cook's distance.

[Insert Table 3.12 about here.]

Panel A in Table 3.12 presents the results for group-firms reactions. The coefficients on the anti-director-rights index and the country market capitalization (% GDP) are negative and statistically significant. This result indicates that billionaires are more valuable to their own firms in countries with higher shareholder protection and more developed financial markets. This might be because, in a country with good legal and financial institutions, a billionaire must possess high entrepreneurial ability in order to survive in a competitive environment. Group size and a billionaire's entrepreneurial capability do not appear to affect his own firms' reactions. The insignificant result observed may be, however, due to the sample size being small, which in turn weakens the statistical power. Therefore, we cannot conclude that the group size and a billionaire's entrepreneurial capability do not affect the firms they control.

Panel B in Table 3.12 presents the results for non-group firm reactions. The reactions of non-group firms appear to be affected by the departing billionaire's capability and group size. The negative and significant coefficient of the founder dummy suggests that billionaires are in fact valuable to firms outside of their business groups if they are founders. This result is consistent with Morck et al. (2000), who find that countries with higher fractions of founder billionaires' wealth as a percentage of GDP grow more rapidly. The coefficients on proxies for group size are all positive, and two of them, namely Family wealth (%GDP) and Group's equity (% country market cap), are statistically significant. This result suggests that non-group firms react more positively when billionaires who control larger business groups suddenly lose power. In other words, the larger the business group, the more negative impact billionaires have on firms outside of their control.

In summary, Table 3.12 indicates that non-group firms regard the departure of billionaires with large business groups as good news, and the departure of founder billionaires as bad news. Additionally, billionaires are more valuable to the firms they control in countries with higher shareholder protection and more developed financial markets.

3.6 Conclusions

This paper provides evidence that big business group controllers have a significant impact not only on their firms but also on the whole market. I employ their sudden deaths and major hospitalizations as exogenous shocks to the equity market. The sample covers 65 events from 31 countries around the world. I find that the market index indeed becomes significantly more volatile around the day a billionaire suddenly passes away or is hospitalized. Moreover, an increase in the volatility is larger in less developed countries, suggesting that billionaires are more influential in these countries.

Furthermore, CARs of the market index are negative around the day a billionaire suddenly loses power. Consistent with the notion that large business groups are important in the early stage of industrialization (Khanna and Yafeh, 2007; Morck and Nakamura, 2007), the regression analysis shows that CARs are negative in low-income countries and positive in high-income ones.

The final investigation also shows that billionaires are more important to their own business groups when their host countries have stronger shareholder protection and more developed financial markets. Moreover, billionaires are beneficial to firms outside of their control when they are founders of the groups. However, they are detrimental to such firms when their group size is large relative to the market.

3.7 Appendix: Test Procedures for the Volatility Event Study

I follow Patell (1976) for the derivations of significance tests for daily and cumulative abnormal returns, and daily abnormal volatility. With these measures, I define cumulative abnormal volatility and derive its significance test. To begin with, I assume that the joint distribution of idiosyncratic returns is stationary and serially independent through time. Specifically,

$$E[\epsilon_{it}] = 0 \tag{3.13}$$

and

$$Cov(\epsilon_{it}, \epsilon_{i\tau}) = \begin{cases} \sigma_i^2 & \text{, if } t = \tau \\ 0 & \text{, otherwise} \end{cases} \tag{3.14}$$

It follows that, for a country i around the event day:

$$Cov(AR_{it}, AR_{i\tau}) = \begin{cases} C_{it}\sigma_i^2 & \text{, if } t = \tau \\ 0 & \text{, otherwise.} \end{cases} \tag{3.15}$$

where C_{it} is the factor that reflects an increase in variance due to out-of-sample prediction and has the value close to 1 if the estimation window is sufficiently long (Patell, 1976).

Let s_i^2 denote an unbiased estimate of σ_i^2. s_i^2 can be estimated from the market model residuals as follows:

$$s_i^2 = \frac{1}{T-K}\sum_{t=1}^{T}\hat{\epsilon}_{it}^2 \tag{3.16}$$

where $K = 1$ if the constant mean model (3.3) is used, and $K = 4$ if the 3-factor global-market benchmarking model (3.2) is used. With OLS and stationary returns assumptions, we have that:

$$\frac{AR_{it}}{\sigma_i\sqrt{C_{it}}} \sim N(0,1) \tag{3.17}$$

$$\frac{(T-K)s_i^2}{\sigma_i^2} \sim \chi^2(T-K). \tag{3.18}$$

Thus,

$$SAR_{it} \triangleq \frac{AR_{it}}{s_i\sqrt{C_{it}}} \sim t(T-K). \tag{3.19}$$

where SAR_{it} is the Standardized Abnormal Return.

Define a Cumulative Abnormal Return for a country i during an event window $[\tau_1, \tau_2]$, CAR_i, as:

$$CAR_i \triangleq \sum_{t=\tau_1}^{\tau_2} AR_{it}. \tag{3.20}$$

The following Cumulative Standardized Abnormal Return during an event window $[\tau_1, \tau_2]$, $CSAR_i$, is Student-t distributed with $T-K$ degrees of freedom:

$$CSAR_i \triangleq \frac{1}{\sqrt{\tau_2-\tau_1+1}}\sum_{t=\tau_1}^{\tau_2} SAR_{it} \sim t(T-K). \tag{3.21}$$

Since we are interested in the significance of abnormal returns across a cross-section of N independent events, the Central Limit Theorem implies that the average standardized (daily or cumulative) abnormal return across N events is normally distributed and we can use the following Z-statistic to test its significance:

$$Z_{AR,t} = \frac{\sum_{i=1}^{N} SAR_{it}}{\sqrt{\sum_{i=1}^{N}\frac{T_i-K}{T_i-K-2}}} \sim N(0,1) \tag{3.22}$$

and

$$Z_{CAR} = \frac{\sum_{i=1}^{N} CSAR_i}{\sqrt{\sum_{i=1}^{N}\frac{T_i-K}{T_i-K-2}}} \sim N(0,1) \tag{3.23}$$

where T_i is the length of estimation window for a country i, which can be different across the sample due to data unavailability.

I now turn to the tests for abnormal volatility. Define an Abnormal Volatility of country i day t, AV_{it}, as follows:

$$AV_{it} \triangleq AR_{it}^2. \tag{3.24}$$

Using (3.17) and (3.18), the following Standardized Abnormal Volatility, SAV_{it} is F-distributed:

$$SAV_{it} \triangleq \frac{AR_{it}^2}{C_{it}s_i^2} \cdot \frac{T_i - K - 2}{T_i - K} \sim F(1, T_i - K) \tag{3.25}$$

with

$$E[SAV_{it}] = 1 \tag{3.26}$$

$$Var[SAV_{it}] = \frac{2(T_i - K - 1)}{T_i - K - 4}. \tag{3.27}$$

With a cross-section of N independent events, the Central Limit Theorem implies that the average standardized abnormal volatility is normally distributed and the following Z-statistic can be used to test its significance:

$$Z_{SAV,t} = \frac{\left(\frac{1}{N}\sum_{i=1}^{N} SAV_{it}\right) - 1}{\sqrt{\frac{1}{N^2}\sum_{i=1}^{N}\frac{2(T_i-K-1)}{T_i-K-4}}} \sim N(0,1). \tag{3.28}$$

Let a Cumulative Abnormal Volatility during an event window $[\tau_1, \tau_2]$, CAV_i, be defined as:

$$CAV_i \triangleq \sum_{t=\tau_1}^{\tau_2} AR_{it}^2. \tag{3.29}$$

The Cumulative Standardized Abnormal Volatility, $CSAV_{it}$, is then given by:

$$CSAV_{it} \triangleq \sum_{t=\tau_1}^{\tau_2} SAV_{it} \tag{3.30}$$

with

$$E[CSAV_{it}] = \tau_2 - \tau_1 + 1, \tag{3.31}$$

$$Var[CSAV_{it}] = \frac{2(T_i - K - 1)}{T_i - K - 4} \cdot (\tau_2 - \tau_1 + 1). \tag{3.32}$$

Again, with a cross-section of N independent events, the Central Limit Theorem allows us to ignore the distribution of $CSAV_{it}$. Thus, it follows that the average cumulative standardized abnormal volatility is normally distributed and the following Z-statistic can be used to test its significance:

$$Z_{CAV} = \frac{\left(\frac{1}{N}\sum_{i=1}^{N} CSAV_i\right) - (\tau_2 - \tau_1 + 1)}{\sqrt{\frac{\tau_2-\tau_1+1}{N^2}\sum_{i=1}^{N}\frac{2(T_i-K-1)}{T_i-K-4}}} \sim N(0,1). \tag{3.33}$$

Figures

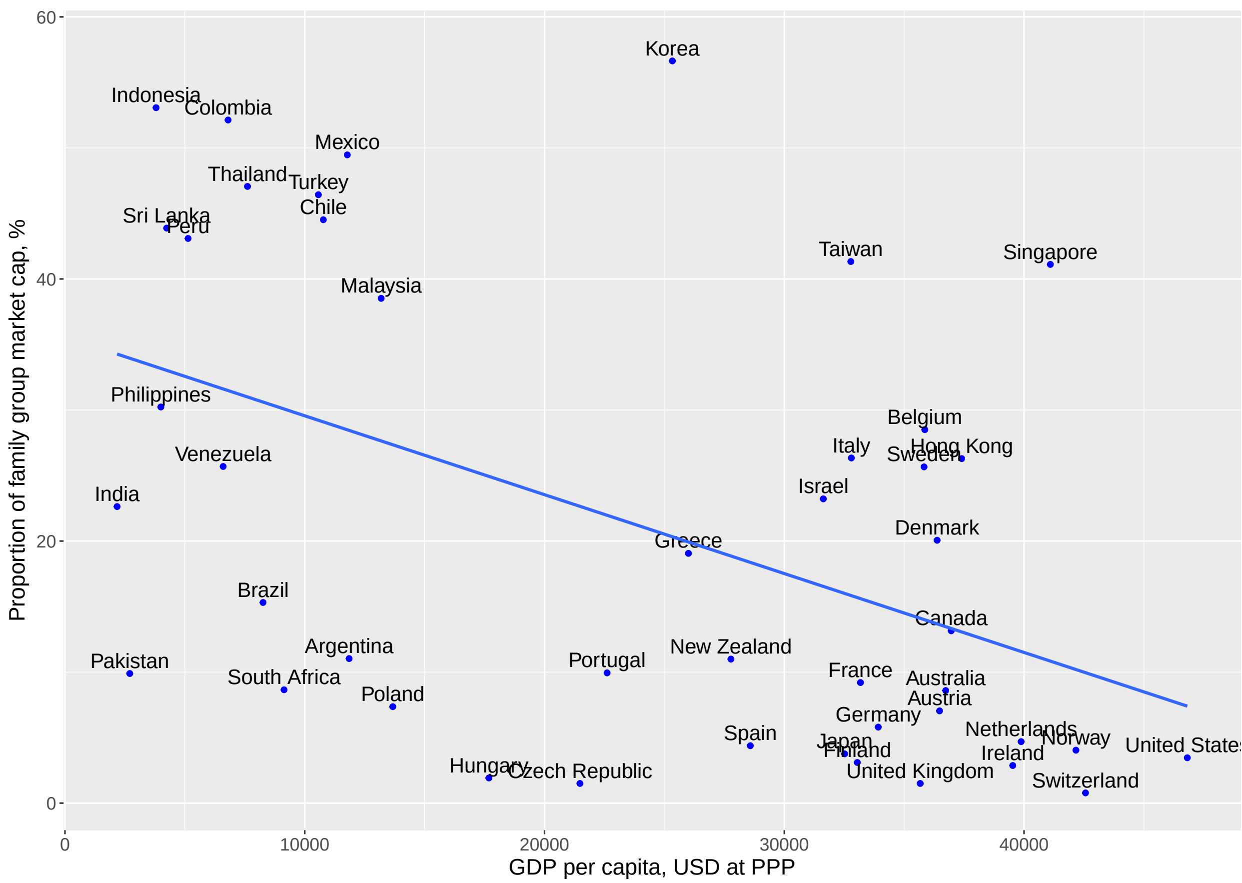

Figure 3.1: Percentage of total market capitalization held by family business groups and GDP per capita. Data as of 2002 (Masulis et al., 2011).

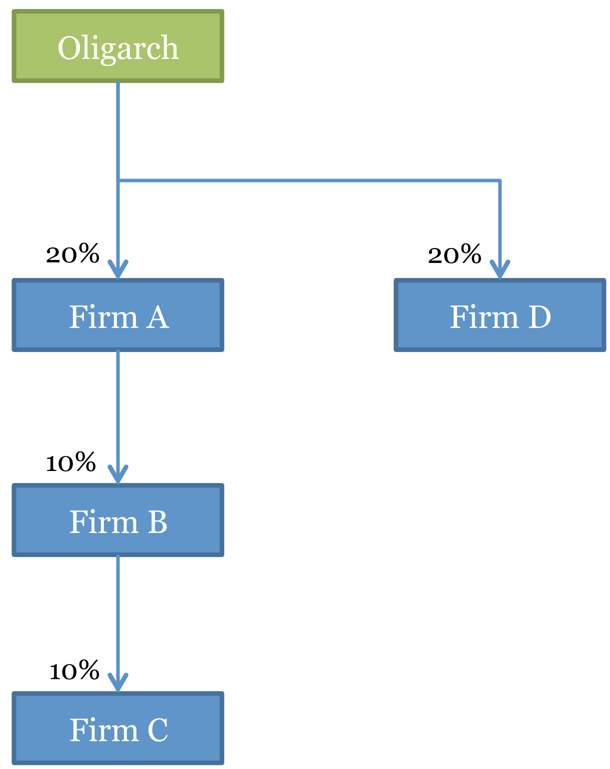

Figure 3.2: A Hypothetical Ownership Structure

Tables

Table 3.1: The Events

This table provides the causes of death or incapacitation of billionaires in the sample. An event is defined as the one that suddenly puts a billionaire (those listed in the Forbes lists of billionaires from 1987 to 2017) out of power. Such an event includes, for example, sudden death, traumatic health condition and assassination.

Event	Number of Cases	Percentage of Total
Sudden Death	**39**	**60.00%**
Accident, car, helicopter or plane crash	5	7.69%
Accident, drowned	2	3.08%
Accident, during a recreational activity	2	3.08%
Accident, fell down	2	3.08%
Complication from a minor surgery	3	4.62%
Phlegm, which caused throat obstruction, difficulty breathing, and heart failure	1	1.54%
Traumatic heart attack, heart failure or cardiac arrest	19	29.23%
Sudden death whose cause was undisclosed by the family	5	7.69%
Incapacitation	**18**	**27.69%**
Hospitalized for a critical condition	4	6.15%
Hospitalized for a brain surgery after falling down	1	1.54%
Hospitalized for a traumatic heart attack, heart failure, cardiac arrest or stroke	8	12.31%
Rumors on their death or critical condition broke out	3	4.62%
The hospital announced his critical condition	2	3.08%
Others	**8**	**12.31%**
Arrested for bribery and fraud allegation	2	3.08%
Assassinated	2	3.08%
Kidnapped and disappeared	1	1.54%
Suicide	3	4.62%
Total	**65**	**100.00%**

Table 3.2: Sample distribution by country

This table provides the sample distribution by country. The sample includes billionaires (those listed in the Forbes lists of billionaires from 1987 to 2017) who died or were incapacitated suddenly while still in power.

	Number of Cases	Percentage of Total		Number of Cases	Percentage of Total
Asia and Oceania	**28**	**43.08%**	**Europe**	**23**	**34.38%**
Australia	1	1.54%	Austria	1	1.54%
Bahrain	1	1.54%	Denmark	1	1.54%
China	1	1.54%	France	4	6.15%
Hong Kong	6	9.23%	Germany	3	4.62%
India	2	3.08%	Italy	3	4.62%
Israel	1	1.54%	Netherlands	1	1.54%
Kuwait	2	3.08%	Poland	2	3.08%
Malaysia	1	1.54%	Portugal	2	3.08%
Philippines	1	1.54%	Spain	1	1.54%
Singapore	2	3.08%	Switzerland	1	1.54%
South Korea	3	4.62%	United Kingdom	4	6.15%
Taiwan	3	4.62%			
Thailand	1	1.54%	**South America**	**9**	**13.85%**
Turkey	3	4.62%	Argentina	3	4.62%
			Brazil	3	4.62%
North America	**5**	**7.69%**	Chile	1	1.54%
Canada	3	4.62%	Peru	2	3.08%
Mexico	2	3.08%			
Total	**65**	**100.00%**			

Table 3.3: Variable Definitions and Data Sources

This table reports the description of main variables and their sources. The value of each variable is as of the year when a billionaire in the sample died or was incapacitated, unless stated otherwise.

Variable	Definition and Data Source
log(GDP)	A natural logarithm of a country's GDP at purchasing power parity (constant 2011 international \$). Source: World Bank Data.
log(GDP per capita)	A natural logarithm of a country's GDP per capita at purchasing power parity (constant 2011 international \$). Source: World Bank Data.
Corruption index	A measure of corruption perceived by experts which ranges from 0 to 100. Higher value indicates lower corruption perception. A median from the latest 5-year panel (2012-2016) is used. Source: Transparency International
Anti-director rights index	A revised measure of aggregate shareholder rights which ranges from 1 to 5. Higher value indicates higher shareholder protection. Source: Spamann (2010).
Country market cap (%GDP)	Total market capitalization of listed domestic companies, scaled by a country's current GDP. Source: World Bank Data.
Founder dummy	An indicator variable equal to one if the billionaire is the founder of his business group, and zero otherwise. Source: Google, Factiva, Forbes magazines, corporate websites and annual reports.
Multiple sons dummy	An indicator variable equal to one if the number of the billionaire's sons is more than one, and zero otherwise. Source: Google, Factiva, Forbes magazines, corporate websites and annual reports.
Heir with science education dummy	An indicator variable that equals one if the successor's education is science, engineering, economics, management or law, and zero otherwise. Source: Google, Factiva, Forbes magazines, corporate websites and annual reports.
Family wealth (%GDP)	Total wealth of the billionaire's family members as of the event year. If wealth in the event year is not available, wealth in the nearest ± 5 years from the event year is used. The total wealth is then scaled by a country's current GDP. Source: Forbes magazines.
Group's sales (%GDP)	Total sales of a group of listed firms controlled by the billionaire, scaled by a country's current GDP. Source: Datastream item "WC01001" for a firm's total sales and World Bank data for current GDP.
Group's equity (%C'try Market Cap)	Total value of common equity of listed firms controlled by the billionaire, scaled by a country's total market capitalization. Source: Datastream item "WC03501" for a firm's common equity and World Bank data for a total market capitalization.

Table 3.4: Summary statistics

This table reports summary statistics of the main variables. Data and variables are defined in Table 3.3. The value of each variable is as of the year a sample billionaire was incapacitated or died, unless stated otherwise.

	N	Mean	SD	Min	p25	p50	p75	Max
GDP (billion USD at PPP)	65	1,325	1,499	50.3	354	961	1,890	10,500
GDP per capita (USD at PPP)	65	28,637	16,243	2,172	14,103	31,018	38,509	77,126
Corruption index	65	39.94	17.64	9.00	25.00	39.00	57.00	66.00
Anti-director-rights index	62	3.71	1.11	1.00	3.00	3.75	5.00	5.00
C'try market cap (%GDP)	62	142.68	264.02	2.56	29.82	54.14	105.18	1,078.3
Founder dummy	65	0.58	0.5	0	0	1	1	1
Number of sons	59	2.02	1.7	0	1	2	3	8
Heir with science education	65	0.51	0.5	0	0	1	1	1
Family wealth (%GDP)	50	1.33	1.85	0.03	0.19	0.50	1.84	6.96
Group's sales (%GDP)	38	4.81	6.49	0.01	0.48	1.63	5.63	25.33
Group's equity (%C'try market cap)	35	4.92	8.31	0.01	0.20	1.13	5.26	30.94

Table 3.5: Daily abnormal volatility around billionaire departures

This table reports daily abnormal volatility around billionaire departures. The event day ($t = 0$) is defined as the day the incapacitation or death occurs. If it is found that the event occurs after trading hours, the event day is set to the next trading day. Average standardized daily abnormal volatility minus its expected value is reported due to its simple interpretation—positive value indicates an increase in volatility, while negative value indicates a decrease. To attenuate the effects of outliers, daily abnormal volatility is winsorized at 5% level, i.e. 2.5% at both ends of the distribution. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Event day	N	Average $SAV - E[SAV]$	$p-$Value
-5	65	0.227	0.201
-4	65	0.283	0.112
-3	65	0.224	0.208
-2	65	-0.252	0.156
-1	65	0.370**	0.038
0	65	0.123	0.488
1	65	-0.146	0.411
2	65	0.149	0.403
3	65	0.070	0.694
4	65	-0.060	0.736
5	65	-0.191	0.280

Table 3.6: Cumulative abnormal volatility around billionaire departures

This table reports cumulative abnormal volatility around billionaire departures. The event day ($t = 0$) is defined as the day the incapacitation or death occurs. If it is found that the event occurs after trading hours, the event day is set to the next trading day. Average standardized cumulative abnormal volatility minus its expected value is reported due to its simple interpretation—positive value indicates an increase in volatility, while negative value indicates a decrease. Results are reported for full sample and subsample that contains only billionaires with public firms. For the subsample results, abnormal volatilities from three different portfolios—entire market, non-group firms, and group firms—are presented. Standardized cumulative abnormal volatility is winsorized at 5% level, i.e. 2.5% at both ends of the distribution, to attenuate the effects of outliers. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Event window	All billionaires	Billionaires with public firms		
	Entire market	Entire market	Non-group firms	Group firms
	(1)	(2)	(3)	(4)
[-1, 0]	0.534**	0.738**	0.487	0.420
	($p = 0.034$)	(0.025)	(0.138)	(0.202)
	[$N = 65$]	[38]	[38]	[38]
[-1, 1]	0.441	0.666*	0.464	3.259***
	(0.152)	(0.098)	(0.250)	(0.000)
	[65]	[38]	[38]	[38]
[-1, 2]	0.784**	1.205***	0.591	3.412***
	(0.027)	(0.010)	(0.204)	(0.000)
	[65]	[38]	[38]	[38]

Table 3.7: Where are billionaires more influential?

This table reports the varying degree of the billionaire influence over different levels of economic development. The billionaire influence of country i over an event window $[\tau_1, \tau_2]$ is defined as $\log(\sum_{t=\tau_1}^{\tau_2} AR_{it}^2)$. A cross-section of billionaire influence over three different event windows is the dependent variable. The level of economic development as measured by log(GDP per capita) is an independent variable. The size of a country's economy as measured by log(GDP) is a control variable. Regressions are run with OLS technique. To reduce the effects of outliers, three observations (approximately 5% of the sample) with the highest Cook's distances are deleted. $p-$values of coefficients are reported in parentheses. Residuals are tested for whether they are normally distributed using the Shapiro-Wilk test. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Dependent Var = Cumulative Abnormal Volatility	[-1, 0]	[-1, 1]	[-1, 2]	[-1, 0]	[-1, 1]	[-1, 2]
	(1)	(2)	(3)	(4)	(5)	(6)
log(GDP per capita)	-0.641***	-0.517***	-0.324*	-0.64***	-0.51**	-0.44**
	(0.008)	(0.008)	(0.069)	(0.009)	(0.011)	(0.020)
log(GDP)				0.089	0.075	0.014
				(0.626)	(0.602)	(0.923)
Intercept	-2.51	-3.36*	-4.92***	-4.96	-5.55	-4.10
	(0.295)	(0.083)	(0.007)	(0.375)	(0.232)	(0.369)
R^2	0.11	0.11	0.05	0.11	0.11	0.09
N	62	62	62	62	62	62
$p-$Value of residual normality test	0.879	0.718	0.200	0.960	0.703	0.312

Table 3.8: Does corruption help increase billionaire influence?

This table shows the effects of corruption on billionaire influence. Billionaire influence of country i over an event window $[\tau_1, \tau_2]$ is defined as $\log(\sum_{t=\tau_1}^{\tau_2} AR_{it}^2)$. A cross-section of billionaire influence over two different event windows is used as a dependent variable. The Corruption Index is a measure of corruption levels as perceived by experts from Transparency International. The index is linearly modified such that higher value indicates more corruption, i.e., Corruption Index = 100 − Original Corruption Index. log(GDP per capita) measures levels of economic development. Regressions are run with OLS technique. To reduce the effects of outliers, three observations (approximately 5% of the sample) with the highest Cook's distances are deleted. $p-$values of coefficients are reported in parentheses. Residuals are tested for whether they are normally distributed using the Shapiro-Wilk test. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Dependent Var = Cumulative Abnormal Volatility	[-1, 0]	[-1, 1]	[-1, 2]	[-1, 0]	[-1, 1]	[-1, 2]
	(1)	(2)	(3)	(4)	(5)	(6)
Corruption Index	0.0206**	0.0203**	0.017**	-0.482*	-0.498**	-0.304
	(0.047)	(0.024)	(0.036)	(0.053)	(0.026)	(0.145)
log(GDP per capita)				-3.07**	-3.12**	-1.96
				(0.035)	(0.017)	(0.107)
Corruption Index × log(GDP per capita)				0.048**	0.0492**	0.0306
				(0.044)	(0.022)	(0.124)
Intercept	-9.76***	-9.36***	-8.84***	22.3	23.4*	11.7
	(0.00)	(0.00)	(0.00)	(0.141)	(0.085)	(0.357)
R^2	0.06	0.08	0.07	0.166	0.175	0.131
N	62	62	62	62	62	62
$p-$value of residual normality test	0.369	0.644	0.242	0.563	0.786	0.105

Table 3.9: Cumulative abnormal returns around billionaire departures

This table reports cumulative abnormal returns, CAR, around billionaire departures. The event day ($t = 0$) is defined as the day the incapacitation or death occurs. If it is found that the event occurs after trading hours, the event day is set to the next trading day. CAR of country i over an event window $[\tau_1, \tau_2]$ is defined as $CAR_i = \sum_{t=\tau_1}^{\tau_2} AR_{it}$ where AR is abnormal return. CARs are from three different portfolios: 1) Entire market contains all firms in the market, 2) Group firms contain all firms controlled by the billionaire, and 3) Non-group firms contain the remaining firms in the market. CAR is winsorized at 5% level, i.e. 2.5% at both ends of the distribution, to attenuate the effects of outliers. $p-$value and sample size are shown in parentheses ( ) and brackets [ ], respectively. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Event window	All billionaires	Billionaires with public firms			
	Entire market	Entire market	Non-group firms	Group firms	Difference Group−Nongroup
	(1)	(2)	(3)	(4)	(5)
[-1, 0]	-0.269 **	-0.0609	-0.124	-0.763	-0.639
	($p = 0.0161$)	(0.385)	(0.653)	(0.217)	(0.233)
	[$N = 65$]	[38]	[38]	[38]	
[-1, 1]	-0.311 **	-0.18	-0.226	-0.744 *	-0.518
	(0.0191)	(0.585)	(0.752)	(0.083)	(0.248)
	[65]	[38]	[38]	[38]	
[-1, 2]	-0.516	-0.273	-0.367	-1.34 **	-0.969
	(0.211)	(0.788)	(0.631)	(0.013)	(0.228)
	[65]	[38]	[38]	[38]	

Table 3.10: Family succession and the market reactions

This table shows the impact of family succession on the market-level reactions. Market reactions are measured by cumulaive abnormal return, CAR, of the market index around the billionaire's departure. CAR of country i over an event window $[\tau_1, \tau_2]$ is defined as $CAR_i = \sum_{t=\tau_1}^{\tau_2} AR_{it}$ where AR is an abnormal return. A cross-section of CARs from three different windows is the dependent variable. Multiple sons dummy is an indicator variable equal to one if the number of the billionaire's sons is more than one, and zero otherwise. More sons implies higher likelihood of family feud over inheritance. Heir with science education dummy is an indicator variable which equals one when the educational degree of the billionaire's successor is related to science. Science education proxies for the successor's capability. A more capable successor implies less reliance on political connections, and hence lower entry barriers. Regressions are run with OLS technique. To reduce the effects of outliers, three observations with the highest Cook's distances are deleted. $p-$values of coefficients are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Dependent Var = Cumulative Abnormal Return	[-1, 0]	[-1, 1]	[-1, 2]	[-1, 0]	[-1, 1]	[-1, 2]
	(1)	(2)	(3)	(4)	(5)	(6)
Multiple sons dummy	0.278	0.735	0.767*			
	(0.463)	(0.110)	(0.093)			
Heir with science education dummy				0.616*	0.703*	0.128
				(0.084)	(0.098)	(0.775)
Intercept	-0.279	-0.472*	-0.729**	-0.478*	-0.531*	-0.508
	(0.228)	(0.093)	(0.010)	(0.059)	(0.077)	(0.112)
R^2	0.009	0.042	0.046	0.049	0.045	0.001
N	62	62	62	62	62	62

Table 3.11: Where are billionaires more valuable?

This table shows the differential value of billionaires in different levels of economic development. A billionaire's value is measured by cumulaive abnormal return of the market index around his departure. CAR of country i over an event window $[\tau_1, \tau_2]$ is defined as $CAR_i = \sum_{t=\tau_1}^{\tau_2} AR_{it}$ where AR is abnormal return. A cross-section of CARs is the dependent variable. log(GDP per capita) measures levels of economic development. Regressions are run with OLS technique. To reduce the effects of outliers, three observations (approximately 5% of the sample) with the highest Cook's distances are deleted. $p-$values of coefficients are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Dependent Var = Cumulative Abnormal Return	[-1, 0]	[-1, 1]	[-1, 2]
	(1)	(2)	(3)
log(GDP per capita)	0.485**	0.421	0.536*
	(0.05)	(0.22)	(0.071)
Intercept	-5.16**	-4.64	-5.99**
	(0.04)	(0.181)	(0.047)
R^2	0.062	0.025	0.053
N	62	62	62

Table 3.12: The impact of billionaires on their firms and the rest of the market

This table shows the impact of billionaires on their firms and the rest of the market. Cross-sections of cumulative abnormal returns over [-1, 2] from a) all firms controlled by the billionaire (group firms) and b) the rest of the market (non-group firms) are used as the dependent variable. Definitions of independent variables are given in Table 3.3. Regressions are run with OLS technique. To reduce the effects of outliers, three observations with the highest Cook's distances are deleted. $p-$values of coefficients are reported in parentheses. ***, ** and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Dependent Var = Cumulative Abnormal Return	[-1, 2]	[-1, 2]	[-1, 2]	[-1, 2]	[-1, 2]	[-1, 2]
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Group Firms						
Anti-director-rights index	-2.16**					
	(0.014)					
Country market capitalization (%GDP)		-0.917**				
		(0.018)				
Founder dummy			-0.531			
			(0.728)			
Family wealth (%GDP)				0.364		
				(0.627)		
Group's sales (%GDP)					0.0502	
					(0.57)	
Group's equity (%C'try market cap)						0.0236
						(0.747)
Intercept	7.11**	0.467	-0.509	-1.40	-0.392	-0.469
	(0.044)	(0.634)	(0.659)	(0.267)	(0.603)	(0.535)
R^2	0.18	0.174	0.004	0.009	0.011	0.004
Panel B: Non-group firms						
Anti-director-rights index	-0.22					
	(0.489)					
Country market capitalization (%GDP)		-0.18				
		(0.104)				
Founder dummy			-1.21*			
			(0.063)			
Family wealth (%GDP)				0.341*		
				(0.066)		
Group's sales (%GDP)					0.075	
					(0.139)	
Group's equity (%C'try market cap)						0.0941**
						(0.029)
Intercept	0.549	-0.108	0.438	-0.557	-0.651	-0.826**
	(0.681)	(0.76)	(0.375)	(0.128)	(0.119)	(0.03)
R^2	0.016	0.086	0.101	0.124	0.069	0.159
N	33	32	35	28	33	30

Chapter 4

The Value of Oligarchs: Evidence from Russia

4.1 Introduction

A relatively small number of industrial tycoons, sometimes dubbed "oligarchs," control a substantial share of the economy in many emerging markets through the use of business groups[1]. Several theories have been proposed in an attempt to rationalize their presence and comprehend their function, such as transaction cost theory, agency theory, and political economy. These theories often lead to conflicting conclusions regarding the value of oligarchs and the nature of the business groups that they control. As an illustration, the transaction cost theory focuses on market failures and institutional voids that create benefits to group formation (Morck and Yeung, 2004). Affiliation to a business group can lift performance as it allows firms to internalize market transactions and form networks of value-fostering relationships that reduce transaction costs. Furthermore, internal markets may permit firms to transfer financial resources between one another, establishing group survival by reducing group risk. These advantages may be stronger in emerging markets, where external markets are less developed and institutional voids more severe. In short, the internal markets within business groups bring lower transaction costs and better risk-sharing, suggesting that oligarchs are potential economic trailblazers and value creators.

Against this positive view of oligarchs and their business groups is the agency view, which posits that business groups in emerging markets are beset by compounded agency and coordination problems. This prompts inefficiency, political rent-seeking, and stagnant

[1]See, among others, La Porta et al. (1999) for high and middle-income countries, Claessens et al. (2000) for nine East Asian countries, and Faccio and Lang (2002) for western European countries.

economic growth (Morck et al., 2005). In other words, oligarchs are more likely to be economic entrenchers and value destroyers.

These theoretical predictions are mirrored by the empirical findings of cross-country studies, as business groups and the oligarchs who create them can either be "paragons" or "parasites," depending on the particular economic conditions that most emerging markets face (Khanna and Yafeh, 2007). We therefore focus on a unique emerging market, Russia, in this study. The post-communist economic transition in Russia offers rare insights into the historical features of business groups because it epitomizes a situation where market deficits were severe, institutional development was in progress, and business groups were relatively young. In Russia, reforms that aim at replacing state planning and ownership with a market economy were instituted in 1991. Before the turn of the century, large business groups controlled by wealthy individuals, a.k.a. "the oligarchs," had emerged. It is noteworthy that Russian business groups became the ruling economic force in just a little over a decade. Dramatic accumulation of private wealth happened along the way—according to Forbes, the six wealthiest individuals in Russia possessed over $5 billion worth of assets in 2003.

We argue that the unusual historical backdrop under which the Russian oligarchs came into prominence better enables us to identify firm values that are directly attributable to oligarchs amongst competing channels than the cross-country setting employed by previous studies. Section 4.2 sketches the characteristics of these oligarchs and their business groups. Another advantage of singling out the country of Russia is that political unrest in that country offers reasonably exogenous shocks which permit us to even better isolate the value impact an oligarch exercises on the group of firms under his control. Specifically, we conduct an event study on seven unanticipated arrests of Russian oligarchs, mostly politically motivated[2], between 2000 and 2019. If these oligarchs are dismissed as "parasites" in Russia, we would expect to see a certain degree of positive reaction from the stock market upon their arrests. On the other hand, if these oligarchs are cheered as "paragons" instead,

[2]Cases against the following persons are potentially politically-motivated: Vladimir Gusinsky, Mikhail Khodorkovsky, Vladimir Yevtushenkov, Ziyavudin Magomedov, Mikhail Abyzov. See Table 4.2 for more details.

the opposite is true.

Because we expect that an oligarch's arrest affects all firms in the Russian stock market, the reactions of these firms can co-move within each arrest event. We account for such co-movements by extending the event-study methodology proposed by Kolari and Pynnönen (2010). Using our extended methodology and a detailed panel of firm-level data, we find robust evidence that the market reactions to the oligarch arrests are largely negative. The value of an average Russian firm declines by 0.4% on the day of the arrest, with a statistical significance at a 5% level. We then categorize firms into three groups—a) firms under the oligarch control, b) firms within the same industries as the oligarch-controlled firms, and c) firms outside such industries. Results show that firm value drops the most for those controlled by the oligarchs (-15%, p-value of 0.006), less for the other firms within the same industries as the oligarch-controlled firms (-0.6%, p-value of 0.06), and the least for the firms outside the industries that oligarch-controlled firms belong to (-0.3%, p-value of 0.26). Next, we investigate the factors that magnify or alleviate this propagation of oligarch impact. We find that higher leverage lets the oligarch impact propagates throughout the entire market more easily. This might be because investors perceive an oligarch's arrest as a signal that bailouts have become less likely; therefore, more highly-levered firms suffer more value losses.

Our paper contributes to the finance literature in the following ways. First, to the best of our knowledge, this is the first comprehensive study on a single country that infers the value of industrial tycoons from their unforeseen removal from power. Such unanticipated removal allows us to circumvent the endogeneity issues that plague prior studies. Second, contrary to the conventional belief that controlling shareholders are firm-specific risks that can be diversified away, we show that in some economies they can be so economically powerful that they can be considered systematic risks. Finally, we highlight the value of political connections to firms in a developing economy. Our results suggest that the value of Russian oligarchs is as high as 15%, which is clearly non-trivial when compared to the value of US CEOs of approximately 3% (Jenter et al., 2018). This implies that, as a result of corruption, the value of political connections can be as high as 12% of the firm value in Russia.

This paper proceeds as follows. Section 4.2 provides a brief description of the general characteristics of Russian oligarchs and their business groups. Section 4.3 describes the sample construction. Section 4.4 discusses the empirical findings. Section 4.5 offers conclusions.

4.2 General Characteristics of Russian Oligarchs and Business Groups

The post-communist transition in Russia has not been a successful shift to a democratic government or a market economy. Rather, a handful of industrial tycoons, or "oligarchs", have seized control over a sizable share of the economy, via the formation of private business groups, and become politically influential. Although a sizable proportion of the first-wave oligarchs are Communist Party ex-cadres, the majority of the present-day oligarchs could be considered outsiders, who came into prominence without connection to the former communist regime (Hoffman, 2011). They were younger and better educated, in contrast to a smaller number of oligarchs with prior political connections, and more likely to make their initial fortune in industries that were overlooked during the era of state planning. Nonetheless, almost all of the previously unconnected oligarchs established special ties with the Russian government, while accumulating their tremendous wealth.

As Russian business groups came out of a relatively recent period of institutional transition, family ownership is rare compared to other emerging markets. Typically, these business groups are controlled by one individual, i.e., the oligarch, with a controlling stake (Hoffman, 2011). Moreover, control is maintained via direct control of voting shares; hence, pyramid structures are uncommon. Russian business groups in many cases own or control banks and other financial intermediaries. Thanks to the culture which emphasizes mutual favours, the resulting matrix of social connections implies that group members are often linked not just commercially, but socially as well as politically.

In summary, Russian oligarchs and their business groups demonstrate the following characteristics. First of all, initial firm size was the main factor oligarchs considered when selecting group members (Hoffman, 2011). Since Russian oligarchs were usually outsiders to the firms they acquired at the outset of privatization, during which time former state-owned enterprises were auctioned off at prices well below their fair value, the ambitious oligarch would naturally be attracted to larger firms in an attempt to lock in a larger absolute return. Next, vertical integration was the central reason behind the formation of Russian business groups, which is unsurprising given our discussion in Section 4.1. Lastly, these business groups acquired and often kept firms that were downright failing; at the same time, they regularly funded the improvement of member firms' productivity (Shleifer and Treisman, 2005). This is most likely due to the oligarch's goal of ensuring group survival.

4.3 Data Construction

This section presents the data construction process. The ultimate objective is to find the unanticipated arrests of politically connected business individuals or oligarchs in Russia. With these events, we would be able to study how firms create value through these individuals. We define a Russian oligarch as those who have or have had net worth more than one billion dollars and were still in control of a corporation at the time of the arrest. By "in control," we mean that they were holding a top management position, such as chairman or CEO, or were one of the top ten major shareholders of the firm.

4.3.1 The Arrest Events

Forbes' lists of billionaires give a good starting point to search for Russian oligarchs because, by our definition, they have net worths greater than one billion dollars. There are totally 166 Russian billionaires from the period from 1987 to 2019. To search for the arrest events, we put a name of every Russian billionaire from Forbes' lists of billionaires from 1987 to 2019 along with a keyword "arrest" as search inputs for Google. With these search inputs, Google retrieves the internet contents related to the billionaire being searched and the keyword "arrest." Note that it is not necessary to input several keywords with the meanings similar to "arrest" because Google will search for similar keywords automatically. After retrieving the internet contents from Google, we look for news about the billionaire and his arrest, if any. This first screening yields a list of Russian oligarchs who were arrested. However, it is still unclear if these oligarchs were still in power at the time of their arrests. Moreover, these arrests could be anticipated by the market, making it difficult to pin-point the event date. To ensure that they were in power at the time of the arrests and these arrests were unanticipated, we perform the next screening.

In this screening, we ensure that the arrest was unanticipated by checking if the oligarch was jailed after he was arrested. The requirement that the oligarch be put in jail after the arrest ensures that the event was unexpected. This is because if the information about the arrest leaked, the oligarch should have fled the country to avoid the arrest. Next, we verify that the oligarchs obtained in this step were still in control of their firms by checking if they were holding top management positions, such as chairman or CEO, or were one of the top ten major shareholders of those firms at the time of the arrests. This final screening yields seven events of Russian oligarchs who were unexpectedly arrested, jailed, and were also in control of their firms at the time of their arrests. Table 4.2 presents details of these events.

[Insert Table 4.2 about here.]

The events are from the period from 2000 to 2019. The sample oligarchs control diverse business sectors such as media, energy, banking, and oil and gas. We further classify these business sectors into Fama-French 12 industry classifications. Oligarchs with public firms are classified using their firms' eight-digit SIC codes. These oligarchs are Mikhail Khodorkovsky, Nikolai Maximov, and Vladimir Yevtushenkov. For oligarchs with only private firms, thus having no SIC codes, we classify their industries using the information about their business sectors.

Classifying an oligarch's industry might be complicated if he controls several firms which span over several industries. Each oligarch in our sample, however, controlled one large firm or a group of firms that belong to one industry. An exception being Ziyavudin Magomedov who controlled a now bankrupted privately-held investment firm, Summa Group. Because his firm is private, it is difficult to track its control of other firms. However, from our own reading, his investment firms has been specialized in engineering and logistics. We therefore classify Magomedov's industry as "Other–Mines, Construction, Building Materials, Transportation, Hotels, Business Services, and Entertainment."

The classifications for the sample oligarchs are shown in Table 4.2. Note that there is one special case of Nikolai Maximov who were in fact arrested on February 8, 2011. However, before this arrest, the government has frozen his assets on July 9, 2010. We therefore select the latter date as the event date, because it represents the day he lost control of his firm.

4.3.2 Firm-level Data

A typical event study with a market model requires data on a market index and individual stock returns. In this paper, we use the total market index from Datastream (ticker "TOTMKRS") for the market index, because this index is value-weighted and covers all stocks in the market, as opposed to the main Russian market index, MOEX Russia Index, which covers only 50 stocks. Daily stock returns are total returns which include dividends and other payouts. Stock return data obtained from Datastream are known to contain some errors such as misreported dividends and unrealistically large returns (Ince and Porter, 2006). In order to clean the return data from Datastream, we follow the procedures proposed by Schmidt, von Arx, Schrimpf, Wagner, and Ziegler (2017).

In later analyses, we also require data on firm characteristics, namely, total assets, long-term debt, and market-to-book ratios. To retrieve these variables from Datastream, we follow the definitions provided in Liao (2014). Total assets, TotalAsset, are book value of total assets in millions of constant 2000 US dollars ("WC07230"). Long-term debt, LongDebt, is a ratio of long-term debt to book value of assets ("WC03251/WC02999"). Market-to-book ratio, MarketToBook, is defined as (Book value of total assets$-$Book value of equity$+$Market value of equity)/Book value of assets ("(WC02999$-$(WC05491$\times$WC05301)$+$WC08001)/WC02999").

4.3.3 Summary Statistics

Table 4.3 provides summary statistics of the sample. Sample firms include all firms listed in the Russian stock market at the times of the arrests. Since there are seven arrest events, we stagger all firms from all events to form the final sample.

[Insert Table 4.3 about here.]

Panel A shows summary statistics of firm characteristics for the full sample. There are totally 565 sample firms. The sample size of each variable varies due to data unavailability. On average, a sample firm finances 20% of its capital with long-term debt. The median market-to-book ratio is approximately 108%. The median total assets are 2 millions US dollars.

Panel B shows summary statistics of firm characteristics by distance from the oligarch's firms. We define distance from the oligarch's firms as follows. The closest distance is the oligarchs' firms or firms under control of the sample oligarchs. The further distance is firms within the sample oligarchs' industries. The furthest distance is firms outside of the sample oligarchs' industries. On average, firms under oligarch control are less indebted, have lower market-to-book ratios, but significantly larger than other groups of firms.

4.4 Main Findings

In this section, we present and discuss our empirical evidence on the value of Russian oligarchs. We infer the value of an oligarch from the market reaction to his unexpected arrest. Market reactions are gauged by both daily and cumulative abnormal returns of Russian firms around the arrest date. Because the oligarch's arrest could potentially impact the entire market, firm reactions are likely correlated. We take these correlations into account by extending the methodology proposed by Kolari and Pynnönen (2010) and present our methodology in Appendix 4.6. Our principal finding is that oligarchs are valuable not only to their firms, but to other firms as well. They are most valuable to their firms, less valuable to firms within the their industries, and least valuable to firms outside their industries. This result suggests that the oligarch impact propagates from their firms to firms in the same industry as the oligarch, and, finally, to firms outside the oligarch industry. We also find that higher leverage allows the oligarch impact to propagate more easily.

4.4.1 The value of Russian oligarchs: full sample

How valuable are these oligarchs to the entire market? As an intuitive first step, we use the full sample to assess the impact of their abrupt arrests on the entire Russian stock market. This sample consists of all firms in the Russian stock market at the time of each arrest event, staggered together to form the full sample. If oligarchs are indeed valuable to the entire market, we should observe that, on the day they were arrested, an average abnormal return (AR) of all firms in the market drops significantly.

[Insert Table 4.4 about here.]

Table 4.4 shows the results. Consistent with the above hypothesis, in Panel A, we observe a negative and highly significant ($p-$value less than 1%) daily AR on and only on the exact day of the arrest, and statistically insignificant AR on the rest of the nine-day event window. This result also suggests that the arrest events are unanticipated by the market. However, one may notice that there is a significant drop in average AR with a p-value of 0.06. This drop is driven by two extremely large negative ARs (less than -20%) from Mechel OAO and Russkaya Akvakultura, both of which were not controlled by the oligarch nor in the oligarch's industries. We therefore attribute this significant drop on day 3 to randomness.

Panel B shows that the cumulative abnormal returns (CAR) of the average sample firm are also negative and significant ($p-$value less than 5%), up to two days after the arrest. Note that our statistical inference is robust to within-industry return co-movements, and the magnitude of AR on the arrest day and CAR two days later (both at around -0.39%) reveals that the value impact of the arrested oligarchs is far-reaching. That is, these oligarchs are valuable not just to their own firms, but are valuable to firms outside their business groups as well.

4.4.2 To which firms are the oligarchs valuable?

To better grasp an oligarch's differential impact on firm value, we split the sample into three distinct groups of firms based on their apparent connectedness to the oligarch, and perform robust AR and CAR calculations by group. Table 4.5 presents the results arranged in a similar style to Table 4.4.

[Insert Table 4.5 about here.]

Panel A in Table 4.5 displays the daily abnormal returns over a 9-day period centered on the day of the arrest. Columns (1) to (3) report the results for the "oligarch firms," those that are directly controlled by the arrested oligarchs. There are no significant firm reactions to the oligarch arrest leading up to day 0, suggesting that the arrest is unanticipated by the market. Value of the oligarch firms drops significantly by 15% on the day the oligarch was arrested. This result shows that oligarchs are worth as much as 15% of the firm value in Russia. Comparing this result to that of Jenter et al. (2018) who find that US CEOs are worth approximately 3% of the firm value, we can argue that, assuming no corruption in the U.S., the political connections are worth 12% (15%-3%) of the firm value in Russia.

Columns (4) to (6) seat the other firms operating within the same industry[3] as the oligarch firms. Such industry is referred to as the "oligarch industry." Similar to oligarch firms, value of the firms in the oligarch industry significantly drops by 0.56% (p-value of 0.06) on the arrest day, with no significant reactions leading up to the event. This result suggests that oligarchs have a significant impact on firms in their industries. This might be because these firms, in certain ways, benefit from the the presence of oligarchs. For example, in an economy with inadequate institutions, transactions costs between two independent firms are high. Firms may reduce these costs by trading with those with reputation such as oligarchs. Firms in the oligarch industries might also benefit from regulation or deregulation spillovers brought about by powerful oligarchs.

[3]Industries are defined by the Fama-French 12-industry classification. Table 4.2 provides classifications of the oligarchs' industries.

Columns (7) to (9) present the results for firms that are neither controlled by the oligarch nor operating in the oligarch industry. The value of these firms drops by 0.27% on the arrest day. Even though such drop in firm value is not statistically significant (p-value = 0.264), it is worth noting that the p-value has dropped substantially around the arrest date. That is, p-value declines from 0.98 on day -2 to 0.29 on day -1 (a 70% decline) and to 0.264 on the arrest day. This result may serve as weak evidence that some firms outside of the oligarch industry respond to the oligarch's arrest.

Panel B in Table 4.5 offers qualitatively matching evidence that the oligarchs are most valuable to their own firms, less valuable to the other firms in the same industries, and least valuable to those outside their industries. Note that the value decline for oligarch firms remains two days after the arrest. However, the value decline for firms in the oligarch industries bounces back to zero after two days.

4.4.3 What magnifies the propagation of oligarch impact?

This section explores what magnifies or alleviates the propagation of oligarch impact. As the results from the previous subsections suggest, the oligarch's impact propagates from his own firms, to firms in his industries, and, finally, to firms outside of his industries. We construct a variable called "DistanceFromOligarch" to measure such propagation. DistanceFromOligarch is defined as follows: firms in the oligarch industry are assigned 1, and firms outside the oligarch industry are assigned 2. In the regression analysis in this section, we drop the oligarch firms as it is trivial to include them, i.e. the coefficient on DistanceFromOligarch could be driven entirely by these firms.

[Insert Figure 4.2 about here.]

Figure 4.2 illustrates an intuitive example of our definition. By construction, we expect the coefficient on DistanceFromOligarch to be positive because firms in oligarch industries suffer more value losses then firms outside oligarch industries. Moreover, the more positive the coefficient is, the less the oligarch impact propagates. To elaborate, when the coefficient on DistanceFromOligarch is highly positive, firms in oligarch industries lose substantially more value than those outside oligarch industries, meaning that the oligarch impact only slightly propagates from the former group of firms to the latter.

[Insert Table 4.6 about here.]

Next, we explore what magnifies or alleviates such propagation of oligarch impact by interacting DistanceFromOligarch with a series of firm characteristics, namely, long-term debt, market-to-book ratio and natural logarithm of total assets. Table 4.6 shows the regression results in which we include the above firm characteristics as control variables and cluster the standard errors by Industry × Event. In column (1), the interaction term between DistanceFromOligarch and long-term debt is negative and statistically significant. This result suggests that the higher the leverage, the easier the oligarch impact propagates throughout the entire market. This might be because an oligarch's arrest sends the signal to the entire market that bailouts are now uncertain. Therefore, more highly-levered firms lose more value as their bailout prospects become less likely. The rest of the interaction terms are not statistically significant.

4.5 Conclusions

In this paper, we show that Russian industrial tycoons, or "oligarchs," are valuable not only to firms within their business groups, but also to those outside. The empirical results, drawn from detailed firm-level data across 20 years, are statistically and economically significant. The evidence from Russia is consistent with the notion that when financial markets are underdeveloped, formal institutions weak, and business groups young, there are potential benefits of being the affiliates of such groups. These benefits are demonstrated by the sharp decline in their firm value when the controlling oligarch is abruptly arrested. The widespread value impact of these events further points to the inter-connected nature of Russian business entities. The value of being affiliated with a business group, or connections to an oligarch for that matter, is likely from the network of internal markets which ease the transfer of vital resources among the affiliates. The internal redistribution could grant the affiliates a competitive edge in a hostile business environment, and improve the group survival rate. Notably, our findings are less affected by the endogeneity concerns plaguing previous studies, and our improved methodology is robust to within-industry return co-movements.

We acknowledge that corruption in Russia is a crucial yet unexplored subject in this study. However, we argue that the method by which Russian business groups were formed does not necessarily retard their performance later. For instance, *The New York Times* reports that, in spite of the corrupt practices Mikhail Prokhorov and Vladimir Potanin employed in securing control over Nornickel, the two oligarchs did manage to turn their conglomerate into a global mining giant. The bottom line is that Russian business groups are better adapted to the difficulties of doing business in Russia, as they themselves were the product of a murky and corrupt society. In other words, we hold a more nuanced stance on oligarchs and business groups, which accepts both their curse and blessing, in not just the country of Russia, but also others with comparable political and economic conditions.

This paper also points to the fact that political risks, sometimes firm-specific, continue to be a major issue in the Russian stock market. The industry-wide value impact in the event of an oligarch's arrest might indicate that investors viewed such an event as a negative signal of a government plot against the business community—investors would naturally become fearful of the looming expropriation of other firms in the same industry, through politically-motivated criminal investigations against their owners. Since the process of privatization in Russia was mainly pushed by political rather than economic factors, political risks rather than purely business ones will be especially important for stakeholders in that economy. Likewise, the rise and fall of Russian business groups are very likely due to social and political considerations beyond finance. Signs of a similar issue are also present in other transition economies, such as former members or allies of the USSR. Nonetheless, Russia provides the most prominent case, and the real consequence of the recurring arrests of her industrial tycoons, i.e., the loss of business reputation and government credibility, is unmeasurable.

4.6 Appendix: Test Procedure

In this paper, we analyze firm reactions to the news of Russian oligarchs' arrests using an event study methodology. Since reactions of all firms in the market can co-move in each arrest event, we take into account such co-movement using the methodology proposed by Kolari and Pynnönen (2010). This methodology, however, is applicable only to the situation in which *one* event affecting all firms in different industries. It is therefore not fully applicable in this paper, as we have seven events, and each event affects all firms. Below, we extend Kolari and Pynnönen (2010)'s methodology to cover the situation in which there are N independent events and, in each event, firm returns co-move within q industries, but are independent across industries. We also explain the event study methodology and then derive the test statistics for daily and cumulative abnormal returns suitable for this situation.

[Insert Figure 4.1 about here]

Figure 4.1 shows an event timeline. Table 4.1 lists all notations used in this section for easy referencing. To begin with, we assume that each event is independent from one another and, in each event, returns of firms in one industry are independent from those in another. Suppose there are N independent events and, in each event, there are q industries. The independence assumption we made allows us to focus on each firm i in $N \times q$ independent clusters. Thus, for the sake of simplicity hereafter, we will keep the subscription of firm i, but drop the subscriptions of industry j and event k.

[Insert Table 4.1 about here]

We measure the firm reactions using abnormal returns around the event date. To obtain these returns, we first use the available data in the estimation period to run the following index model for each firm i in an industry j and an event k:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \tag{4.1}$$

where R_{it} is the firm i's return on day t, R_{mt} is the market return on day t, and ϵ_{it} is the error term.

Running the index model as in Equation (4.1) gives estimates of α_i and β_i which are denoted by $\hat{\alpha}_i$ and $\hat{\beta}_i$, respectively. With these estimates, we compute an abnormal return of firm i on day t, AR_{it}, as follows:

$$AR_{it} \triangleq R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \tag{4.2}$$

where t is now in the event period τ_1 to τ_2 as in Figure 4.1. With AR of each firm in the sample, we compute a Cumulative Abnormal Return, CAR, for each firm i in an event k during an event window $[\tau_1, \tau_2]$, CAR_i, as:

$$CAR_i \triangleq \sum_{t=\tau_1}^{\tau_2} AR_{it}. \tag{4.3}$$

Next, we derive the test statistics for AR and CAR. As with Kolari and Pynnönen (2010), we assume that the joint distribution of idiosyncratic returns for each firm i is stationary and serially independent. Patell (1976) shows that with these assumptions, we can compute a Standardized Abnormal Return, SAR_{it} as:

$$SAR_{it} \triangleq \frac{AR_{it}}{s_i\sqrt{C_{it}}} \sim t(T-K). \tag{4.4}$$

SAR_{it} is Student-t distributed with $T-K$ degrees of freedom. T is the number of days in the estimation period. K is the number of explanatory variables in Equation (4.1), which, in this case, equals 2 as there are a constant term and a market return on the right hand side of the equation. C_{it} is the factor that reflects an increase in variance due to out-of-sample prediction and has the value close to 1 if the estimation window is sufficiently long (Patell, 1976). s_i is an unbiased estimate of standard deviation of the residuals in Equation (4.1), which is given by:

$$s_i^2 = \frac{1}{T-K}\sum_{t=1}^{T} \hat{\epsilon}_{it}^2 \tag{4.5}$$

By definition, SAR_{it} weights AR_{it} with the inverse of its standard deviation, implying that noisier AR_{it} receives less weight while less noisy AR_{it} receives more weight. This modification lets SAR_{it} exhibit identical statistical properties for all sample firms. That is, for all firms, SAR_{it} is Student-t distributed with $T - K$ degrees of freedom. With this advantageous property, SAR_{it} should be used to test if an average abnormal returns around the event date is significantly different from zero.

Define an Average Standardized Abnormal Return on day t, $\overline{SAR}_t$ as follows:

$$\overline{SAR}_t = \frac{\sum_i \sum_j \sum_k SAR_{ijk,t}}{\sum_j \sum_k n_{jk}} \tag{4.6}$$

where n_{jk} is the number of firms in an industry j in an event k. Essentially, $\overline{SAR}_{ijk,t}$ is the sum of SAR of all firms in all industry-event clusters divided by the sum of numbers of firms in all industry-event clusters. As before, suppose there are N independent events and, in each event, there are q industries. Thus, there are $N \times q$ independent industry-event clusters. Let us assume that returns of firms in the same industry-event cluster co-move, but are independent across the clusters. With this assumption, we can decompose Equation (4.6) as:

$$\overline{SAR}_t = \frac{\sum_{i=1}^{n_{11}} SAR_{i11,t} + \sum_{i=1}^{n_{12}} SAR_{i12,t} + \cdots + \sum_{i=1}^{n_{qN}} SAR_{iqN,t}}{n_{11} + n_{12} + \cdots + n_{qN}}. \tag{4.7}$$

The first summation term on the numerator is the sum of SAR of all firms in the 1^{st}-industry-1^{st}-event cluster; while, the last summation term is the sum of SAR of all firms in the q^{th}-industry-N^{th}-event cluster. Because each summation term represents one independent random variable, Equation (4.7) is essentially the sum of $q \times N$ independent random variables divided by a constant. Central Limit Theorem implies that $\overline{SAR}_t$ is normally distributed with an expected value and variance as follows:

$$E[\overline{SAR}_t] = 0 \tag{4.8}$$

and

$$Var(\overline{SAR}_t) = \frac{1}{n^2} \sum_{j=1}^{q} \sum_{k=1}^{N} n_{jk} \sigma_{jk}^2 (1 + (n_{jk} - 1)\bar{\rho}_{jk}) \tag{4.9}$$

where $n = \sum_j \sum_k n_{jk}$ and $\bar{\rho}_{jk}$ is an average correlation of the abnormal returns within a j^{th}-industry-k^{th}-event cluster. Because $\sigma_{jk}^2 = \frac{T-K}{T-K-2}$ for all j and k, the test statistic for an average abnormal return is:

$$t_{AR} = \frac{\sum_i \sum_j \sum_k SAR_{ijk,t}}{\sqrt{\frac{T-K}{T-K-2}} \cdot \sqrt{\sum_j \sum_k n_{jk}(1 + (n_{jk} - 1)\bar{r}_{jk})}} \tag{4.10}$$

where $\bar{r}_{jk}$ denotes an unbiased estimate of $\bar{\rho}_{jk}$.

Next, we define a Cumulative Abnormal Return of firm i over the event period τ_1 to τ_2, CAR_i, as follows:

$$CAR_i \triangleq \sum_{t=\tau_1}^{\tau_2} AR_{it}. \tag{4.11}$$

We can test if the average CAR on the event period is significantly different from zero in the similar fashion as the average AR above. That is, to test the significance of an average CAR, we use a Cumulative Standardized Abnormal Return, $CSAR_i$, defined below:

$$CSAR_i \triangleq \frac{1}{\sqrt{\tau_2 - \tau_1 + 1}} \sum_{t=\tau_1}^{\tau_2} SAR_{it} \sim t(T-K). \tag{4.12}$$

We derive its test statistic for an average $CSAR$ in the same fashion as that of an average SAR and obtain the following test statistic:

$$t_{CAR} = \frac{\sum_i \sum_j \sum_k CSAR_{ijk}}{\sqrt{\frac{T-K}{T-K-2}} \cdot \sqrt{\sum_j \sum_k n_{jk}(1 + (n_{jk} - 1)\bar{r}_{jk})}}. \tag{4.13}$$

Figures

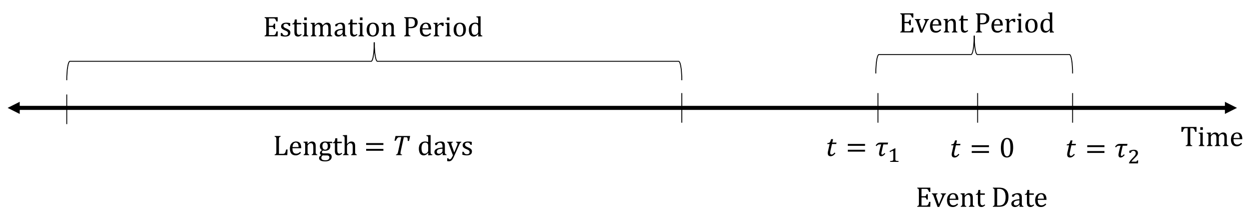

Figure 4.1: Event Timeline

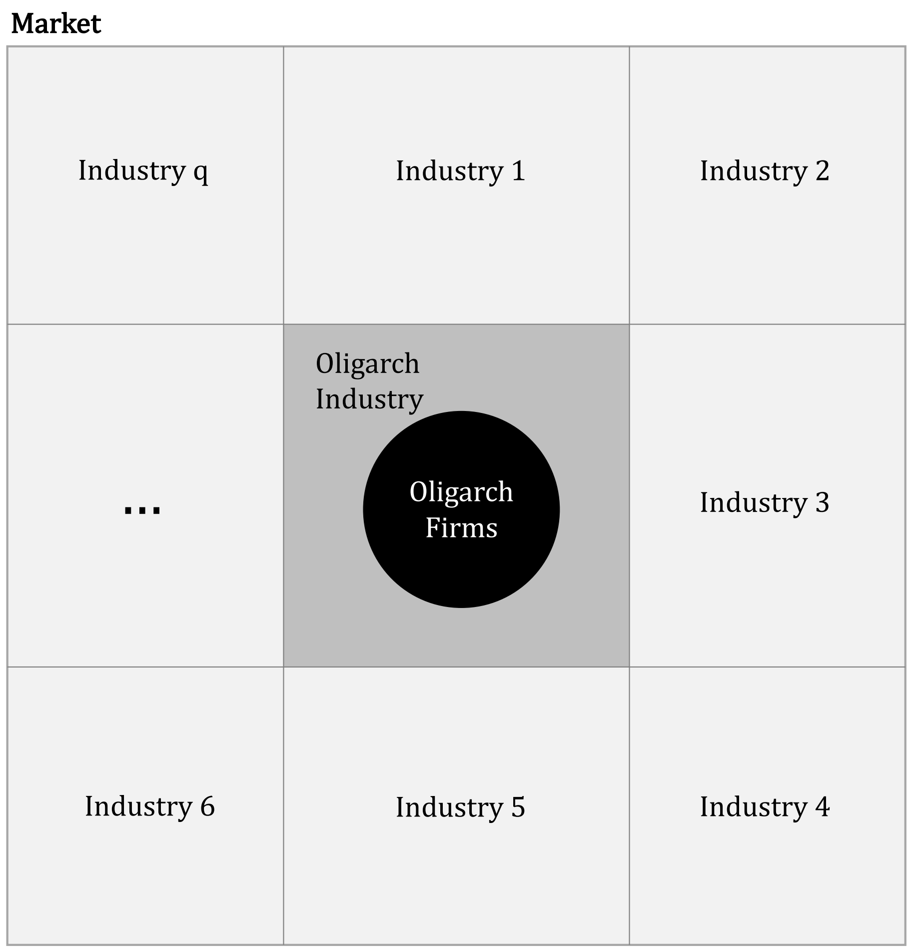

Figure 4.2: Distance from oligarch firms

DistanceFromOligarch is defined as follows: Firms within the same industries as the oligarchs are assigned 1. Firms outside the oligarchs' industries are assigned 2.

Tables

Table 4.1: Notations for Derivations of Test Statistics

This table provides notations and descriptions of the variables used in deriving the test statistics for daily and cumulative abnormal returns in Appendix 4.6.

Notation	Description
i	Firm index
j	Industry index
k	Event index
N	Number of events
q	Number of industries
R	Daily total return (including dividends) on a firm
R_m	Daily total return (including dividends) on the market
AR	Daily abnormal return on a firm
SAR	Standardized abnormal return
s	An unbiased estimate of standard deviation of the residuals of the index model (4.1)
T	Length of the estimation period
K	Number of explanatory variables in the index model (4.1), which is equal to 2
$\overline{SAR}$	Average standardized abnormal return
n_{jk}	Number of firms in industry j, event k
$\bar{\rho}_{jk}$	The average population correlation of abnormal returns within industry j, event k
$\bar{r}_{jk}$	An unbiased estimate of $\bar{\rho}_{jk}$
CAR	Cumulative abnormal return on a firm
τ_1	Starting day of the event period
τ_2	Ending day of the event period
$CSAR$	Cumulative standardized abnormal return on a firm

Table 4.2: The Arrests

This table provides details about the seven arrest cases of Russian oligarchs used in constructing the sample.

Oligarch	Business Group	Business Sector	Fama-French-12-Industry Classification	Arrest Date	Allegation
Vladimir Gusinsky	NTV	Media	Other – Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment	2000/06/13	Misappropriation of funds
Mikhail Khodorkovsky	Yukos	Energy	Oil, Gas, and Coal Extraction and Products	2003/10/25	Fraud and tax evasion
Nikolai Maximov	Sberbank	Banking	Finance	2010/07/09	Fruad and abuse of power
Vladimir Yevtushenkov	AFK Sistema	Telecommunication	Telephone and Television Transmission	2014/09/17	Money laundering
Dmitry Kamenshchik	Moscow Domodedovo Airport	Transportation	Other – Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment	2016/02/18	Criminal negligence
Ziyavudin Magomedov	Summa group	Holding	Other – Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment	2018/03/31	Racketeering and embezzlement of state funds
Mikhail Abyzov	E4 group	Engineering	Other – Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment	2019/03/26	Embezzlement

Table 4.3: Summary Statistics

This table reports summary statistics of the sample firms. Panel A reports summary statistics for all sample firms. Panel B groups the sample firms by the distance from oligarch firms and reports their summary statistics. LongDebt (in %) is long term debt divided by book value of total assets. MarketToBook (in %) is (Book value of total assets−Book value of equity+Market value of equity)/Book value of total assets. TotalAsset book value of total assets in millions of constant 2,000 US dollars.

Panel A: Summary statistics for all firms

	N	Mean	SD	p5	p25	p50	p75	p95
LongDebt	544	19.82	31.82	0.00	1.82	13.99	27.55	56.72
MarketToBook	557	308.76	4000.26	43.63	85.34	107.73	143.14	264.00
TotalAsset	561	15.68	55.03	0.022	0.34	1.92	7.10	68.39

Panel B: Summary Statistics by distance from oligarch firms

	Oligarch firms			Oligarch industries excluding oligarch firms			All firms excluding oligarch industries and firms		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
LongDebt	3	12.78	12.60	77	22.95	23.29	464	19.34	33.10
MarketToBook	3	83.74	38.47	79	150.51	113.16	475	336.50	4331.63
TotalAsset	3	97.17	119.70	79	7.05	12.42	479	16.594	58.372

Table 4.4: Market Reactions to Oligarch Arrests

This table shows AR and CAR around the event date. Event day 0 is the day the oligarch was arrested unexpectedly. AR and CAR are computed using the index model in Equation (4.1). Details of their computations are provided in Section 4.6. The computations of their t-statistics assume that the seven arrest events are independent from one another, and that idiosyncratic returns of the sample firms co-move within the same industry, but are independent across industries. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Panel A: Daily Abnormal Return

Event Day	N	Average AR, %	p-Value
-4	565	-0.011	0.465
-3	565	-0.084	0.815
-2	565	-0.061	0.844
-1	565	0.126	0.393
0	565	-0.393***	0.009
1	565	-0.058	0.528
2	565	0.066	0.778
3	565	-0.304*	0.060
4	565	-0.091	0.367

Panel B: Cumulative Abnormal Return

Event Period	N	Average CAR, %	p-Value
[0, 0]	565	-0.393***	0.009
[0, 1]	565	-0.451**	0.021
[0, 2]	565	-0.385**	0.041

Table 4.5: Market Reactions by Distance from Oligarch Firms

This table groups sample firms by distance from oligarch firms and reports their ARs and CARs around the arrest date. Distance from oligarch firms is defined as follows. Oligarch firms are the nearest. Farther from these firms are firms within the same industry as oligarch firms. The farthest are firms outside the oligarch industry. AR and CAR are computed using the index model in Equation (4.1). Details of their computations are provided in Section 4.6. The computations of their t-statistics assume that the seven arrest events are independent from one another, and that idiosyncratic returns of the sample firms co-move within the same industry, but are independent across industries. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

Panel A: Daily Abnormal Return

Event Day	Oligarch firms			Oligarch industry excluding oligarch firms			All firms excluding oligarch industry and firms		
	N	Avg AR,%	p-Val	N	Avg AR,%	p-Val	N	Avg AR,%	p-Val
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
-4	3	0.449	0.700	81	-0.324	0.233	481	0.039	0.724
-3	3	-1.006	0.569	81	-0.037	0.866	481	-0.086	0.789
-2	3	1.680	0.245	81	-0.218	0.433	481	-0.045	0.978
-1	3	0.322	0.807	81	0.042	0.665	481	0.139	0.288
0	3	-14.94***	0.006	81	-0.561*	0.063	481	-0.274	0.264
1	3	-0.371	0.800	81	-0.055	0.484	481	-0.057	0.699
2	3	1.437	0.253	81	0.525	0.869	481	-0.020	0.629
3	3	-2.182	0.211	81	0.291	0.268	481	-0.393**	0.021
4	3	1.784	0.264	81	0.073	0.760	481	-0.131	0.231

Panel B: Cumulative Abnormal Return around the arrest date

Event Period	Oligarch firms			Oligarch industry excluding oligarch firms			All firms excluding oligarch industry and firms		
	N	Avg CAR,%	p-Val	N	Avg CAR,%	p-Val	N	Avg CAR,%	p-Val
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
[0, 0]	3	-14.944***	0.006	81	-0.561*	0.063	481	-0.274	0.264
[0, 1]	3	-15.314**	0.011	81	-0.616*	0.071	481	-0.331	0.288
[0, 2]	3	-13.878**	0.020	81	-0.091	0.166	481	-0.351	0.252

Table 4.6: What magnifies the propagation of oligarch impact?

This table provides regression evidence on how the impact of oligarch arrests propagates throughout the market and the factors that magnify such propagation. The dependent variable is CAR[0, 2]. DistanceFromOligarch is defined as follows: Firms within the same industries as the oligarchs' firms are assigned 1. Firms outside the oligarchs' industries are assigned 2. Firms under control of the oligarchs who were arrested are dropped. LongDebt (in %) is long term debt divided by book value of total assets. MarketToBook (in %) is (Book value of total assets−Book value of equity+Market value of equity)/Book value of total assets. log(TotalAsset) is a natural logarithm of book value of total assets in millions of constant 2000 US dollars. Standard errors are clustered by Industry×Event. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively.

	Dependent Variable = CAR[0, 2]		
	(1)	(2)	(3)
DistanceFromOligarch × LongDebt	-0.037**		
	(0.015)		
DistanceFromOligarch × MarketToBook		0.0044	
		(0.427)	
DistanceFromOligarch × log(TotalAsset)			0.26
			(0.343)
DistanceFromOligarch	0.77	-0.73	-3.74
	(0.524)	(0.688)	(0.415)
LongDebt	0.070**	-0.00075	-0.00018
	(0.010)	(0.908)	(0.978)
MarketToBook	0.00031	-0.0084	0.00026
	(0.669)	(0.449)	(0.717)
log(TotalAsset)	0.071	0.085	-0.40
	(0.515)	(0.436)	(0.429)
Constant	-2.88	-0.14	5.45
	(0.348)	(0.975)	(0.530)
SE Clustered by	Industry × Event	Industry × Event	Industry × Event
R^2	0.005	0.003	0.003
N	537	537	537

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