Essays on the Link between Institutions and Finance

by

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A thesis submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Finance

Faculty of Business

University of Alberta

Abstract

This thesis consists of three essays linking institutional quality and finance. The first essay shows that the positive relationship between corporate social responsibility (CSR) and firm value is stronger for firms located in countries with higher levels of individualism. I posit that firm-level capital allocation efficiency is a plausible yet unexplored channel driving this seemingly counter-intuitive observation. Using the seminal investment-Q framework, I provide concrete evidence that CSR reduces investment sensitivity to Tobin's Q, while increasing investment sensitivity to cash flow, more so for firms with lower corporate governance ratings. Such firms are more prevalent in countries with a collectivistic culture, which has been shown to hamper institutional development and foster inferior corporate governance practices. The positive moderating effects of individualism and better corporate governance on the value of CSR remain strong after controlling for other potentially confounding factors, using a propensity-score-matched sample, or implementing instrumental variables estimation. Taken together, my findings call attention to the environment under which managers may engage in value-destroying activities in the name of corporate social responsibility.

The second essay presents an event study involving Russian oligarchs. As transaction costs between two free-standing firms are oftentimes excessive in an economy with underdeveloped formal institutions, firms will try and reduce these costs by affiliating with those possessing economic powers, making economically powerful figures valuable not only to their own but also to other firms in such an economy. Using the unanticipated arrests of Russian oligarchs from 2000 to 2019 as exogenous shocks to the Russian stock market, we find that the average value of all firms declines by 0.4% around the arrest day in a statistically significant manner (p-value is less than 0.01). Firm value drops the most for those under the oligarch's direct control (-15%), less for those within the oligarch's industries (-0.6%), and the least for those outside the oligarch's industries (-0.3%). These drops in firm value are statistically significant for the first two categories of firms, but insignificant for the third

category (p-values are 0.01, 0.06, 0.26, respectively). Furthermore, firms with higher leverage ratios derive more value from the oligarchs – *ceteris paribus*, their values declined more when the arrests took place.

The third essay assesses the integrity of the Doing Business report, a World Bank flagship publication that produces the renowned "Ease of Doing Business" indicators. The indicators were originally straightforward measures assessing the regulatory burden in key aspects of business transactions for a given country, but had become increasingly complex over time due to repeated methodological changes. We conduct an in-depth audit of the indicators, in response to former World Bank Chief Economist Paul Romer's highly publicized criticism that the World Bank's ongoing attempts to refine the indicators had raised concerns of politically motivated data manipulation. Our audit concludes that the World Bank economists were innocent of any external political pressures, but had been encouraged to continually "improve" the indicators, which indeed rendered the indicators incomparable across years, reducing their value to politicians, the media, and researchers. Our audit bridges a crucial gap in the literature on the Doing Business project as it pays equal attention to the project's pros and cons, while offering unique insights into the World Bank's database management that prominent development and financial economists could benefit from.

Preface

Part of the research conducted for this thesis is joint work. I identified the research topic, performed empirical analysis, and wrote the manuscript for the research project in Chapter 2 under the supervision of Professor Randall Morck. I identified the research topic, performed empirical analysis, and wrote the manuscript for the research project in Chapter 3 with Bordin Bordeerath under the supervision of Professor Randall Morck. I devised the research methodology, performed data analysis, and wrote the manuscript for the research project in Chapter 4 with Professor Randall Morck. Both Professor Morck and Mister Bordeerath are with the University of Alberta.

Acknowledgments

I wish to express my sincere gratitude to my supervisor, Professor Randall Morck. This thesis would not have been possible without his guidance and support over the years. I am indebted as well to the other members of my thesis committee, Professors Vikas Mehrotra and Valentina Galvani, for their constructive comments on my research, and to my arm's length examiners, Professors Moin Yahya and David Stangeland, for kindly participating in my doctoral final exam. I would also like to thank Mister Bordin Bordeerath, who has been an amazing colleague during this long journey.

My special thanks go to Debbie Giesbrecht from the Business PhD office for the many warm conversations, and to my family and friends for their everlasting encouragement. Last but not least, I am grateful to the following organizations for their generous financial support: the World Bank, the Canadian Foundation for Governance Research, Alberta Investment Management Corporation, and the Alberta School of Business.

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Chapter 1

Introduction

While technological innovation is the central ingredient of economic development, finance and institution are two indispensable supporting factors in the determination of the wealth of nations. This thesis studies country-level institutions and their impacts on firm-level financial outcomes. It distinguishes itself from a large body of existing literature by taking both formal (e.g., legal) and informal (e.g., cultural) institutions seriously, and by integrating the emerging field of corporate social responsibility (CSR) into financial decision making.

The financial consequences of national culture have received increasing attention in the literature (Zingales, 2015; Karolyi, 2016). In a nutshell, the appeal of studying the culture-finance nexus is twofold. First, national culture ties seamlessly with the field of behavioural finance (Chui, Titman, and Wei, 2010; Eun, Wang, and Xiao, 2015), and the importance of incorporating psychology in business studies has been duly acknowledged (e.g., Thaler's 2017 Nobel Prize). To a large extent, culture is the collective psychology of a nation's people. Second, national culture offers potentially better causal inference against alternative explanations for a given financial outcome, as it is reasonably predetermined (Hofstede, 2001) and relatively time-invariant (Beugelsdijk, Maseland, and Van Hoorn, 2015), especially for the purpose of corporate finance research, where the sample is often constructed at the firm level and spans less than a few decades.

The second point above is of particular relevance in light of the ongoing efforts to improve causal inference in financial studies. One alternative to the reliance on "quasi-natural experiments" or sophisticated statistical methods (e.g., regression discontinuity design, synthetic control method, etc.) is perhaps to go back to the fundamentals, i.e., to rely on factors that are at the very bottom of our institution (North, 1990; Williamson, 2000), and national culture is one such factor. It is interesting to note that the idea of the culture-finance nexus

echoes that of the biology-finance nexus, which theorizes how evolution (the environment) exerts a profound effect on people's financial behaviour (Lo, 2019) – on the macro level, the resulting behavioural traits are largely reflected in national culture (Talhelm, Zhang, Oishi, Shimin, Duan, Lan, and Kitayama, 2014; Liu, Morris, Talhelm, and Yang, 2019).

Corporate social responsibility (CSR) is another fast-growing field in financial research (Servaes and Tamayo, 2017). CSR is a natural extension of the traditional field of corporate governance, and looks at how well a firm takes cares of its stakeholders in addition to mere shareholders. The benefits of CSR to firm performance have been extensively discussed, yet its costs have not received enough attention in the literature, nor has its interplay with national culture. It has long been established that corporate governance varies predominantly between rather than within countries (Doidge, Karolyi, and Stulz, 2007), and it is only until recently that researchers are able to offer a convincingly fundamental explanation for this phenomenon through the use of national culture (Griffin, Guedhami, Kwok, Li, and Shao, 2017). A similar pattern is observed for CSR practices across countries (Cai, Pan, and Statman, 2016).

Motivated by these recent developments in governance and CSR research, I set out to tackle the empirical puzzle that CSR is valued higher in more individualist countries in Chapter 2. I find that managers are more likely to engage in value-destroying capital budgeting in the name of CSR in poorly-governed firms, which are more prevalent under collectivist cultures. To the extend that firms have a higher propensity to do good when they do well (Hong, Kubik, and Scheinkman, 2012) or when agency problems are more pronounced (Cheng, Hong, and Shue, 2013), it is unlikely that my results are driven by managers of poorly-governed firms who make genuine contributions to social welfare at the expense of shareholder wealth. Rather, the results highlight the environment under which managers may use CSR as a convenient tool for extracting private benefits. With a comprehensive international sample, the investment efficiency channel that I explored in this chapter not only

helps solve the aforementioned puzzle, but more importantly, adds to the growing literature on the costs of CSR.

Chapter 3 looks at a special type of institution, oligarchy, that has emerged in a number of member states of the former Soviet Union during a period of economic transition. In particular, my coauthor, Bordin Bordeerath, and I investigate the market reaction to unanticipated arrests of oligarchs in Russia over a 20-year period. Unsurprisingly, the shares of firms directly under the oligarch's control fall sharply, consistent with the intuition that much of their value is derived from the oligarch's unique connections and talent for navigating the intricacies of doing business in Russia. Furthermore, we show that other firms in the same industries as the decedent oligarch's firms also see share price drops. This surprising result has not yet been explored in the literature. In theory, the prices of industry rival firms might be expected to rise when one of their competitors runs into trouble. One explanation for our novel finding is that Russian markets are highly oligopolistic and that oligarchs keep a lid on "excess competition". The demise of an oligarch might then lead to increased competition and lower share prices. In sum, our study offers new evidence on the involved nature of oligarchy that could reinvigorate research into this important yet undesirable outcome of institutional reform.

Chapter 4 investigates a high-profile controversy surrounding the Doing Business report, a World Bank flagship publication that produces the renowned "Ease of Doing Business" indicators. The indicators assess the regulatory burden in key aspects of business transactions in a given country, with the goal of promoting institutional development that aids private sector growth across the globe, and are widely used in studies of development economics and international capital markets (Besley, 2015). They were originally straightforward measures originating from a series of influential articles in the law and finance literature (Djankov, McLiesh, and Shleifer, 2007; Djankov, La Porta, Lopez-de Silanes, and Shleifer, 2008), but had become increasingly complex over time due to repeated "methodological improvements".

This issue ultimately led to a highly publicized exchange between former World Bank Chief Economist Paul Romer (Nobel Prize 2018) and a *Wall Street Journal* reporter, in which Romer stated that the World Bank's ongoing attempts to improve and refine the indicators had made them largely useless and had raised concerns of politically motivated data manipulation.

In Chapter 4's coauthored report, Professor Randall Morck and I conduct an in-depth audit of the Doing Business project, and conclude that the World Bank economists were innocent of any external political pressures, but had been encouraged to continually "improve" the indicators, which indeed rendered the indicators incomparable across years, reducing their value to politicians, the media, and above all, researchers. We recommend that the World Bank cease incentivizing in this way and attach more importance to consistency over time when constructing the indicators. Our report bridges a crucial gap in the controversy surrounding the Doing Business project because it pays equal attention to the project's pros and cons, while offering unique insights into the World Bank's database management that prominent development and financial economists could benefit from.

Chapter 2

The Value of Corporate Social Responsibility:

The Role of National Culture, Corporate Governance, and Investment

2.1. Introduction

Corporate social responsibility (CSR) has become an integral part of business practice over the last decade or so. In fact, many corporations across the globe dedicate a section of their annual reports and corporate websites to CSR activities, illustrating the importance they attach to such activities.[1] But do they create value for the firm's shareholders or do they focus too much on other stakeholders, thereby lowering firm value? After all, CSR is commonly defined as "actions that appear to further some social good, beyond the interest of the firm and that which is required by law (McWilliams and Siegel, 2001)." Despite much research on the topic, few solid conclusions can be drawn, except that the literature is divided. Although there appears to be more support for the view that CSR activities are positively related to corporate financial performance (CFP) such as profitability and value,[2] a few studies find the opposite relation. As a result, general implications of the research on corporate social responsibility remain uncertain.

Two broad views regarding CSR prevail in the literature. On the one hand, CSR can be compatible with shareholder value maximization while achieving broader societal goals (Edmans, 2011; Servaes and Tamayo, 2013). On the other hand, beginning with Friedman's (1970) famous argument that "the only social responsibility of corporations is to make money", the opposite view contends that CSR is a byproduct of agency problems

[1] KPMG Survey of Corporate Responsibility Reporting 2017, available at: `www.kpmg.com/crreporting`.

[2] Equivalently, higher CSR ratings are known to be associated with lower costs of capital or better access to external finance. See, *inter alia*, El Ghoul, Guedhami, Kwok, and Mishra (2011), Cheng, Ioannou, and Serafeim (2014), and Lins, Servaes, and Tamayo (2017).

(Bénabou and Tirole, 2010; Krüger, 2015), and is usually costly for shareholders. In spite of the substantial amount of attention, the answer to one crucial question remains unclear: does CSR result in firm-level efficiencies and value creation – if so, in what ways?

This paper aims to further our understanding of whether and how CSR affects firm value through firm-level capital allocation efficiency. Specifically, I study the effects of CSR on Tobin's Q, investment sensitivity to Q, and investment sensitivity to cash flow for an international sample of firms from 41 countries. More importantly, I investigate the moderating role of corporate governance regimes, as well as the cultural environment (at the country-level) which gives rise to these regimes. I posit that CSR reduces firm-level capital allocation efficiency, gauged by the responsiveness of investment to growth prospects, in several ways:

First, from a trade-off perspective, investing in CSR initiatives is likely to reduce a firm's capital that could otherwise be used for funding growth opportunities, thereby reducing investment sensitivity to Q. Next, CSR is more likely to be used for the pursuit of managers' self-interest under weak corporate governance. From this managerial opportunism view (Tirole, 2001; Cheng, Hong, and Shue, 2013), managers could pursue personal goals and extract private benefits from CSR over-investment, which causes additional inefficiencies in investment practices. Moreover, the alignment of shareholders' wealth interests with those of the executive team could incentivize management to reduce over-investment into CSR initiatives, and instead use capital for realizing growth options (Jensen and Murphy, 1990). On the other hand, actively-involved stakeholders could push management into investing in certain CSR initiatives or abandon certain positive-NPV projects that contribute to shareholder wealth but may be damaging to the interests of these stakeholders. As a result, the distortionary effect of CSR on investment sensitivity to Q also depends on the shareholder-manager incentive alignment, or for that matter, the cultural context of stakeholder involvement.[3]

[3] It is true that firms may undertake negative-NPV projects that genuinely improve the community so as to maximize the welfare of all stakeholders. My empirical results, however, suggest that this is largely too good to be true. Note also that commitment to community is only one of the seven categories under which

To test these predictions, I collect firm-level CSR ratings from Thomson Reuters' ASSET4 ESG Database, which has been employed in a number of influential studies (Ferrell, Liang, and Renneboog, 2016; El Ghoul, Guedhami, and Kim, 2017; Dyck, Lins, Roth, and Wagner, 2019). I combine these ratings with data on firm characteristics from Datastream and Worldscope, data on country characteristics from the World Bank, and data on cultural values from Hofstede (2001), Schwartz (2012), and the World Value Survey (WVS). As a preview of my results, I find that CSR activities reduce the sensitivity of current growth opportunities to future investment.[4] In other words, CSR distorts the firm-level capital allocation efficiency. I then show that an individualistic cultural environment or a well-functioning corporate governance regime dampens the distortionary effects of CSR. My results are consistent with the prediction that CSR has important implications for firm value. Specifically, CSR activities are valued higher by investors in a more individualistic culture, which has been shown to produce a corporate governance regime better at keeping agency problems in check (Griffin, Guedhami, Kwok, Li, and Shao, 2017).[5] Above all, these results are robust to alternative model specifications, sample selection, as well as the use of instrumental variables.

This paper contributes to the ongoing debate on the role of CSR in corporate finance. I show that under certain corporate governance regimes, CSR enhances the value of the firm, but under others, the opposite is true, suggesting that some CSR-oriented firms adhere to the shareholder-value-maximization model nonetheless, while others are subject to more divergent objectives (Shleifer and Vishny, 1997; Jensen, 2001). In addition, this paper contributes to the growing line of research examining the influence of national culture on

a firm's social performance is measured. See Table A1 for more details.

[4] Furthermore, investment is more dependent on internally generated cash flows for firms with higher CSR ratings, which is in line with Hong, Kubik, and Scheinkman (2012)'s findings that firms are more likely to do good when they do well, but not vice versa.

[5] Note that the negative impact of CSR on investment efficiency does not imply that the value implication of CSR is also negative. In fact, my empirical results show that, on average, CSR commands a positive and significant effect on firm value, which is consistent with the findings of the existing literature. What has not been adequately addressed in the literature though, is the heterogeneity of such a positive value implication, and perhaps more importantly, the driver of this heterogeneity.

economic outcomes (Karolyi, 2016). My findings illustrate the unexplored yet unequivocal contingency effects of national culture on the CSR-CFP nexus, and cast doubts on the cultural value conformity hypothesis that CSR should be valued higher (lower) in more collectivistic (individualistic) societies, the very societies which tend to possess a lower (higher) level of economic development, institutional quality, and trust among their citizens.[6]

The remainder of this paper is organized as follows. Section 2.2 theorizes the distortionary effect of CSR on firm-level capital investment, and how good corporate governance could help alleviate this inefficiency, which is ultimately reflected by the positive moderating effect of individualism, a country-level measure, on the value of CSR. Section 2.3 describes the sample and variable construction. Section 2.4 presents my main empirical results. Section 2.5 conducts causal inference through the use of propensity score matching and instrumental variables, along with additional robustness tests. Section 2.6 offers concluding remarks.

2.2. Hypothesis Development

Previous research develops a seminal framework capturing the relationship between investments and Tobin's Q ratio (Tobin, 1969; Hayashi, 1982; Baker, Stein, and Wurgler, 2003). Using this framework, I hypothesize that CSR can reduce investment sensitivity to Q in a number of ways.

First of all, engagement in CSR activities could conceivably divert capital and other corporate resources from identifying and financing profitable investment projects, hence distorting the responsiveness of investment to growth prospects (proxied by Tobin's Q). Intuitively, if firm resources are devoted to charity, environmental protection, community development, etc., these CSR accomplishments might be achieved at the expense of investment

[6] See Aguilera and Jackson (2003) for a discussion on the cultural value conformity hypothesis. Cai, Pan, and Statman (2016) reveal that individualism remains a strong predictor for better CSR among a comprehensive set of firm- and country-level controls, but are silent on the value implications of national culture for CSR. El Ghoul, Guedhami, and Kim (2017) document that CSR is valued higher in weaker institutions, which is essentially at odds with my empirical results.

efficiency. In addition, managers preoccupied with CSR activities may lose track on their primary managerial responsibilities (Jensen, 2001) and miss promising investment opportunities. Moreover, opportunistic managers may use CSR to collude with certain stakeholders who possess the capacity to harbour them from shareholders' disciplinary actions. Consequently, CSR-oriented managers potentially have greater leeway to consume perks, build empires, or simply slack, which leads to further investment inefficiencies (Cheng, Hong, and Shue, 2013).

Furthermore, firms prioritizing favorable social and environmental performance might have to sacrifice certain investment opportunities profitable to shareholders but harmful to other stakeholders. As a result, investments will be less sensitive to Q for these firms. Common forms of investment distortion could be, for instance, avoiding lucrative projects related to non-renewable energy, not investing in countries with a record of human rights violations, withholding investment in innovative technologies that have potential military applications, etc. While each of these projects may be sensible for shareholders, if the firm intends to please other stakeholders such as environment activist groups, labor unions, or the local community, it might have to forgo certain positive NPV projects that do not conform to its CSR standards.

It is also widely known that divergence of interest between managers and shareholders brings about the agency problem (Jensen and Meckling, 1976). Potential mechanisms keeping such problems in check include incentive systems (compensation policy) as well as other governance measures. Intuitively, the perceived level of agency conflict between management and shareholders has implications for CSR's effect on investment sensitivity to Q as well. As an illustration, strong managerial pay-for-performance policy could incentivize managers to reduce over-investment in CSR activities and use corporate resources efficiently for identifying and financing growth options, as per Jensen and Murphy (1990). Conversely, if the wealth interests of shareholders and managers are poorly aligned, then managers would have

greater incentives to mis-allocate the firm's resources for their own private benefits, potentially using CSR initiatives as a disguise. Based on the discussion thus far, I postulate the following.

Hypothesis 1. The distortionary effect of CSR on a firm's investment sensitivity to Q is stronger for firms with weaker corporate governance.

Analogously, the managerial opportunism theory (Tirole, 2001; Cheng, Hong, and Shue, 2013) also predicts that managers might pursue personal goals and extract private benefits from CSR activities at the expense of shareholders' wealth (Di Giuli and Kostovetsky, 2014). Since this is again more likely to occur in poorly governed firms, I expect to see the following, which mirrors my postulation above.

Hypothesis 2. CSR is valued less for firms with weaker corporate governance.[7]

At the country level, Licht, Goldschmidt, and Schwartz (2007) provides robust evidence on the strong and positive relation between individualism and governance, namely, the rule of law, corruption, and democratic accountability.[8] Doidge, Karolyi, and Stulz (2007) demonstrate that country characteristics are the most important determinant of a firm's governance practices. More importantly, they find that country fixed effects alone are able to explain between 40% to 70% of the variation in firm-level governance ratings. Griffin, Guedhami, Kwok, Li, and Shao (2017) later show that individualism, one of Hofstede's cultural dimensions, along with uncertainty avoidance capture about 90% of the said country fixed effects,

[7] As shown in Column (4), Panel B of Table 2.2, firms in civil law countries tend to have higher CSR ratings but lower corporate governance ratings. Quite plausibly, laws that push firms into pursuing more CSR objectives may have the unintended consequence of creating more agency problems, which is in line with my hypothesis here. In this regard, having a direct measure of firm-level governance quality helps separate the law-abiding well-run firms from those using CSR as a shield behind which managers may extract private benefits from shareholder wealth.

[8] In addition, both North (1990) and Williamson (2000) contend that culture lies at the foundation of formal institutions. Treisman (2000) studies the relationship between culture and corruption. Guiso, Sapienza, and Zingales (2006) provide a pathbreaking review on culture as a determinant of economic behaviour, and further (2015) claim that informal institutions (national culture) are at least as important as formal ones (laws and regulations) in the determination of economic outcomes, while corporations are excellent laboratories for assessing the direction of causality.

and outperforms all other country-level explanatory variables used in the corporate governance literature. They show that individualism strongly predicts good firm-level governance, while controlling for a battery of observable country characteristics. It is therefore consequential and intuitive to extend my firm-level hypotheses and formulate their country-level counterparts.

Hypothesis 1B. The distortionary effect of CSR on a firm's investment sensitivity to Q is weaker for firms located in more individualistic countries.

Hypothesis 2B. CSR is valued more for firms located in more individualistic countries.

2.3. Sample and Variables

2.3.1. CSR Ratings

I obtain CSR ratings from Thomson Reuters' ASSET4. Founded in 2003 in Switzerland, ASSET4 is a leading vendor of objective and standardized information that offers one of the world's largest databases of environmental, social, and governance (ESG) activities to investors and corporations alike. Each year, ASSET4 employs over 100 analysts to extract relevant, comparable, and up-to-date information from publicly available data sources, spanning annual reports, stock exchange filings, and news outlets. Sample selection bias is minimized by including all constituent firms of major equity indexes around the world.[9]

The ASSET4 ESG ratings are equally weighted assessments based on over 250 key performance indicators (KPIs). These ratings are standardized and normalized to lie between 0% and 100%, which are grouped into 15 categories under three pillars:[10] (1) environmental performance score, which examines resource reduction, emission reduction, and product

[9] Such as ASX 300, Bovespa, CAC 40, DAX, FTSE 250, MSCI Emerging Markets, MSCI World, NASDAQ 100, S&P500, SMI, STOXX 600, etc. The ASSET4 universe covers over 70% of the global market capitalization.

[10] The fourth pillar, economic performance, is excluded, as it lies outside the discussion of this paper. Also, the term "CSR" in this study refers only to the environmental and social performance, while corporate governance is examined as a moderating factor.

innovation; (2) social performance score, which evaluates employment quality, health and safety, training and development, diversity, human rights, community, and product responsibility; (3) corporate governance score, which assesses board structure, compensation policy, board functions, shareholder rights, vision and strategy. Detailed descriptions of what these categories entail are presented in Table A1.

A firm receives a z-score in year t for each of the three pillars by benchmarking its performance against the rest of the firms, given the information available in fiscal year $t-1$. To illustrate, an environmental performance score in 2015 reflects a firm's investments with regard to resource reduction, emission reduction, and product innovation in 2014. Therefore, ESG rating scores are lagged one year by construction, and higher scores indicate better relative performance. After matching with other variables of interest, I have over 43,500 firm-year observations from 41 countries between 2004 and 2016.[11] The distribution of observations by country is presented in Table 2.1. The United States accounts for 30.17% of all firm-year observations, followed by Japan (11.75%), the United Kingdom (9.17%), Australia (6.02%), and Canada (5.41%).

2.3.2. Cultural Indexes

The key cultural variable of interest is a measure of individualism, and the most notable one was developed by Geert Hofstede (the IDV index), who initially conducted surveys of IBM employees across 33 countries. After new waves of surveys and cultural studies, his individualism index now covers over 90 countries. Individuals in countries with a high IDV score value personal freedom and status, while individuals in countries with a low IDV score value harmony and conformity. Hofstede's cultural indexes (six in total) are all constructed through factor analysis on answers to a variety of survey questions. His individualism index is the first factor in answers regarding the value of personal time, fulfillment, interest, etc.

[11] Removing observations impacted by the Great Recession of 2007 – 2009 does not materially change my empirical results.

This factor loads positively on valuing individual freedom, opportunity, achievement, and advancement, but negatively on valuing harmony, cooperation, and relations with superiors. Conversely, the emphasis on harmony, cooperation, and good relations with superiors fits well with the definition of collectivism, and implies a stronger sense of conformity and a fear of sticking out.

Although Hofstede's data were collected initially for the purpose of understanding differences in IBM's corporate culture, his measure of individualism has been validated in a number of studies and is widely regarded as the paradigm in comparative cultural studies.[12] In addition to the individualism index, I also use Hofstede's uncertainty avoidance index (UAI) to refine my sample partitioning in Section 2.4. For the robustness tests in Section 2.5, I further include the harmony and embeddedness measures from Schwartz (2012), as well as the environmental/social awareness and the trust indexes from the World Value Survey (WVS).

2.3.3. Firm-level Controls

I collect firm-level financial data from Worldscope and Datastream. The dependent variable in my investment regressions (2.2) is capital expenditure scaled by total assets, as per Baker, Stein, and Wurgler (2003).[13] Tobin's Q, calculated as market-to-book assets, is the dependent variable in my valuation regressions (2.1). It also serves as a proxy for growth opportunities in my investment regressions. This measure of Tobin's Q is also adopted by McLean, Zhang, and Zhao (2012) and McLean and Zhao (2014), among others.[14]

[12] See Hofstede (2001) and Hofstede, Hofstede, and Minkov (2010) for a review. Chui, Titman, and Wei (2010) document a robust and positive relationship between individualism and momentum around the world. Eun, Wang, and Xiao (2015) find that stock prices co-move more (less) in collectivistic (individualistic) countries, after accounting for a battery of alternative explanations.

[13] Alternative definitions of corporate investment, such as the sum of capital expenditure and R&D scaled by total assets, the sum of capital expenditure, R&D and SG&A scaled by total assets, or asset growth lead to qualitatively similar results.

[14] Peters and Taylor (2017) devise a novel measure of Tobin's Q that better captures the investment-Q relation for intangible capital, of which CSR is an important component. However, it is not materially superior in describing the investment-Q relation for tangible capital, which is the main focus of this paper, nor

Additionally, I control for the following firm characteristics in all regressions: size, leverage, asset tangibility, cash holdings, and profitability. These variables have been identified as key determinants for capital investment and corporate valuation by previous studies. They are translated into real US dollar amounts wherever applicable, using fiscal-year-end exchange rates. Detailed definitions can be found in Panel A of Table A2. All firm-level variables are winsorized at the 1% level.

2.3.4. Country-level Controls

Data on economic development and institutional quality are from various databases hosted at the World Bank. I obtain the rule of law, control of corruption, and regulatory quality indexes from the Worldwide Governance Indicators database (the methodology is thoroughly covered in Kaufmann, Kraay, and Mastruzzi (2011). Real GDP per capita and the human capital index (HCI) are from the World Development Indicators (WDI) database. Different from the celebrated Human Development Index (HDI), the HCI captures not only the level of education and healthcare, but also serves as a proxy for the intellectual ability of a given population through its use of standardized test scores. The updated legal origin indicator (equals 1 for common law countries) is from La Porta, Lopez-de Silanes, and Shleifer (2008). Detailed definitions can be found in Panel B of Table A2.

2.3.5. Descriptive Statistics

Table 2.1 describes the characteristics of the sample countries using both firm- and country-level measures, along with the two cultural indexes. All variables are expressed as country-level means. Across the board, the international heterogeneity is obvious. Unsurprisingly, individualistic countries tend to be those with higher income, better institutional quality, and

can it serve as the dependent variable in my valuation regressions. Although no study that I am aware of suggests that measurement error in Q is systematically lower for firms with high CSR ratings, when re-estimating my investment regressions using the cumulant method (Erickson, Jiang, and Whited, 2014), I obtain qualitatively similar findings to those reported in the paper.

superior corporate governance ratings, consistent with the observations of previous studies (Licht, Goldschmidt, and Schwartz, 2007; Griffin, Guedhami, Kwok, Li, and Shao, 2017). This is also confirmed by the pairwise correlations between the individualism index and a battery of country characteristics, tabulated in Panels B and C of Table 2.2. Figure 2.1 presents a visual comparison of differences in individualism scores and ESG ratings around the world. Evidently, firms located in individualistic countries have superior governance ratings on average, but not necessarily better environmental or social ratings. The contrast between the governance and E&S ratings is particularly pronounced for countries such as the United States, Japan, Australia, and Canada, which account for over 50% of all firm-year observations when combined.

The direction of causality has been extensively discussed in the aforementioned studies, hence it is not of major concern within the scope of this study. Specifically, individualism has a strong casual effect on international differences in economic and institutional development, and the problem of reverse causality is negligible for comparative studies across nations.[15] Nevertheless, the endogeneity challenge pertaining to this study, i.e., whether the effect of corporate social responsibility on capital investment and firm value is causal, will be addressed through the use of a U.S.-matched sample (via propensity scores) and instrumental variables in Section 2.5.

2.4. Empirical Results

To combat the issue of a few developed countries dominating the sample, I implement the following two empirical strategies. First, I exclude the U.S. from my main analysis and use the country primarily as a benchmark for propensity score matching[16] in Section 2.5, where

[15] Beugelsdijk, Maseland, and Van Hoorn (2015) reveal that changes in Hofstede's cultural indexes have been small and more within than between nations since their creation.

[16] Aggarwal, Erel, Stulz, and Williamson (2008) implement a similar approach that matches non-U.S. firms to their U.S. peers based on observable firm characteristic. Furthermore, the value of CSR for U.S. firms has been largely uncovered by a few influential studies. See, *inter alia*, Edmans (2011), Servaes and Tamayo

I tackle the endogeneity of CSR ratings. Second, for my firm-level regressions, I perform the weighted least squares (WLS) estimation where each firm-year observation is weighted by the inverse of the number of observations in the firm's host country. Standard errors of the coefficient estimates are clustered at the country level to account for within-country correlation among observations.

2.4.1. The Value of CSR vs. The Effect of CSR on Investment: A Primer

Tables 2.3 and 2.4 serve as a primer for my main results in Tables 2.5 and 2.6, which rely on sample splits. The value regressions in Table 2.3 take the following form:

$$Q_{it} = \alpha + \beta_1 ESG_{it} + \gamma' X_{it-1} + \Lambda + \varepsilon_{it} \tag{2.1}$$

where Q_{it} is Tobin's Q of firm i in year t, and ESG_{it} is one of the three ratings: environmental, social, or governance score for the firm in year t, which is lagged one year by design as per my discussion in Section 2.3, X_{it-1} are a set of firm characteristics in year $t-1$ which include size, cash holdings, leverage, profitability, asset tangibility, R&D expenditure, and 2-year geometric average sales growth, and Λ are industry, country, and year fixed effects.[17] Analogously, the investment regressions in Table 2.4 have the following specification:

$$I_{it} = \alpha + \theta_1 ESG_{it} + \theta_2 ESG_{it} \times Q_{it-1} + \theta_3 ESG_{it} \times CF_{it} + \delta' Y_{it-1} + \Lambda + \varepsilon_{it} \tag{2.2}$$

where I_{it} is the investment of firm i in year t, Q_{it-1} is its Q ratio in year $t-1$, CF_{it} is its operating cash flow (after dividends) in year t, and Y_{it-1} are the same set of firm-level controls as in Equation (2.1), excluding profitability, R&D, and sales growth but including Q_{it-1}, CF_{it}, and dividends.

(2013), Flammer (2015), and Lins, Servaes, and Tamayo (2017).

[17] Using firm and year fixed effects instead yields qualitatively similar, albeit weaker results, since ESG ratings tend to be sticky. On the other hand, using country-by-year fixed effect in place of country and year fixed effects does not materially change my results.

Using the full sample (excluding the U.S.), the first two columns of Table 2.3 show that, controlling for a comprehensive set of firm characteristics and year, industry and country fixed effects,[18] the two CSR ratings, i.e., the Environmental Score and the Social Score, both command a positive and significant impact on firm value. The positive value implication of corporate governance is relatively weaker but still present, as shown in Column (3). These results are largely in line with those established in previous studies. Nevertheless, mine are less susceptible to omitted variable bias due to the inclusion of multilevel fixed effects, as previous studies have sometimes relied on a random effects specification or neglected the unobservable heterogeneity between countries.

What is surprising is the negative impact of CSR on investment-Q sensitivity, revealed by the first two columns of Table 2.4. Previously, corporate investment was thought to be one of the value-enhancing channels for CSR initiatives (El Ghoul, Guedhami, and Kim, 2017; Benlemlih and Bitar, 2018). Here, I observe the complete opposite under the investment-Q framework, which is arguably the paradigm for gauging the efficiency of capital allocation in the finance literature (Wurgler, 2000; Durnev, Morck, and Yeung, 2004; McLean, Zhang, and Zhao, 2012).[19] The result in Column (3) of Table 2.4 is as expected, since picking positive-NPV projects is the foremost element of good corporate governance (at least from a financial perspective), and Tobin's Q reflects the combined NPV of a firm's ongoing capital investments.[20] Consequently, Governance Score should (and does) exert a positive effect on investment-Q sensitivity and a negative one on investment's sensitivity to cash flow.

[18] Industries are defined by 2-digit SIC. Due to the inclusion of country fixed effects, cultural indexes and other time-invariant country characteristics are only introduced in subsequent tables through the use of sample splits and interaction terms.

[19] El Ghoul, Guedhami, and Kim (2017) claim that, *ceteris paribus*, high-CSR firms invest more without analyzing whether such investment is undertaken in an efficient fashion. Benlemlih and Bitar (2018) measure investment efficiency using the residual from a simple investment regression for U.S. firms, similar to the methodology of Richardson (2006). It is unclear if an "optimal" level of investment could be captured by a simple linear model, or for that matter, if investment efficiency should be gauged by the (lack of) deviation from the model prediction.

[20] A firm's average Q ratio is greater than one if and only if the combined NPV of its ongoing investment projects is positive. Strictly speaking, this holds if and only if the stock market is efficient. Nevertheless, Tobin's Q is still widely used in the literature as a benchmark for measuring firms growth prospects.

2.4.2. CSR, Investment Efficiency, and Firm Value: The Role of Corporate Governance

Given the discussion above, a follow-up question naturally arises: is the distortionary effect of CSR on (economic) investment efficiency weaker for better governed firms? The answer is yes, as shown in Panel A of Table 2.5, where I split the full sample of firms used in the preceding section at the median governance rating, and repeat the same regression as in Table 2.4 for each sub-sample.[21] Clearly, the negative effect of each of the two CSR ratings on investment-Q sensitivity is more pronounced for firms with lower Governance Scores, which translates precisely to the differential value implications of CSR for well- vs. poorly-governed firms, as documented in Panel B. That is, owing to the severer distortionary effect of CSR on corporate investment efficiency among firms with larger governance shortfalls, CSR initiatives of such firms hold a lower value.

2.4.3. CSR, Investment Efficiency, and Firm Value: The Role of National Culture

Prior research has established the positive causal effect of individualism on good governance practices (Licht, Goldschmidt, and Schwartz, 2007; Griffin, Guedhami, Kwok, Li, and Shao, 2017) at both the country and the firm levels. In light of my findings regarding the role of corporate governance, a firm characteristic, in moderating the impact of CSR on investment and hence the value of CSR, I proceed to investigate whether individualism, a country characteristic, has a similar moderating effect. The answer to this question should help solve the empirical puzzle that CSR is valued lower by shareholders in collectivistic nations, where social harmony is supposedly valued higher compared to individualistic nations. To be specific, Panel A of Table 2.6 presents this very puzzle, obtained from a slightly revised version of Equation (2.1):

[21] Levels of the interaction terms and additional firm-level controls are included in each regression, but not tabulated for brevity. The use of interaction terms combined with sample splits essentially creates a triple difference (difference-in-difference-in-differences, or DDD) model.

$$Q_{it} = \alpha + \beta_1 ESG_{it} + \beta_2 ESG_{it} \times Culture_c + \gamma' X_{it-1} + \Lambda + \varepsilon_{it} \tag{2.1b}$$

where $Culture_c$ is either the Individualism or the Uncertainty Avoidance index of firm i's host country c. Note that the level of $Culture_c$ is not included in the above regression, as it is absorbed by the country fixed effect in Λ. In Columns (1) and (3), both CSR ratings are indisputably more valuable in more individualistic countries, as indicated by the positive and significant coefficient estimate of the interaction terms involving the individualism index. On the other hand, despite being an important cultural trait of social harmony,[22] Hofstede's uncertainty avoidance (UAI) index commands a negative and significant moderating effect on the value of CSR, as seen from Columns (2) and (4).

These results are no longer puzzling once we examine the mechanism behind them, which is tabulated in Panel B. Here, I partition the sample along the two cultural dimensions in the spirit of Griffin, Guedhami, Kwok, Li, and Shao (2017). For example, Columns (1) and (3) contain firms based in countries with an above median individualism index (high IDV) and a below-median uncertainty avoidance index (low UAI). They are also the type of firms more likely to earn a higher Governance Score, given the established culture-governance nexus. Following the same line of logic, low IDV and high UAI cultures tend to produce poorly-governed firms, which are placed in Columns (2) and (4).[23] Consistent with my theoretical predictions in Section 2.2, only firms from low IDV (high UAI) countries experience a negative impact from CSR activities on their investment-Q sensitivity. As a result, the value of CSR is lower in such countries, and the lack of investment efficiency exacerbated by inferior corporate governance is a convincing driver of this phenomenon.

[22] Hofstede's uncertainty avoidance (UAI) index is included here as a sample partitioning variable and robustness check, as UAI promotes social harmony but hinders good governance. See Licht, Goldschmidt, and Schwartz (2007) and Griffin, Guedhami, Kwok, Li, and Shao (2017) for a detailed discussion.

[23] Note that the correlation between IDV and UAI is -0.145 and is not statistically significant. Two additional categories from the two-way partitioning, "high IDV and high UAI" and "low IDV and low UAI", are not included in Table 2.6 for brevity, as they do not yield a potential contrast in governance quality as great as the two included categories.

2.5. Endogeneity, Causal Inference, and Robustness

The preceding section establishes the positive moderating effect that good governance or an individualistic culture exerts on the value of CSR, through the investment efficiency channel. Still, the question of causality remains, i.e., whether such a moderating effect is spurious due to the endogenous nature of CSR initiatives.[24] In order to obtain better causal inference, I employ the following two approaches. First, I construct a U.S.-matched sample using propensity scores and repeat my analysis in Tables 2.5 and 2.6 on this matched sample. Second, I take an instrument variables approach and re-analyze the relationship between culture and the value of CSR.

2.5.1. Propensity Score Matching

To begin with, I estimate the probability via a probit regression that a randomly selected firm from my entire sample universe (including U.S. firms) is a non-U.S. firm, given a set of observable characteristics as used in Table 2.3 (size, leverage, asset tangibility, cash holdings, profitability, R&D spending, and sales growth). Then for each year, I match with replacement each non-U.S. firm to the closest U.S. firm that is within a 0.01 radius of the estimated probability (a.k.a. propensity score) and that belongs to the same industry. In the end, 21812 out of the 27834 non-U.S. firm-year observations can be matched to a U.S. peer through this nearest neighbour propensity score matching procedure.[25] The U.S. is chosen as the benchmark country not only because it offers the largest donor pool for potential matches, but more importantly, it is also a country that exhibits a sharp contrast in its over-

[24] Hong, Kubik, and Scheinkman (2012) demonstrate that causality primarily flows from corporate financial performance to corporate social responsibility for U.S. firms. That is, firms are more likely do good when they do well, but not vice versa. Beugelsdijk, Maseland, and Van Hoorn (2015) show that Hofstede's culture indexes can be treated as reasonably exogenous. Ferrell, Liang, and Renneboog (2016) contend that better governed firms engage more in CSR activities.

[25] My results in Tables 2.7 and 2.8 are robust to any choice of caliper within the interval of [0.005, 0.02]. Intuitively, there is a trade-off between matching quality and the number of matches. Choosing a caliper of 0.01 strikes a fine balance between the two competing objectives.

all social/environmental performance vs. corporate governance performance, as the average governance rating for U.S. firms is considerably higher that their average CSR rating.

Table 2.7 follows the analytical framework of Table 2.5, except that the underlying sample is now U.S.-matched. "Governance Shortfall" is the difference in governance ratings between the non-U.S. firm and its matched U.S. peer (i.e., non-U.S. minus U.S.), and "Matched Difference in Social Score" or "Matched Difference in Environmental Score" is constructed in the same fashion. Columns (1) and (2) contain firms whose governance shortfalls are below median, which correspond to the better governed firms in Table 2.5, while the opposite is true for firms in Columns (3) and (4). As expected, Panel A shows that only firms with high governance shortfalls experience a negative and significant impact on their investment-Q sensitivity from an increase in CSR ratings over their U.S. peers, and unsurprisingly, they are the very firms whose incremental CSR ratings hold a lower value, as seen from Panel B.

Table 2.8, the spiritual descendant of Table 2.6, reveals a pattern similar to the one documented above. Here in Panel A, I no longer rely on interaction terms to uncover the moderating effect of culture on the value of CSR. Rather, I use sample splits to facilitate a more intuitive interpretation of the coefficient estimates, as we are now handling the difference in CSR ratings (between two firms in a matched pair) as opposed to their levels. Nevertheless, the results are qualitatively the same as those in Table 2.6. Specifically, the incremental CSR of a non-U.S. firm over its U.S. peer is valued higher in countries with a more individualistic culture, and less so in countries with an above-median level of uncertainty avoidance. This is conceivably caused by the fact that the negative impact of a firm's incremental CSR on its investment efficiency is more pronounced in collectivistic or high UAI countries, as shown in Panel B.

In summary, the results obtained from the U.S.-matched sample are consistent with those in Tables 2.5 and 2.6, strengthening the credibility of CSR's causal effect on corporate investment and consequently corporate valuation. More importantly, they offer corroborating

evidence for the culture-governance nexus that national culture is of first-order importance in the determination of corporate governance practices (Griffin, Guedhami, Kwok, Li, and Shao, 2017), i.e., individualism promotes good governance at the firm level, while uncertainty avoidance hinders it.

2.5.2. Instrumental Variables Approach

To further substantiate my hypothesis that corporate governance (or national culture for that matter) plays a causal role in moderating the value of CSR, I use the median CSR rating of all other firms in the same industry and the same country as an instrumental variable (IV) for a given firm's rating, and re-run my value regressions under this IV setting (two-stage least squares, or 2SLS) in Table 2.9. Recall that an instrumental variable has to meet the following two restrictions to be valid:

Restriction 1. It should have a strong correlation with the endogenous variable (relevance).

Restriction 2. It should have no direct effect on the dependent variable other than that through the endogenous variable (exclusion).

My choice of IV meets the two restrictions because:

1. CSR practices by peer firms in the same country and the same industry have a conceivable influence on a given firm's practice (relevance).

2. The direct effect of peer firms' CSR practices on the focal firm's CSR value is largely purged by country and industry fixed effects (exclusion).[26]

The sample is now one-way split at the median of corporate governance rating (Panel A),

[26] The IV is never significant when included directly in my value regressions. Using the median CSR rating of peer firms as opposed to the average reduces the influence of extreme values. In unreported tests, I obtain qualitatively similar results to those in Table 2.9 using the initial value of a firm's CSR rating as the instrument. However, this approach is susceptible to varying panel lengths; it is also more likely to breach the exclusion restriction.

Hofstede's individualism index (Panel B), or Hofstede's uncertainty avoidance index (Panel C). Since the economic intuition behind interaction terms involving IVs is not straightforward to interpret, Angrist and Pischke (2008) suggest the use of sample splits as a preferred alternative. The "F-statistic" from first-stage regressions are included at the bottom of each panel, which strongly reject the null hypothesis that the instruments are weak.[27] This reaffirms the relevance of my chosen IVs. The results are perfectly in line with those in Panel A of Tables 2.5 and 2.6. That is, CSR is valued higher among firms with better corporate governance, which are more prevalent in countries with a more individualistic culture. Table 2.9 again validates the culture-governance nexus and solidifies the moderating effect of national culture on the value of CSR, through the corporate governance channel that ultimately leads to efficient capital investments or lack thereof.

2.5.3. Additional Robustness Tests

As yet another step to ensure that the moderating effect of culture on the value of CSR is not spurious, I conduct an empirical horse race of value regressions in this section, where alternative cultural measures and additional country characteristics are interacted with the E&S Score, alongside the two Hofstede indexes scrutinized in my main analysis. The specification is then a further revised version of Equation (2.1):

$$\begin{aligned} Q_{it} = \alpha + \beta_1 E\&S_{it} + \beta_2 E\&S_{it} \times Culture_c + \beta_3 E\&S_{it} \times Characteristic_c \\ + \gamma' X_{it-1} + \Lambda + \varepsilon_{it} \end{aligned} \tag{2.1c}$$

where $E\&S_{it}$ is the arithmetic average of the environmental and social scores[28] of firm i in year t, and $Characteristic_c$ is one of the additional country-level controls for firm i's host

[27] The "F-statistic" is constructed as per Kleibergen and Paap (2006), which is robust to data clustering and tests the joint significance of all variables in first stage regression. Note that the Stock and Yogo (2005) tests of weak instruments assume i.i.d. errors and are hence not applicable in my panel setting.

[28] Collapsing the two CSR ratings into one conserves space in tables of robustness tests, as previous sections have sufficiently demonstrated that empirical results obtained from either the social score or the environmental score are qualitatively comparable.

country c described below. As before, levels of the time-invariant variables are not included in the regressions,[29] due to the presence of country fixed effects.

"Embeddedness", an alternative measure of cultural collectivism, and "Harmony", another indicator of uncertainty avoidance, are from Schwartz (2012). "Environmental and Social Awareness", "Trust", and "Perceived Fairness" are from the World Value Survey (WVS).[30] They capture the aggregate social mentality in the said areas, and are expressed as the average of all available waves (until WVS 6 in 2014) for each nation. "Rule of Law", "Control of Corruption", and "Regulatory Quality" are from Kaufmann, Kraay, and Mastruzzi (2011), which have been widely employed as controls for institutional quality in comparative research. Finally, "Human Capital Index" and real GDP per capita are from the World Development Indicators database (WDI) hosted at the World Bank. The former gauges not only the level of education, but also the perceived level of intellectual ability (from standardized test scores) for a given population, while the latter is the benchmark measure of economic development.

Regardless of the additional variables and their interactions with the E&S Score, individualism (uncertainty avoidance) always commands a robust and positive (negative) moderating effect on the value of CSR, as shown in Table 2.10 (2.11). The variables added do emerge with expected signs, but most of them are statistically insignificant. Figure 2.2 provides a tangible visualization of the key results in Table 2.10, where the marginal effect of E&S Score on Tobin's Q is plotted against Hofstede's Individualism index. The resulting lines are clearly upward-sloping and statistically significant (based on the 95%-confidence band). Furthermore, the slope is not sensitive to the inclusion of either controls of institutional quality or alternative cultural measures.[31] This reaffirms that the two Hofstede indexes are not

[29] Real GDP per capita is the only time-varying country-level control in this section. As a result, its level is always included along with its interaction with $E\&S_{it}$.

[30] Dyck, Lins, Roth, and Wagner (2019) discuss the impact of environmental and social awareness on corporate social responsibility. Lins, Servaes, and Tamayo (2017) analyze the role of trust in determining the value of corporate social responsibility.

[31] A similar set of plots involving the Uncertainty Avoidance index (based on the results of Table 2.11) are not presented for brevity. The patterns are qualitatively comparable to those in Figure 2.2, albeit in the

merely picking up the effects of other potentially confounding factors – quite the contrary, they are the principal component in moderating the value of CSR across nations.

2.6. Concluding Remarks

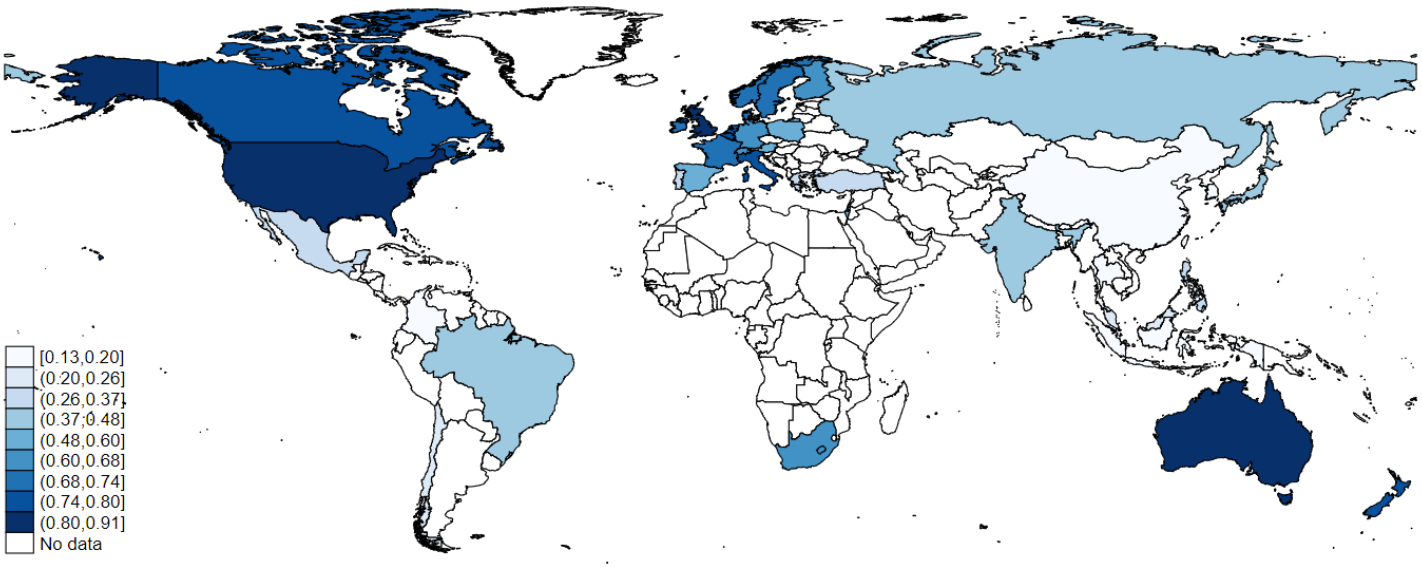
Within the Anglosphere, corporate governance is generally concerned with "how investors get the managers to give them back their money (Shleifer and Vishny, 1997)." Corporate social responsibility, however, is often viewed as a form of cash diversion and an agency problem, due to its emphasis on all stakeholders rather than mere shareholders. On the other hand, the good governance view contends that CSR activities are usually adopted by firms that are well governed. It is often neglected, in this debate, that legal rules and cultural norms are quite different outside the Anglosphere, which has both conscious and subconscious effects on the executives' incentives, the fiduciary duties of the management, and the overall decision-making process. The debate on the role of CSR hence demonstrates the diversity of both formal and informal institutions across nations.

This paper's findings are more in line with the agency problem connotation while at odds with the good governance view of CSR. Using a comprehensive sample of firms from 41 countries between 2004 and 2016, I show that the positive relationship between capital investment and Tobin's Q is weaker for high CSR firms. In addition, I discover that the distortionary effect of CSR on investment sensitivity to Q is stronger for firms with weaker corporate governance. I further show that CSR is valued less for such firms. My main results are robust to alternative model specifications, sample selection, and the use of instrumental variables. I therefore argue that CSR may impose costs to a firm in the form of forgone positive-NPV projects, or more nefariously, be used as a tool for opportunistic managers to extract private benefits which, in the long run, is manifested in the loss of shareholder wealth.

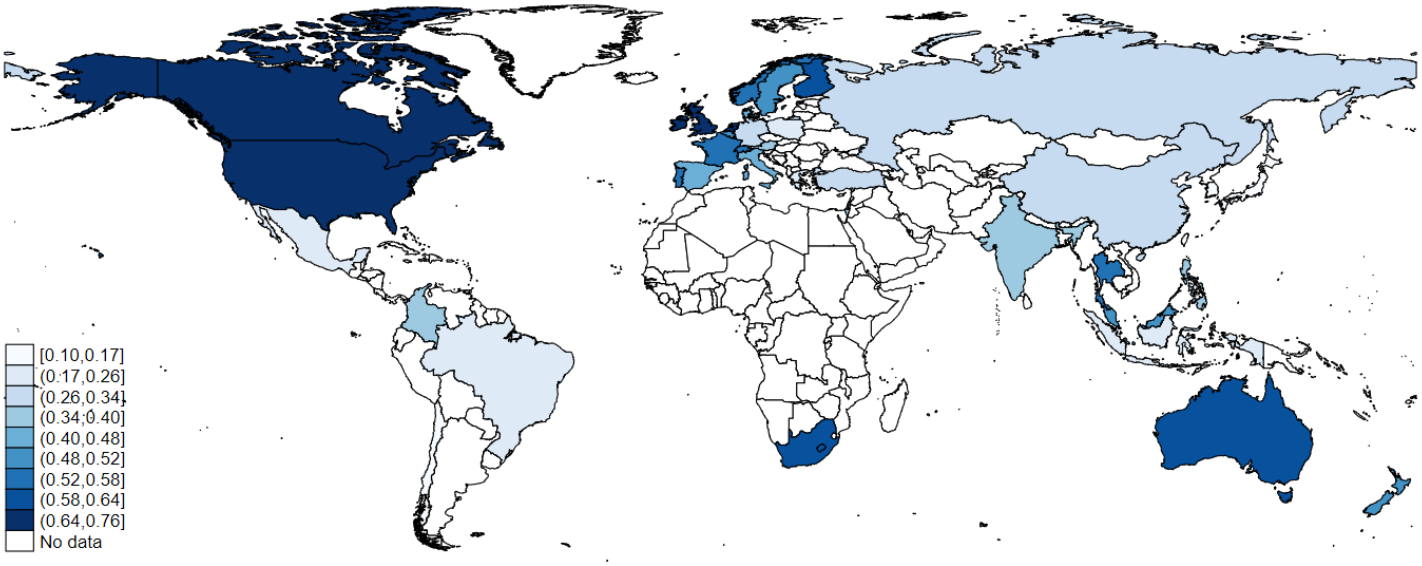
opposite direction.

Consistent with my firm-level results, my analysis from the cultural perspective offers corroborating evidence on the distortionary effect of CSR on investment sensitivity to Q, and on the moderating role of good corporate governance. Griffin, Guedhami, Kwok, Li, and Shao (2017) establish a strong and robust positive relationship between individualism and Anglo-American style corporate governance regimes, which emphasize board independence, financial transparency, and equity-based compensation. While what works for America (or members of the former British Empire for that matter) does not necessarily work for the rest of world, what constitutes good corporate governance should not deviate too far from the aforementioned aspects. Following this line of logic, I discover that the distortionary effect of CSR on investment sensitivity to Q is weaker for firms located in countries that enjoy a higher level of individualism. As a result, firm-level CSR initiatives are valued higher in such countries.

Taken together, the evidence in this paper offers new insight into the pros and cons of corporate social responsibility initiatives. Some researchers argue that CSR in the private sector is indispensable for filling institutional voids, as governments can be corrupt, inefficient, and at times predatory towards the private sector (Shleifer and Vishny, 2002). Here I cast doubt on this view. Without a solid foundation of institutional quality, CSR can easily degenerate into a tool for diverting shareholder wealth. Yet, institutional development is deeply rooted in a nation's culture. It is therefore imperative to jointly examine the cultural context and the governance regime the firm is subject to, when assessing the merits (or lack thereof) of its corporate social responsibility initiatives, as conflicting views may only be resolved until we piece together a more complete picture.



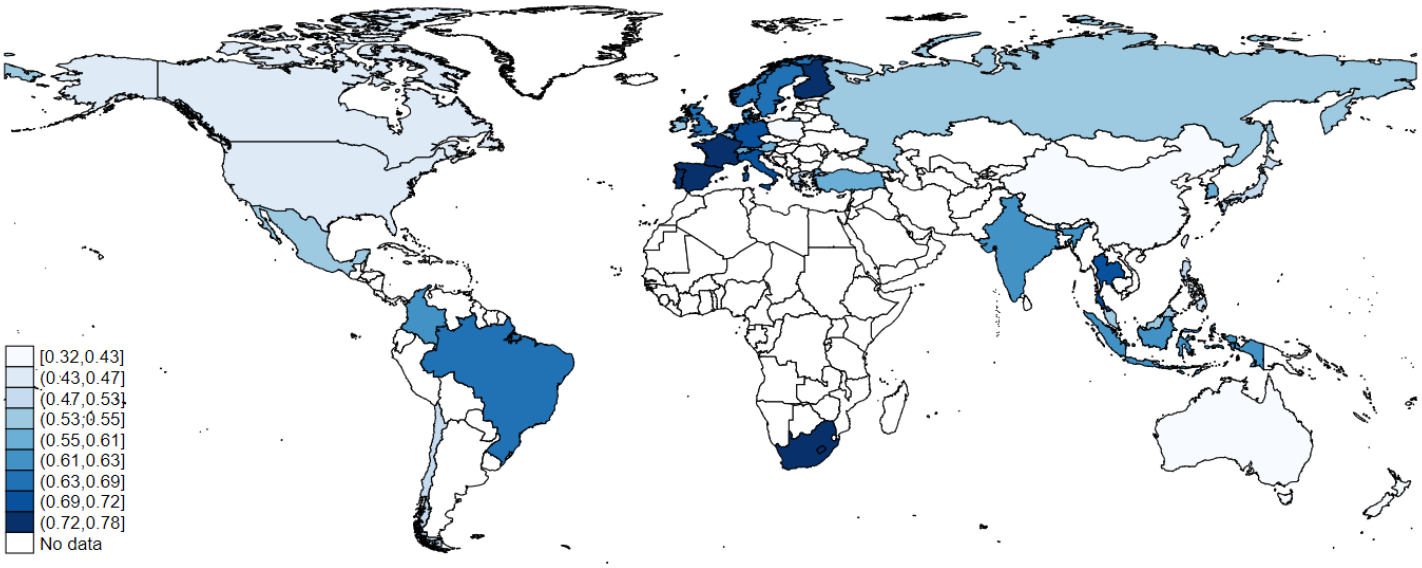
Panel A Individualism Scores around the World



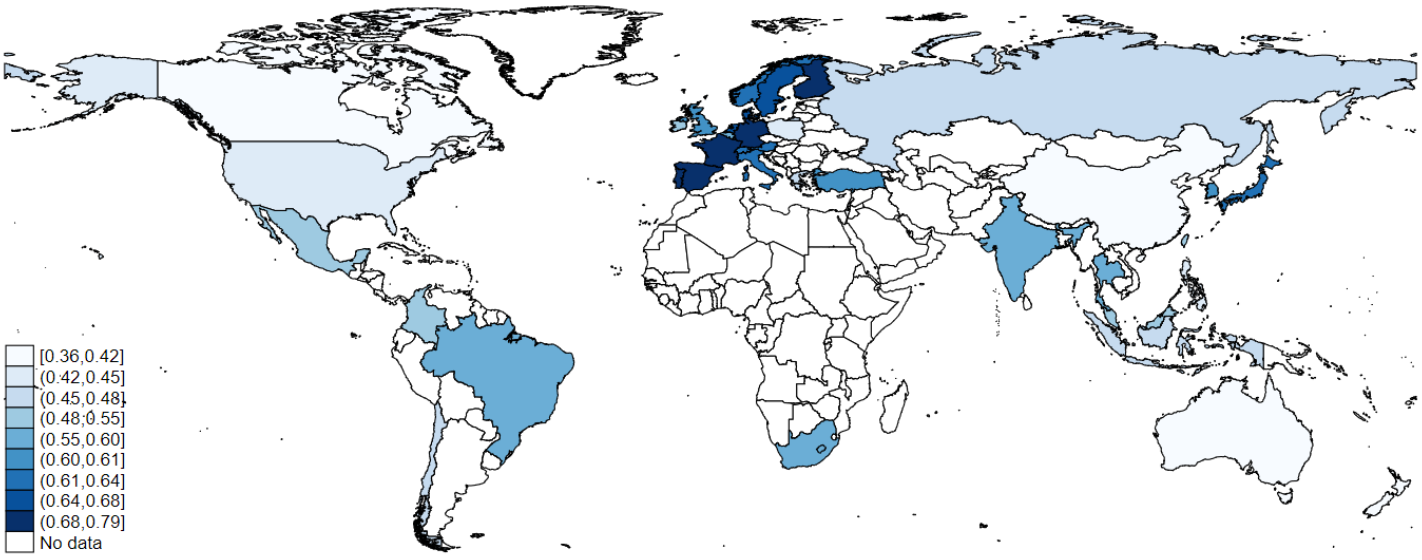
Panel B Corporate Governance Ratings around the World

Figure 2.1 Individualism and ESG Ratings: A Visual Comparison

This figure illustrates the levels of individualism and ESG ratings for different parts of the world, based on the information from Table 2.1.

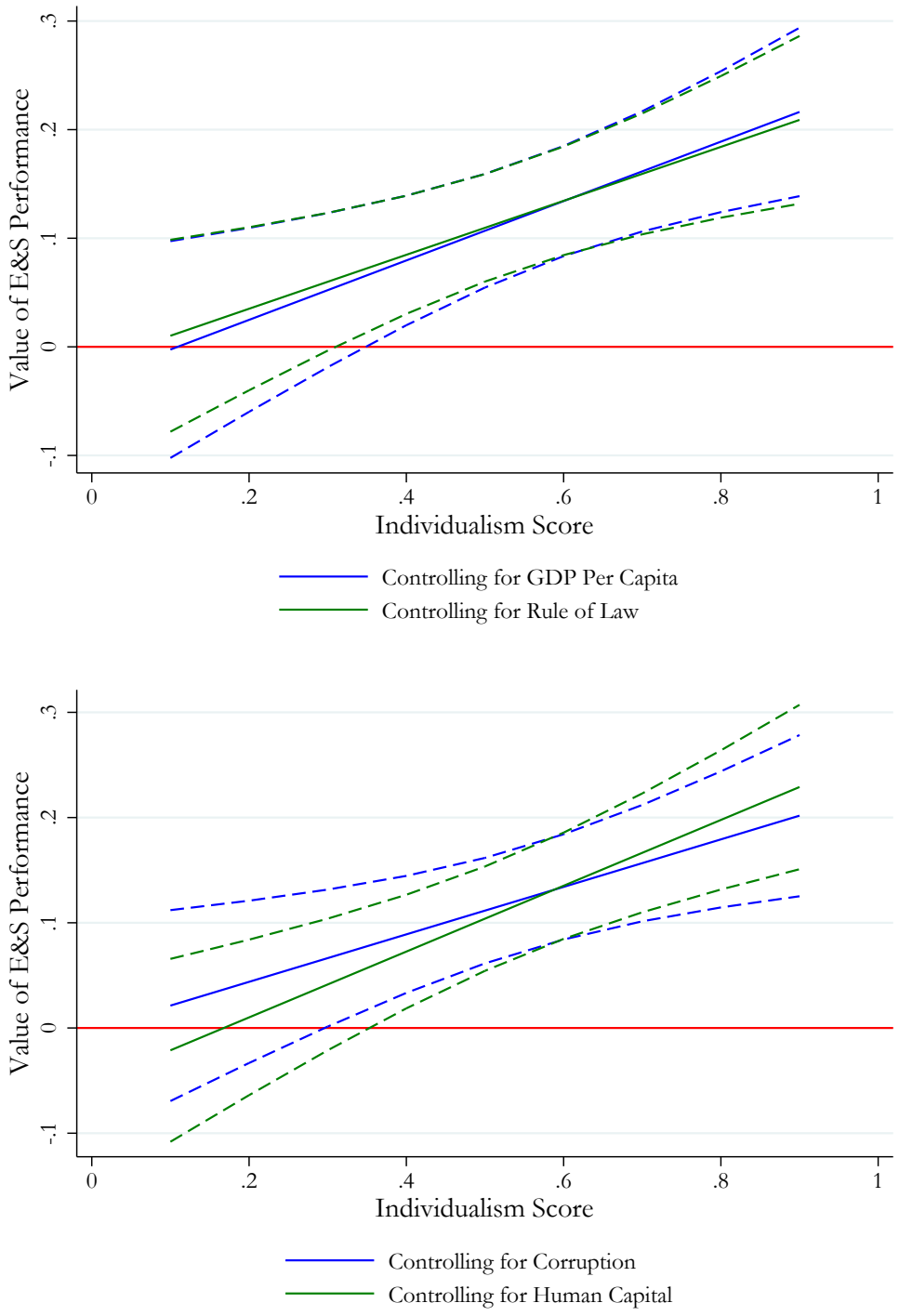


Panel C Corporate Social Ratings around the World



Panel D Corporate Environmental Ratings around the World

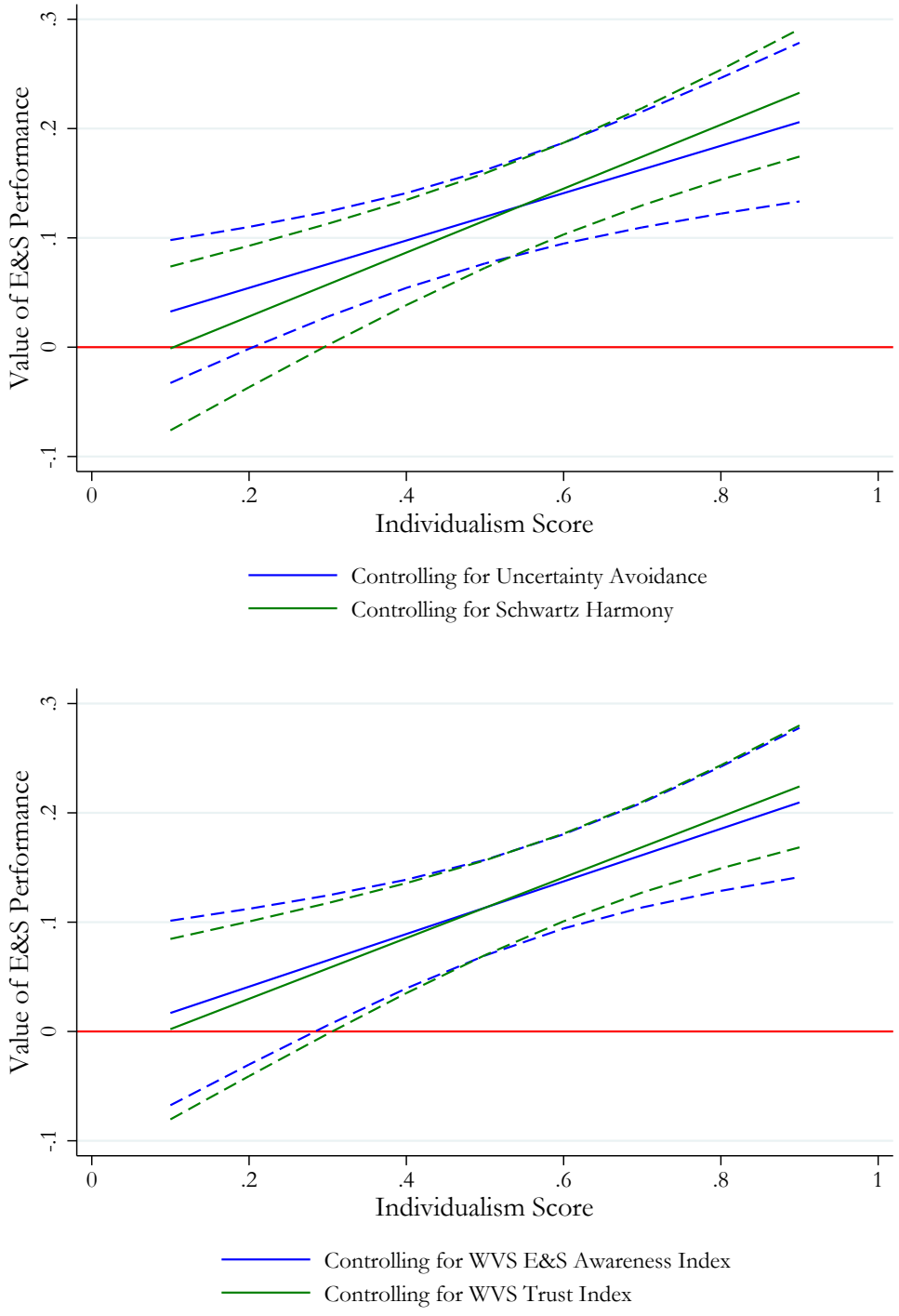
Figure 2.1 continued.



Panel A Controlling for Institutional Quality

Figure 2.2 Individualism and the Value of CSR: Robustness

This figure shows the value of a representative firm's environmental and social (E&S) performance given different levels of individualism. It is a partial visualization of the estimation results in Table 2.10. The dashed lines depict the upper and lower bounds of the 95%-confidence band. The value of the firm's environmental and social performance is gauged by the marginal effect of E&S Score on Tobin's Q from Equation (2.1c).



Panel B Controlling for Alternative Cultural Measures

Figure 2.2 continued.

Table 2.1 Countries at a Glance

This table summarizes the key variables of interest in the paper. "IDV" and "UAI" are the Individualism and Uncertainty Avoidance scores from Hofstede (2001). Environmental, Social, and Governance scores are from the ASSET4 ESG database. Firm characteristics other than the ESG ratings are from Datastream and Worldscope. Panel A lists Individualism and selected firm characteristics; Panel B lists Uncertainty Avoidance and selected country characteristics. Data on economic development and institutional quality are from the World Bank; additional cultural measures are provided by the World Value Survey (WVS) and Schwartz (2012). Legal origin data are from La Porta, Lopez-de Silanes, and Shleifer (2008). Detailed variable definitions can be found in Table A2. All variables are expressed as country-level means.

Panel A: Individualism and Selected Firm Characteristics

Country	No. of Obs.	IDV	Tobin's Q	Investment	Gov. Score	Social Score	Env. Score
Australia	2628	0.90	1.75	7.39	0.61	0.43	0.38
Austria	195	0.55	1.33	7.48	0.35	0.61	0.64
Belgium	305	0.75	1.41	6.00	0.52	0.53	0.59
Brazil	627	0.38	1.71	5.69	0.26	0.67	0.57
Canada	2361	0.80	1.64	9.26	0.76	0.43	0.42
Chile	186	0.23	1.53	6.58	0.10	0.48	0.47
China	1316	0.20	1.78	6.06	0.29	0.32	0.36
Colombia	77	0.13	1.31	4.92	0.38	0.63	0.55
Denmark	266	0.74	2.44	5.50	0.44	0.61	0.66
Finland	340	0.63	1.66	4.54	0.60	0.74	0.79
France	1177	0.71	1.50	4.92	0.53	0.78	0.78
Germany	1054	0.67	1.61	5.11	0.33	0.69	0.68
Greece	187	0.35	1.45	5.23	0.23	0.50	0.46
Hong Kong, China	1106	0.25	1.45	4.61	0.39	0.42	0.42
India	682	0.48	2.44	7.56	0.34	0.61	0.60
Indonesia	201	0.14	2.29	8.33	0.21	0.62	0.47
Ireland	320	0.70	1.99	4.00	0.72	0.53	0.54
Israel	121	0.54	1.89	3.80	0.40	0.40	0.39
Italy	452	0.76	1.47	4.49	0.45	0.70	0.63
Japan	5127	0.46	1.33	4.77	0.11	0.50	0.64
Korea, Republic of	787	0.18	1.41	6.03	0.13	0.56	0.61
Luxembourg	85	0.60	1.64	5.92	0.46	0.60	0.61
Malaysia	339	0.26	1.82	6.19	0.49	0.55	0.48
Mexico	252	0.30	2.09	6.68	0.17	0.55	0.51
Netherlands	532	0.80	1.63	4.98	0.64	0.72	0.67
New Zealand	244	0.79	1.85	5.78	0.49	0.37	0.39
Norway	232	0.69	1.64	6.90	0.58	0.65	0.63
Philippines	160	0.32	1.80	6.76	0.37	0.49	0.45
Poland	151	0.60	1.33	7.67	0.21	0.43	0.42
Portugal	114	0.27	1.48	7.25	0.53	0.75	0.74
Russian Federation	271	0.39	1.47	10.63	0.30	0.53	0.47
Singapore	522	0.20	1.61	4.94	0.51	0.46	0.43
South Africa	778	0.65	1.69	6.68	0.61	0.72	0.57
Spain	487	0.51	1.86	5.20	0.45	0.76	0.74
Sweden	660	0.71	1.77	4.37	0.48	0.64	0.68
Switzerland	835	0.68	2.17	4.17	0.52	0.61	0.62
Taiwan, China	924	0.17	1.57	5.74	0.15	0.47	0.55
Thailand	192	0.20	2.17	7.64	0.53	0.69	0.59
Turkey	167	0.37	1.65	6.85	0.27	0.59	0.60
United Kingdom	4002	0.89	1.74	5.23	0.71	0.64	0.60
United States	13164	0.91	2.05	5.49	0.71	0.44	0.42
All countries	43626	0.51	1.72	6.03	0.42	0.57	0.56
All countries ex. U.S.	30462	0.50	1.71	6.05	0.42	0.57	0.56

Table 2.1 Continued.

Panel B: Uncertainty Avoidance and Selected Country Characteristics

Country	No. of Obs.	UAI	GDP Per Capita	Common Law	Regulatory Quality	Human Capital	WVS Trust Index
Australia	2628	0.51	10.84	1	1.74	0.80	0.48
Austria	195	0.70	10.74	0	1.52	0.79	0.33
Belgium	305	0.94	10.69	0	1.29	0.76	0.31
Brazil	627	0.76	9.25	0	0.06	0.56	0.06
Canada	2361	0.48	10.78	1	1.67	0.80	0.45
Chile	186	0.86	9.44	0	1.44	0.67	0.18
China	1316	0.30	8.28	0	-0.26	0.67	0.57
Colombia	77	0.80	8.72	0	0.23	0.59	0.10
Denmark	266	0.23	10.98	0	1.78	0.77	0.59
Finland	340	0.59	10.73	0	1.78	0.81	0.57
France	1177	0.86	10.62	0	1.17	0.76	0.22
Germany	1054	0.65	10.64	0	1.59	0.79	0.38
Greece	187	1.00	10.15	0	0.68	0.68	0.24
Hong Kong, China	1106	0.29	10.33	1	1.94	0.82	0.45
India	682	0.40	7.12	1	-0.35	0.44	0.34
Indonesia	201	0.48	8.00	0	-0.37	0.53	0.47
Ireland	320	0.35	10.88	1	1.70	0.81	0.41
Israel	121	0.81	10.31	1	1.12	0.76	0.23
Italy	452	0.75	10.49	0	0.87	0.77	0.31
Japan	5127	0.92	10.71	0	1.12	0.84	0.41
Korea, Republic of	787	0.85	9.95	0	0.90	0.84	0.32
Luxembourg	85	0.70	11.55	0	1.74	0.69	0.25
Malaysia	339	0.36	9.10	1	0.58	0.62	0.09
Mexico	252	0.82	9.13	0	0.34	0.61	0.23
Netherlands	532	0.53	10.82	0	1.81	0.80	0.54
New Zealand	244	0.49	10.43	1	1.82	0.77	0.52
Norway	232	0.50	11.39	0	1.48	0.77	0.66
Philippines	160	0.44	7.65	0	-0.10	0.55	0.06
Poland	151	0.93	9.38	0	0.88	0.75	0.24
Portugal	114	0.99	10.00	0	0.98	0.78	0.17
Russian Federation	271	0.95	9.21	0	-0.34	0.73	0.29
Singapore	522	0.08	10.69	1	1.94	0.88	0.27
South Africa	778	0.49	8.85	1	0.47	0.41	0.20
Spain	487	0.86	10.33	0	1.12	0.74	0.30
Sweden	660	0.29	10.85	0	1.70	0.80	0.64
Switzerland	835	0.58	11.20	0	1.69	0.77	0.44
Taiwan, China	924	0.69	9.89	0	1.12	0.74	0.31
Thailand	192	0.64	8.48	1	0.25	0.60	0.37
Turkey	167	0.85	9.29	0	0.26	0.63	0.10
United Kingdom	4002	0.35	10.59	1	1.75	0.78	0.35
United States	13164	0.46	10.80	1	1.49	0.76	0.40
All countries	43626	0.62	9.98	0.32	1.04	0.72	0.34
All countries ex. U.S.	30462	0.63	9.96	0.30	1.03	0.72	0.34

Table 2.2 Pairwise Correlations between Key Variables

This table reports pairwise correlations between key variables used in the paper. Detailed variable definitions are in Table A2. Panel A tabulates the correlations between firm and country characteristics; Panel B tabulates the correlations among ESG ratings, culture, and institutional quality; Panel C tabulates the correlations between culture and institutional quality. All variables are expressed as country means. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. The correlation between Governance and Social (Environmental) Scores is 0.271 (0.182) and significant at 10% level. The correlation between Social and Environmental Scores is 0.875 and significant at 1% level.

Panel A: Firm and Country Characteristics

	(1) Tobin's Q	(2) Corporate Investment	(3) Cash Holdings	(4) Leverage	(5) Asset Tangibility	(6) Firm Size	(7) EBIT	(8) Dividend
Governance Score	0.159	-0.119	-0.369**	-0.0876	-0.195	-0.276*	-0.174	0.112
Social Score	0.0776	-0.121	-0.338**	0.212	-0.218	0.306*	0.0476	-0.0655
Environmental Score	-0.0289	-0.283*	-0.26	0.101	-0.353**	0.383**	-0.18	-0.243
Individualism	0.0553	-0.168	-0.451***	-0.339**	-0.295*	-0.277*	-0.247	-0.143
Uncertainty Avoidance	-0.480***	0.156	-0.168	0.407***	0.297*	0.355**	-0.204	-0.223
GDP Per Capita	-0.281*	-0.431***	-0.196	-0.266	-0.286*	-0.0532	-0.549***	-0.218
Common Law	0.287*	0.0197	-0.0206	-0.102	0.0451	-0.484***	0.08	0.245
Regulatory Quality	-0.177	-0.468***	-0.259	-0.310*	-0.23	-0.205	-0.551***	-0.0883
Human Capital Index	-0.378**	-0.339**	-0.0599	-0.122	-0.178	0.104	-0.653***	-0.324**
WVS E &S Index	0.103	-0.168	-0.330*	-0.381**	-0.2	-0.217	-0.0909	-0.0426
WVS Trust Index	0.271*	-0.104	-0.0482	-0.461***	-0.258	-0.226	-0.00113	-0.0553

Panel B: ESG Ratings, Culture, and Institutional Quality

	(1) Individualism	(2) Uncertainty Avoidance	(3) GDP Per Capita	(4) Common Law	(5) Regulatory Quality	(6) Human Capital	(7) WVS E&S Index	(8) WVS Trust Index
Governance Score	0.640***	-0.449***	0.418***	0.494***	0.466***	0.225	0.345**	0.315**
Social Score	0.171	0.175	0.0885	-0.302*	-0.0195	-0.152	0.212	-0.0645
Environmental Score	0.250	0.214	0.319**	-0.437***	0.205	0.148	0.331*	0.104

Panel C: Culture and Institutional Quality

	(1) Individualism	(2) Uncertainty Avoidance	(3) GDP Per Capita	(4) Common Law	(5) Regulatory Quality	(6) Human Capital	(7) WVS E&S Index	(8) WVS Trust Index
Individualism	1							
Uncertainty Avoidance	-0.145	1						
GDP Per Capita	0.622***	-0.00956	1					
Common Law	0.157	-0.518***	-0.0602	1				
Regulatory Quality	0.568***	-0.250	0.886***	0.173	1			
Human Capital Index	0.360**	-0.0244	0.811***	-0.0549	0.766***	1		
WVS E&S Index	0.670***	-0.0677	0.734***	-0.181	0.643***	0.492***	1	
WVS Trust Index	0.435***	-0.464***	0.418***	0.0460	0.444***	0.453***	0.689***	1

Table 2.3 Corporate Social Responsibility and Corporate Valuation: Full Sample

The dependent variable is Tobin's Q. Environmental, Social, and Governance scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ESG ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions are in Table A2. t-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

DV = Tobin's Q	(1) Environmental Score	(2) Social Score	(3) Governance Score	(4) ESG
Environmental Score	0.0728***			-0.0165
	(3.96)			(-0.83)
Social Score		0.105***		0.109***
		(4.89)		(4.51)
Governance Score			0.0792*	0.0243
			(1.89)	(0.55)
Firm Size$_{t-1}$	-0.0935***	-0.0964***	-0.0898***	-0.0962***
	(-10.06)	(-10.24)	(-9.72)	(-10.26)
Cash Holdings$_{t-1}$	0.388***	0.388***	0.384***	0.388***
	(6.33)	(6.33)	(6.37)	(6.30)
Leverage$_{t-1}$	0.0116	0.0144	0.00596	0.0137
	(0.14)	(0.17)	(0.07)	(0.16)
EBIT$_{t-1}$	1.959***	1.947***	1.960***	1.947***
	(18.32)	(18.05)	(18.47)	(18.02)
Asset Tangibility$_{t-1}$	0.0397	0.0423	0.0426	0.0432
	(0.95)	(1.03)	(1.02)	(1.06)
R&D$_{t-1}$	1.442***	1.427***	1.501***	1.435***
	(5.08)	(4.78)	(5.52)	(4.78)
2-yr Sales Growth	0.209***	0.212***	0.206***	0.213***
	(7.81)	(8.17)	(7.30)	(8.19)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.516	0.517	0.515	0.518
Adj. Within R-Squared	0.354	0.357	0.354	0.357

Table 2.4 Corporate Social Responsibility and Corporate Investment: Full Sample

The dependent variable is corporate investment. Environmental, Social, and Governance scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ESG ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions can be found in Table A2. The ESG Score in Column (4) is the arithmetic average of its three components. Control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. t-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

DV = Investment	(1) Environmental Score	(2) Social Score	(3) Governance Score	(4) ESG
Environmental Score	0.0285			
	(0.05)			
Environmental Score × Tobin's Q_{t-1}	-1.271*			
	(-1.90)			
Environmental Score × Cash Flow	8.171**			
	(2.07)			
Social Score		-0.114		
		(-0.17)		
Social Score × Tobin's Q_{t-1}		-1.943***		
		(-2.87)		
Social Score × Cash Flow		8.700*		
		(1.89)		
Governance Score			-0.306	
			(-0.56)	
Governance Score × Tobin's Q_{t-1}			1.185**	
			(2.45)	
Governance Score × Cash Flow			-5.120*	
			(-1.71)	
ESG Score × Tobin's Q_{t-1}				-1.159
				(-1.61)
ESG Score × Cash Flow				6.641
				(1.26)
Tobin's Q_{t-1}	3.165***	3.494***	2.103***	3.137***
	(6.39)	(6.88)	(7.84)	(6.27)
Cash Flow	8.869***	8.673***	14.86***	9.353**
	(3.36)	(2.78)	(5.35)	(2.58)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.412	0.413	0.412	0.412
Adj. Within R-Squared	0.226	0.227	0.226	0.225

Table 2.5 CSR and Corporate Valuation/Investment: Sample Split by Governance Quality

The dependent variable is corporate investment in Panel A and Tobin's Q in Panel B. Environmental, Social, and Governance scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ESG ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions can be found in Table A2. Firms with a governance rating above the sample median are in Columns (1) and (3), and the remainder are in Columns (2) and (4). Levels of the interaction terms and control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. *t*-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Corporate Investment

DV = Investment	Social Score		Environmental Score	
	(1)	(2)	(3)	(4)
	High Gov. Score	Low Gov. Score	High Gov. Score	Low Gov. Score
Social Score × Tobin's Q_{t-1}	-1.580	-2.425***		
	(-1.34)	(-3.21)		
Social Score × Cash Flow	6.454	11.73**		
	(1.52)	(2.15)		
Env. Score × Tobin's Q_{t-1}			-0.690	-1.769**
			(-0.64)	(-2.02)
Env. Score × Cash Flow			3.692	14.16**
			(1.24)	(2.28)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	13952	13985	13952	13985
No. of Countries	40	40	40	40
Adj. R-Squared	0.458	0.373	0.455	0.373
Adj. Within R-Squared	0.230	0.218	0.227	0.218

Panel B: Corporate Valuation

DV = Tobin's Q	Social Score		Environmental Score	
	(1)	(2)	(3)	(4)
	High Gov. Score	Low Gov. Score	High Gov. Score	Low Gov. Score
Social Score	0.195***	0.0841***		
	(5.80)	(6.52)		
Environmental Score			0.136***	0.0766***
			(3.31)	(3.76)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	13952	13985	13952	13985
No. of Countries	40	40	40	40
Adj. R-Squared	0.469	0.538	0.465	0.538
Adj. Within R-Squared	0.322	0.347	0.318	0.346

Table 2.6 CSR and Corporate Valuation/Investment: Sample Split by Culture

The dependent variable is Tobin's Q in Panel A and corporate investment in Panel B. Environmental and Social scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ES ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions can be found in Table A2. Individualism (IDV) and Uncertainty Avoidance (UAI) are two cultural indexes from Hofstede (2001). Firms whose host country has an IDV score above (below) the sample median *and* a UAI score below (above) the sample median are in Columns (1) and (3) ((2) and (4)). Levels of the interaction terms and control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. *t*-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Corporate Valuation

DV = Tobin's Q	Social Score		Environmental Score	
	(1) Individualism	(2) Uncertainty Avoidance	(3) Individualism	(4) Uncertainty Avoidance
Social Score × Individualism	0.276***			
	(4.16)			
Social Score × UAI		-0.262***		
		(-3.92)		
Env. Score × Individualism			0.276***	
			(3.36)	
Env. Score × UAI				-0.158**
				(-2.34)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.499	0.499	0.498	0.497
Adj. Within R-Squared	0.335	0.335	0.333	0.332

Panel B: Corporate Investment

DV = Investment	Social Score		Environmental Score	
	(1) High IDV and Low UAI	(2) Low IDV and High UAI	(3) High IDV and Low UAI	(4) Low IDV and High UAI
Social Score × Tobin's Q_{t-1}	0.278	-1.537**		
	(0.26)	(-2.87)		
Social Score × Cash Flow	4.795	10.84**		
	(0.78)	(2.23)		
Env. Score × Tobin's Q_{t-1}			1.380	-2.032***
			(1.49)	(-3.62)
Env. Score × Cash Flow			0.689	15.28***
			(0.15)	(5.29)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	12439	8978	12439	8978
No. of Countries	12	12	12	12
Adj. R-Squared	0.407	0.383	0.406	0.385
Adj. Within R-Squared	0.298	0.292	0.298	0.294

Table 2.7 CSR and Corporate Valuation/Investment: Sample Split by Governance Shortfall (U.S.-Matched Sample)

The dependent variable is corporate investment in Panel A and Tobin's Q in Panel B. Environmental, Social, and Governance scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ESG ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions can be found in Table A2. Matching is done in a nearest-neighbor fashion through the use of propensity scores (within a caliper of 0.01). Propensity scores (=1 for non-U.S. firms) are estimated from a probit regression, using the same set of controls as in Table 2.3. Exact matching is enforced for industry and year. Matched differences are always calculated as "non-U.S. minus U.S." Firms whose matched difference in governance rating is above the sample median are in Columns (1) and (3), and the remainder are in Columns (2) and (4). Levels of the interaction terms and control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. t-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Corporate Investment

DV = Investment	Social Score		Environmental Score	
	(1) Low Gov. Shortfall	(2) High Gov. Shortfall	(3) Low Gov. Shortfall	(4) High Gov. Shortfall
Matched Diff. in Social Score × Tobin's Q_{t-1}	0.0198	-2.204***		
	(0.01)	(-5.30)		
Matched Diff. in Social Score × Cash Flow	-3.493	11.95***		
	(-0.62)	(3.11)		
Matched Diff. in Env. Score × Tobin's Q_{t-1}			0.0874	-1.987***
			(0.08)	(-3.08)
Matched Diff. in Env. Score × Cash Flow			1.440	14.48***
			(0.34)	(3.74)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	10640	10579	10640	10579
No. of Countries	40	40	40	40
Adj. R-Squared	0.457	0.390	0.458	0.391
Adj. Within R-Squared	0.265	0.263	0.266	0.263

Panel B: Corporate Valuation

DV = Tobin's Q	Social Score		Environmental Score	
	(1) Low Gov. Shortfall	(2) High Gov. Shortfall	(3) Low Gov. Shortfall	(4) High Gov. Shortfall
Matched Diff. in Social Score	0.168***	0.0893***		
	(6.21)	(4.85)		
Matched Diff. in Env. Score			0.0962***	0.0769***
			(3.06)	(3.20)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	10900	10912	10900	10912
No. of Countries	40	40	40	40
Adj. R-Squared	0.480	0.542	0.477	0.542
Adj. Within R-Squared	0.359	0.381	0.355	0.380

Table 2.8 CSR and Corporate Valuation/Investment: Sample Split by Culture (U.S.-Matched Sample)

The dependent variable is Tobin's Q in Panel A and corporate investment in Panel B. Environmental and Social scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ES ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions can be found in Table A2. Matching is done in a nearest-neighbor fashion through the use of propensity scores (within a caliper of 0.01). Propensity scores (=1 for non-U.S. firms) are estimated from a probit regression, using the same set of controls as in Table 2.3. Exact matching is enforced for industry and year. Matched differences are always calculated as "non-U.S. minus U.S." Firms whose host country has an individualism score above (below) the sample median *and* an uncertainty avoidance score below (above) the sample median are in Columns (1) and (3) ((2) and (4)). Levels of the interaction terms and control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. t-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Corporate Valuation

DV = Tobin's Q	Social Score		Environmental Score	
	(1) High IDV and Low UAI	(2) Low IDV and High UAI	(3) High IDV and Low UAI	(4) Low IDV and High UAI
Matched Diff. in Social Score	0.184***	0.0888***		
	(6.19)	(3.88)		
Matched Diff. in Env. Score			0.130***	0.0807**
			(3.11)	(2.60)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	8954	6477	8954	6477
No. of Countries	12	12	12	12
Adj. R-Squared	0.458	0.537	0.454	0.535
Adj. Within R-Squared	0.356	0.391	0.352	0.389

Panel B: Corporate Investment

DV = Investment	Social Score		Environmental Score	
	(1) High IDV and Low UAI	(2) Low IDV and High UAI	(3) High IDV and Low UAI	(4) Low IDV and High UAI
Matched Diff. in Social Score × Tobin's Q_{t-1}	0.961	-2.005***		
	(0.86)	(-4.03)		
Matched Diff. in Social Score × Cash Flow	-6.614	12.25**		
	(-1.51)	(2.77)		
Matched Diff. in Env. Score × Tobin's Q_{t-1}			1.149	-2.434***
			(1.12)	(-4.23)
Matched Diff. in Env. Score × Cash Flow			-1.163	17.81***
			(-0.42)	(5.71)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	8671	6391	8671	6391
No. of Countries	12	12	12	12
Adj. R-Squared	0.463	0.412	0.463	0.414
Adj. Within R-Squared	0.265	0.291	0.265	0.294

Table 2.9 Culture, Corporate Governance, and the Value of CSR: Instrumental Variables Estimation

The dependent variable is Tobin's Q in all panels. Environmental, Social, and Governance scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ESG ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Detailed variable definitions can be found in Table A2. Social (Environmental) Score of a given firm is instrumented by the median score of all *other* firms in the same industry and the same country. In Panels A and B, firms whose host country has an individualism (uncertainty avoidance) score above the sample median are in Columns (1) and (3), and the remainder are in Columns (2) and (4). In Panel C, firms with a governance rating above the sample median are in Columns (1) and (3), and the remainder are in Columns (2) and (4). Control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. *t*-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Individualism

DV = Tobin's Q	Social Score		Environmental Score	
	(1)	(2)	(3)	(4)
	High IDV	Low IDV	High IDV	Low IDV
Social Score	0.289***	0.0398		
	(3.74)	(0.44)		
Environmental Score			0.191*	0.0221
			(1.85)	(0.34)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	15421	13221	15421	13221
No. of Countries	20	20	20	20
Adj. R-Squared	0.342	0.357	0.341	0.355
First-stage F-stat	350.5	153.5	222.9	225.6

Panel B: Uncertainty Avoidance

DV = Tobin's Q	Social Score		Environmental Score	
	(1)	(2)	(3)	(4)
	High UAI	Low UAI	High UAI	Low UAI
Social Score	0.0353	0.241**		
	(0.46)	(2.38)		
Environmental Score			-0.0208	0.185**
			(-0.25)	(2.11)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	12200	16442	12200	16442
No. of Countries	20	20	20	20
Adj. R-Squared	0.363	0.316	0.359	0.313
First-stage F-stat	139.1	312.3	159.5	427.5

Panel C: Corporate Governance

DV = Tobin's Q	Social Score		Environmental Score	
	(1)	(2)	(3)	(4)
	High Gov. Score	Low Gov. Score	High Gov. Score	Low Gov. Score
Social Score	0.260***	0.0111		
	(2.96)	(0.11)		
Environmental Score			0.186**	-0.0326
			(2.63)	(-0.35)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	14277	14365	14277	14365
No. of Countries	40	40	40	40
Adj. R-Squared	0.317	0.336	0.313	0.333
First-stage F-stat	300.8	211.9	365.9	305.0

Table 2.10 Individualism and the Value of CSR: Robustness Checks

The dependent variable is Tobin's Q in all panels. Environmental and Social scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ES ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Data on economic development and institutional quality are from the World Bank. Additional cultural measures are provided by the World Value Survey (WVS) and Schwartz (2012). Legal origin data are from La Porta, Lopez-de Silanes, and Shleifer (2008). Detailed variable definitions can be found in Table A2. E&S Score is the arithmetic average of Environmental and Social scores. Levels of the interaction terms and control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. t-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Institutional Quality

DV = Tobin's Q	(1) GDP Per Capita	(2) Rule of Law	(3) Control of Corruption	(4) Human Capital Index
E&S Score × Individualism	0.273***	0.248***	0.226**	0.313***
	(2.96)	(2.93)	(2.63)	(3.71)
E&S Score × GDP Per Capita	0.0253			
	(1.18)			
E&S Score × Rule of Law		0.0457		
		(1.48)		
E&S Score × Control of Corruption			0.0491*	
			(1.87)	
E&S Score × Human Capital Index				0.112
				(0.61)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.500	0.499	0.500	0.500
Adj. Within R-Squared	0.332	0.335	0.336	0.332

Panel B: Alternative Cultural Measures

DV = Tobin's Q	(1) Uncertainty Avoidance	(2) Schwartz Harmony	(3) WVS E&S Index	(4) WVS Trust Index
E&S Score × Individualism	0.276***	0.338***	0.331***	0.318***
	(3.60)	(4.20)	(4.15)	(4.32)
E&S Score × Uncertainty Avoidance	-0.165**			
	(-2.38)			
E&S Score × Schwartz Harmony		-0.0878		
		(-1.48)		
E&S Score × WVS E&S Awareness			-0.159	
			(-0.56)	
E&S Score × WVS Trust Index				0.0367
				(0.24)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.500	0.499	0.496	0.499
Adj. Within R-Squared	0.336	0.335	0.332	0.335

Table 2.11 Uncertainty Avoidance and the Value of CSR: Robustness Checks

The dependent variable is Tobin's Q in all panels. Environmental and Social scores are from Thomson Reuters' ASSET4 ESG database. Firm characteristics other than the ES ratings are from Datastream and Worldscope, and are winsorized at the 1st and 99th percentiles. Data on economic development and institutional quality are from the World Bank. Additional cultural measures are provided by the World Value Survey (WVS) and Schwartz (2012). Legal origin data are from La Porta, Lopez-de Silanes, and Shleifer (2008). Detailed variable definitions can be found in Table A2. E&S Score is the arithmetic average of Environmental and Social scores. Levels of the interaction terms and control variables as in Table 2.3 are included in each regression, but not tabulated for brevity. t-statistics are in parentheses, calculated from standard errors clustered by country. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Institutional Quality

DV = Tobin's Q	(1) GDP Per Capita	(2) Common Law	(3) Regulatory Quality	(4) Human Capital Index
E&S Score × Uncertainty Avoidance	-0.264***	-0.233*	-0.186**	-0.257***
	(-4.97)	(-1.92)	(-2.25)	(-3.62)
E&S Score × GDP Per Capita	0.0599**			
	(2.22)			
E&S Score × Common Law		0.0113		
		(0.16)		
E&S Score × Regulatory Quality			0.0773*	
			(1.89)	
E&S Score × Human Capital Index				0.186
				(0.69)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.523	0.520	0.521	0.522
Adj. Within R-Squared	0.353	0.357	0.358	0.352

Panel B: Alternative Cultural Measures

DV = Tobin's Q	(1) Schwartz Embeddedness	(2) Schwartz Harmony	(3) WVS E&S Index	(4) WVS Perceived Fairness
E&S Score × Uncertainty Avoidance	-0.269***	-0.277***	-0.263***	-0.257***
	(-3.82)	(-3.68)	(-4.65)	(-3.04)
E&S Score × Schwartz Embeddedness	-0.152			
	(-1.67)			
E&S Score × Schwartz Harmony		0.0773		
		(1.43)		
E&S Score × WVS E&S Awareness			0.371	
			(1.68)	
E&S Score × WVS Perceived Fairness				-0.126
				(-0.42)
Controls	Yes	Yes	Yes	Yes
Year/Industry/Country FE	Yes	Yes	Yes	Yes
No. of Obs.	27834	27834	27834	27834
No. of Countries	40	40	40	40
Adj. R-Squared	0.521	0.520	0.518	0.518
Adj. Within R-Squared	0.357	0.357	0.358	0.354

Chapter 3

The Value of Oligarchs: Evidence from Russia

3.1. 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 economic growth (Morck, Wolfenzon, and Yeung, 2005). In other words, oligarchs are more

[1] See, among others, La Porta, de Silanes, and Schleifer (1999) for high and middle-income countries, Claessens, Djankov, and Lang (2000) for nine East Asian countries, and Faccio and Lang (2002) for Western European countries.

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 3.2 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 3.1 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, Matveyev, and Roth, 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 3.2 provides a brief description of the general characteristics of Russian oligarchs and their business groups. Section 3.3 describes the sample construction. Section 3.4 discusses the empirical findings. Section 3.5 concludes.

3.2. 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 3.1. 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.

3.3. 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.

3.3.1. 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 3.1 presents details of these events.

[Insert Table 3.1 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 3.1. 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.

3.3.2. 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×WC05301)+WC08001)/WC02999").

3.3.3. Summary Statistics

Table 3.2 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 3.2 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.

3.4. 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 B. 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.

3.4.1. 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 3.3 about here.]

Table 3.3 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.

3.4.2. 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 3.4 presents the results arranged in a similar style to Table 3.3.

[Insert Table 3.4 about here.]

Panel A in Table 3.4 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, Matveyev, and Roth (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.

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 3.4 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

[3] Industries are defined by the Fama-French 12-industry classification. Table 3.1 provides classifications of the oligarchs' industries.

firms remains two days after the arrest. However, the value decline for firms in the oligarch industries bounces back to zero after two days.

3.4.3. What Magnifies the Propagation of the Oligarch's 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 3.2 about here.]

Figure 3.2 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 3.5 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 3.5 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 levered firms lose more value as their bailout prospects become less likely. The rest of the interaction terms are not statistically significant.

3.5. 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.

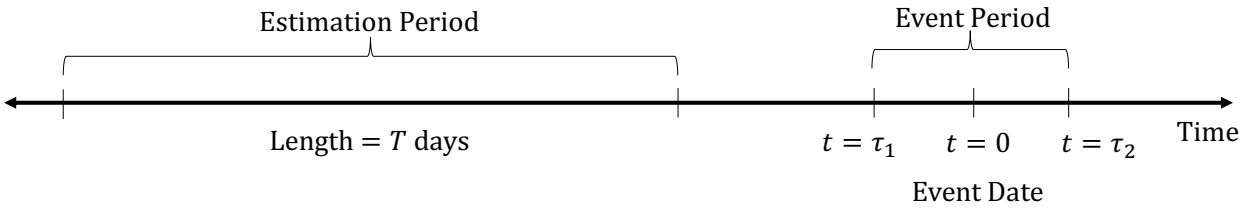


Figure 3.1 Event Timeline

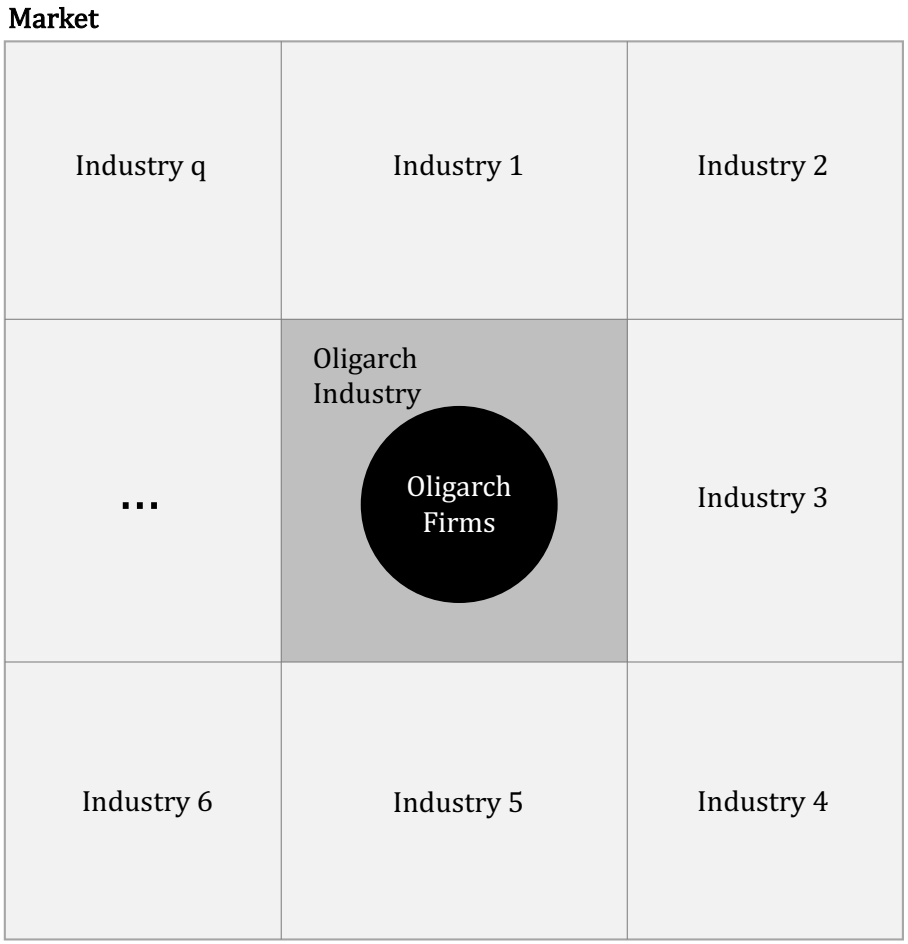


Figure 3.2 Distance from Oligarch Firms

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

Table 3.1 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 3.2 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 3.3 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 (B.1). Details of their computations are provided in Appendix B. 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 3.4 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 (B.1). Details of their computations are provided in Appendix B. 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 3.5 What Magnifies the Propagation of the Oligarch's 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

Chapter 4

On the Integrity of the "Ease of Doing Business" Indicators

4.1. Introduction

In an early 2018 *Wall Street Journal* interview, Paul Romer raised specific and general concerns about the World Bank's Ease of Doing Business indicators. The specific concern is that World Bank staff might have manipulated the indicators for Chile (or other countries). The general concern is that frequent methodology changes undermine the indicators' social value to researchers, policy-makers and the media.

We address the specific concern through a comprehensive audit of the raw data and calculations of the Doing Business 2015, 2016 and 2017 indicators (DB2015, DB2016 and DB2017) for Chile and a set of twelve other economies.[1] In every case we checked, the indicators are based on unaltered survey data, faithfully entered into an automated data management system, and are mechanically constructed free of manipulation by World Bank staff. **The Ease of Doing Business indicators for Chile and for the other economies we examined were not subject to manipulation by World Bank staff.**

This exercise reveals that both the survey questionnaires and how the indicators are calculated have changed frequently. Each major methodology change has economically sound justification. **However, frequent methodology changes reduce the value of the indicators to researchers, policy makers and the media.**

World Bank staff entrusted with overseeing the Ease of Doing Business database contend with difficult trade-offs between completeness, current relevance and comparability over time. Methodology changes reflect concerns about keeping the Ease of Doing Business indicators relevant to current issues and expanding their scope to implement recommendations made

[1] These reflect conditions as of June 1^{st} of 2014, 2015 and 2016 respectively.

by its Independent Panel of Experts in 2013, World Bank Group staff, governments and the private sector. **Concerns that World Bank staff implement methodology changes to manipulate the Ease of Doing Business indicators of specific economies or to sway domestic politics in affected economies are entirely without evidence.**

Nonetheless, frequent methodology changes cause many economies' Ease of Doing Business indicators to change mechanically – that is, for reasons unrelated to real changes in the ease of doing business in these economies. This reduces their value to researchers because recent trends in econometrics contrast the impact of changes in policy variables across data differentially affected by those changes. Mechanical changes in the data risk undermining such studies. The World Bank's practice of providing old and new methodology versions of the data for the year prior to methodology changes is helpful, but inadequate because data more than one year removed remains non-comparable. Mechanical changes also reduce the indicators' value in providing bragging rights to successful reformers, ammunition to reformers combating deteriorating institutions, and readily comprehensible information for the media.

The World Bank may wish to minimize methodology changes except to fix confirmed problems with existing methodology. Confirmation might require the identification of a problem in a peer reviewed research article and its verification by an independent review. When methodology changes to existing indicators are unavoidable, the World Bank may wish to favor changes that preserve comparability by allowing adjustment to prior years' data. For example, when the World Bank modified the Starting a Business indicator to reflect gender parity, prior years' data were recalculated using the revised methodology. This can render studies using older data unreproducible, but at least preserves comparability across years. In contrast, when the Registering Property and Enforcing Contracts indicators were modified to reflect gender parity, prior values of those indicators were not recalculated. This renders those indicators non-comparable across time.

The World Bank may wish to expand the Ease of Doing Business database with new indicators to cover additional aspects of the business environment, rather than with methodological changes to existing indicators. New factors important enough to affect how the indicators are constructed are presumably important enough to merit their own indicator. For example, to account for the unambiguously important issue of gender parity in the ease of doing business, the World Bank changed the methodologies for calculating the Starting a Business, Registering Property, and Enforcing Contracts indicators to encompass gender parity. Had the World Bank introduced an entirely new Gender Parity in Ease of Doing Business indicator based on gender parity in starting businesses, registering property and enforcing contracts, gender parity might have been more prominently addressed and the other indicators left comparable across all years.

The World Bank obviously balances such things in deciding how to update the indicators, but this balancing process in making methodology changes may itself need a methodology change. Developments in how researchers, policy-makers, and the media use the Ease of Doing Business indicators suggest that, **going forward, the World Bank may wish to consider assigning a much greater weight to preserving comparability in the indicators across all years.**

The media and policy-makers, especially, attend to changes in the indicators over the years and across economies. **The World Bank may wish to exploit this by providing an alternative set of stable indicators and rankings**, based solely on those subcomponents of the indicators that are free of major methodology changes, such as the compliance costs and delays, which would be comparable across all years. These might be given a different name - perhaps **Doing Business Development indicators – to stress their suggested use in tracking institutional development through time** and to distinguish them from the DB indicators.

The World Bank normalizes the indicators as Distance to Frontier (DTF) scores. These

measure each economy's proximities to (not distances from) global best practice frontiers. Each indicator lies between zero (a global worst practice benchmark) and 100% (a global best practice "frontier"). A less confusing term might be simply Doing Business scores. The World Bank sensibly exercises judgement in fixing these endpoints because economies' distances to frontiers would otherwise move about whenever the best or worst among them improve or deteriorate.

World Bank staff have indicated that the World Bank contemplates updating these endpoints every five years.[2] This would render the distance to frontier measures comparable only within five-year periods. The World Bank makes non-normalized subcomponents of all Ease of Doing Business indicators for all years publicly available. This mitigates such problems for researchers. However, by directing users to Distance to Frontier scores, the World Bank risks renewed controversy every five years. **The World Bank may wish to establish objective methodologies that continuously update distance-to-frontier endpoints that need updating to avoid future controversy about methodology-driven changes.**

The Ease of Doing Business indicators are one of the World Bank's most important contributions to research and public policy. Were the indicators unimportant, controversy about them would not attract media attention. World Bank staff charged with overseeing the indicators have a difficult and challenging task. This audit finds absolutely no evidence that World Bank staff acted inappropriately or maliciously towards Chile or any other country. Rather, the World Bank's success in credibly tracking quantifiable improvements and backsliding in the ease of doing business in different economies makes concerns about its methodology global news. That importance now also encompasses the methodologies used to calculate the indicators. All this affirms the broader success of the World Bank's Doing Business initiative.

[2] The endpoints changed from year to year during a piloting phase, DB2012 through DB2015, but are fixed from DB2015 onwards. *Doing Business* reports for more details: `http://www.doingbusiness.org/reports/global-reports/doing-business-2014`.

4.2. Why the Ease of Doing Business Database Is Important

The World Bank's Ease of Doing Business indicators is a major force for institutional development. For example, in 2018, the Rwandan government rolled out a series of reforms explicitly designed to improve its standing in the Doing Business data.[3] These included reforms to cut bureaucracy in construction, delays in connecting to the electricity grid, and delays exporters experience at customs. Similarly, The Financial Times describes how Senegal's government "is focused on further improving its position on the World Bank's Doing Business index."[4] A search of news websites reveals numerous items of this sort.

Politicians and journalists throughout the world have become aware of the indicators, and especially of their economies' rankings. This makes the indicators effective in encouraging politicians into enacting reforms. For example, the Indian newspaper, The Hindu, describes how "The low rank last year galvanised India to act. There was an explicit order from the PM (Narendra Modi) to ensure faster reforms to improve India's rankings." The media and politicians attend more to ranking than to economically nuanced measures because economy rankings uniquely command attention. This attention is a powerful force for reform that the World Bank might wish to harness to promote economic development and institutional reform. The World Bank is aware that changes in rankings can reflect methodology changes to an extent, and deemphasizes historical rankings. An alternative strategy might exploit this media focus by ensuring that future changes in an economy's ranking primarily reflect reductions in bureaucratic delays, reduced compliance costs, and other aspects of genuine institutional development; not changes in how the World Bank constructs the indicators.[5] Otherwise, politicians overseeing deteriorating institutions can evade blame by pointing to methodology changes and politicians overseeing genuine reforms cannot highlight advance-

[3] Rwanda: Government Rolls out New Doing Business Reforms. *New Times*, by Collins Mwai, April 18, 2018.
[4] Reputation for stability lures new foreign investors to Senegal. *Financial Times*, by Neil Munshi, April 18, 2018.
[5] As we discuss below, the World Bank currently provides back-calculations for the year prior to the methodology changes. This is not unhelpful, but still leaves data more than one year removed non-comparable.

ment in the rankings.

The Doing Business database is also among the World Bank's most prominent recent contributions to research into reducing poverty and promoting economic development. The first major study introducing key variables in the database, "The regulation of entry" by Djankov, La Porta, Lopez-de-Silanes and Shleifer, published in the prestigious Quarterly Journal of Economics in 2002, has over 4,200 citations in academic articles, books and working papers according to Google Scholar. The same bibliometric source lists over 13,000 articles referencing both "World Bank" and "Ease of Doing Business." Over one hundred of these articles using the data appear in prominent research journals, and many articles in less prominent journals study issues important to specific economies or regions. A lengthy tabulation, compiled by World Bank staff, of these important articles is available on the World Bank's website.[6]

Alternative measures of the business environments of different economies, such as the Heritage Foundation's Index of Economic Freedom or the Fraser Institute's Economic Freedom of the World index, are based on Ease of Doing Business quantitative data (procedures, costs, and delays). The Heritage Foundation and the Fraser Institute both have ideological agendas, which let skeptics discount inconvenient findings based on their indexes. The World Bank alone has the credibility, resources, prestige, and expertise to collect the needed data and assemble it into meaningful and credible indicators. This makes the Doing Business database a unique and indispensable resource for researchers.

The comparability of data over time is crucial to its value in research. This is because economists are increasingly concerned about causal inference. For example, if fewer regulations limiting the formation of new businesses correlate positively with faster innovation, do lower barriers to starting a new business encourage innovation or does faster innovation press governments to ease regulatory barriers? If lighter regulation causes faster innovation,

[6] See `http://www.doingbusiness.org/research`.

governments wanting more innovation should ease up on regulatory barriers. But if a faster pace of innovation causes governments to stand back, easing regulatory barriers to starting new businesses is like pushing a string.

Econometric tests of "what causes what" typically require "panel" databases – that is, databases that track the same measures for many economies and for many years. Panel data lets economists explore causality. For example, "Granger causality" tests explore whether changes in one set of variables typically precede or follow changes in other variables. "Difference-in-difference" tests, another approach to causal inference, compare differences in the values of key variables the year before versus the year after policy changes to differences in the values of the same variables over the same years in otherwise similar environments unaffected by those policy changes. Many subcomponents of the Doing Business indicators remain comparable over time (e.g. the cost and time subcomponents of the indicator sets), so researchers and policy makers could trace changes in these over multiple years. This practice might be expanded to cover as much of the Doing Business data as possible. The World Bank may wish to implement methodology-driven changes in the aggregate Doing Business indicators, which it now presents as Distance to Frontier (DTF) scores, in ways that preserve long-run comparability over time in as many components of each indicator as possible. This would allow researchers and policy-makers to analyze and track economically meaningful changes in each indicator set over the years.

In all of these econometric tests, the comparability of the data across multiple years is essential. If differences in the values of the variables reflect differences in how they are constructed, rather than genuine differences in underlying economic realities, the connection between reforms and economic outcomes is lost.

The validity of the Ease of Doing Business indicators as panel data is extremely important. The indicators are tremendously useful if changes in them over time primarily reflect real changes in economies' business environments. They are less useful if their changes reflect

changes in how the indicators are constructed more than real changes in the ease of doing business. The World Bank may wish to expand its evaluation and consultation process prior to methodology changes to attach a greater weight to preserving comparability of the dataset over multiple years.

4.3. Why Overseeing the Ease of Doing Business Database is Challenging

World Bank staff entrusted with overseeing the Ease of Doing Business database contend with difficult challenges. These involve trade-offs between comparability over time, completeness, and current relevance. If the indicators do not change to reflect newly appreciated and obviously important concerns, they risk losing relevance. If the indicators change whenever new concerns arise, they become non-comparable across time and their usefulness to researchers, politicians and the media becomes compromised. If economies' rankings and Distance to Frontier scores change because the way the World Bank calculates the indicators changes, rather than because the ease of doing business changes, the indicators risk losing relevance more thoroughly.

This would be acceptable if the Ease of Doing Business indicators served only to compare different economies within the current year, and they certainly find use for that purpose. However, changes in economies' rankings and indicators over many years are far more socially useful if interpretable as policy progress or backsliding by research economists, the media, and government officials.

World Bank's Doing Business website cautions users about problems with comparability over time. A note at the bottom of the main download webpage reads[7]

Note: In recent years, Doing Business introduced improvements to all of its indicator sets. In Doing Business 2015, Resolving Insolvency introduced new measures of quality, while Get-

[7] This refers to `http://www.doingbusiness.org/Custom-Query`, the World Bank's Doing Business webpage entitled "Historical Data Sets and Trends Data" as of June 6, 2018.

ting Credit and Protecting Minority Investors broadened their existing measures. In Doing Business 2016, Dealing with Construction Permits, Getting Electricity, Registering Property and Enforcing Contracts also introduced new measures of quality, and Trading across Borders introduced a new case scenario to increase the economic relevance. In Doing Business 2017, Paying Taxes introduced new measures of postfiling processes and Starting a Business, Registering Property and Enforcing Contracts added gender components. For the details on the Doing Business methodology changes, please view the Distance to Frontier metrics.

As a gesture towards mitigating the problems methodology changes cause, the web page elaborates "Each methodology expansion was recalculated for one year to provide comparable indicator values and DTF scores for the previous year." This is helpful, but still leaves data more than a year away from the change in one direction non-comparable to data more than a year away from the change in the other direction.

Table 4.1 lists the subcomponents of each Ease of Doing Business indicators, indicating which methodology changes affected which subcomponents in which years.[8] The table omits some methodology changes. For example, the addition of the Getting Electricity indicator and the dropping of the Employing Workers indicator from the ranking calculation after a transition period from DB2010 to DB2012 are not prominently addressed on the Doing Business website. Also, numerous questionnaire revisions to improve respondents' understanding of the questions are not considered methodology changes. From DB2015 on, a secondary business city in each of Bangladesh, Brazil, China, India, Indonesia, Japan, Mexico, Nigeria, Pakistan, Russia and the United States was surveyed and those economies' DTF scores became population-weighted average DTFs for the two cities. Earlier years' DTF scores for those economies reflect surveys of their main business city only, as is the case for all other economies in all years.

[8] A table of methodology changes is available at `http://www.doingbusiness.org/Methodology/Distance-to-Frontier-Metrics`. The webpage `http://www.doingbusiness.org/Methodology/Changes-to-the-Methodology` elaborates.

We queried World Bank staff about each methodology change and, in every case, received an entirely reasonable justification. We are convinced that World Bank staff have been seeking to improve each individual indicator in each case.

Going forward, the World Bank may wish to consider a "fallacy of composition problem" associated with methodology changes. Many limited changes, each genuinely intended to improve an individual indicator, may combine to diminish the social value of the data as a whole.

This problem is most evident in comparing economies' Distance to Frontier scores and rankings across years. The World Bank is attempting to deemphasize changes in economy rankings by presenting rankings for the current year only in the Doing Business historical dataset. The final paragraph on this webpage explains this decision as follows

Rankings are calculated for Doing Business 2018 only. Year-to-year changes in the number of economies, number of indicators and methodology affect the comparability of prior years.

These statements are all true. However, year-to-year changes in the number of indicators and the methodology used also affect the comparability of the Distance to Frontier scores across years. Not publishing the old rankings under old methodologies does draw attention to the fact that rankings over time are not comparable, but publishing comparable rankings would be preferable.

The World Bank appears to be urging users to rely on the Distance to Frontier scores rather than on economy rankings. Clicking on the Frequently Asked Question "Why are the rankings for the previous year not being recalculated in this year's report?" on the World Bank's Doing Business website returns the following explanation

For several years, Doing Business recalculated the published ranks, because the indicator sets underwent important methodology expansions. For example, in Doing Business 2015, Resolving Insolvency introduced new measures of quality and 2 topics (Getting Credit, Pro-

tecting Minority Investors) broadened the existing measures. Moreover, for the first time, Doing Business expanded the sample of cities in 11 large economies. In Doing Business 2016, 4 topics (Dealing with Construction Permits, Getting Electricity, Registering Property and Enforcing Contracts) also introduced new measures of quality. Moreover, Trading across Borders overhauled its methodology to increase the relevance of indicators. In Doing Business 2017, Paying Taxes introduced new measures of postfiling processes and 3 topics (Starting a Business, Registering Property and Enforcing Contracts) added gender components. In contrast, the Doing Business 2018 edition of the report introduced no major methodology expansions. Thus, the previous year's ranks are not recalculated.[9]

Because rankings are not comparable across multiple years, the database omits reporting rankings for all prior years, not just rankings for the previous year. Moreover, as noted above, these changes also affect the comparability of the Distance to Frontier scores across multiple years.

A clearer justification for stressing the Distance to Frontier scores follows in the subsequent paragraph, which reads

More importantly, economies should assess their progress with the historical performance by using the Distance to Frontier score instead of the ranking. With the DTF scores, it is possible to see both how close an economy is to the global best performance at any point in time, and how big a stride it has made in improving its regulatory environment over time.

This is entirely correct. The Distance to Frontier scores all range from zero to one hundred percent, and thus are readily comparable across economies within a given year. This also leaves them more conveniently averaged into composite indicators. However, because the Distance to Frontier scores are meaningful, ranking economies by the Distance to Frontier scores is likely to be also meaningful.

[9] This refers to `http://www.doingbusiness.org/About-us/faq`, the World Bank's Doing Business webpage entitled "Frequently Asked Questions" as of June 6, 2018.

Warnings against comparing Ease of Doing Business indicators across multiple years are likely to be ignored because real changes in the ease of doing business across years are too economically important to be ignored. The World Bank may wish to adopt measures that render the Ease of Doing Business indicators reliably comparable across years to fill this very important need. The World Bank has unique capacity and credibility to do this.

Warnings that economy rankings be downplayed and ought not to be compared across multiple years are likewise likely to be ignored. How one economy ranks against another and how those rankings change over time appear to be of considerable importance in spurring politicians to improve the ease with which business can be done.

This is not bad news. If national pride associated with advancing in the rankings or from ranking above nearby economies can be harnessed as a force for needed reform, and thus for poverty alleviation and economic development, this would seem to be perfectly aligned with the World Bank's twin 2030 goals[10]

- End extreme poverty by decreasing the percentage of people living on less than $ 1.90 a day to no more than 3%
- Promote shared prosperity by fostering the income growth of the bottom 40% for every country

Making the Ease of Doing Business indicators more reliably comparable over time is a straightforward step towards meeting these very important goals. The World Bank may wish to prioritize the funding of such an initiative.

Because national pride associated with an economy's position in the rankings, and with its ascent or descent in the rankings, appears to be an important force for institutional development, the World Bank may wish to consider measures to make the rankings more reliably comparable, rather than measures to discourage comparisons over time in economies'

[10] Quoted from the World Bank's "What We Do" webpage at `http://www.worldbank.org/en/about/what-we-do`.

rankings.

4.4. How the Ease of Doing Business Indicators Were Challenged

On January 12^{th} 2018, *The Wall Street Journal* reported that Paul Romer, then at the World Bank, asserted that the Doing Business database is "potentially tainted by political motivations of World Bank staff."[11] The article further quoted Professor Romer taking responsibility in saying "I want to make a personal apology to Chile, and to any other country where we conveyed the wrong impression." The problems with the report, he elaborated, were "my fault because we did not make things clear enough." He further explained that he "couldn't defend the integrity of the process that led to the methodology changes."

Professor Romer's comments were widely discussed. The Economist summarized an especially contentious allegation that "Chile's ranking in the yearly report had dropped sharply during the presidency of Michelle Bachelet, a left-leaning politician who took office for the second time in 2014. Chile sank so heavily not because doing business had become harder, but because the bank had repeatedly changed its method of assessment."[12] *The Economist* elaborated, "The data-gathering and analysis were overseen by a former professor of economics at the University of Chile in Santiago, adding to the suspicion of skullduggery. Supporters of Ms. Bachelet, whose coalition lost the recent presidential election, were apoplectic. Some even suggested that Chile's slide in the rankings had hurt confidence, undermining investment and jeopardizing their political prospects." The Chilean government expressed deep concerns.[13]

Subsequent clarifications – by the World Bank, Paul Romer and others – responded to these concerns. Romer partly retracted his comments in his blog, writing "In a conversation

[11] World Bank Unfairly Influenced Its Own Competitiveness Rankings. *The Wall Street Journal*, by Josh Zumbrun and Ian Talley, Jan. 12, 2018.
[12] The World Bank's "ease of doing business" report faces tricky questions. *The Economist*, Jan. 18, 2018.
[13] See, e.g., "Chile Slams World Bank Amid Charges of Political Bias". *The New York Times*, by Pascale Bonnefoy and Ernesto Londoño, Jan. 13, 2018.

with a reporter, I made comments about the Doing Business report that gave the impression that I suspected political manipulation or bias. This was not what I meant to say or thought I said. I have not seen any sign of manipulation of the numbers published in Doing Business report or in any other Bank report."[14] Nonetheless, questions about the integrity of the database remained.

The episode raises methodology changes as a general issue. In clearly worded rebuttal to Romer's charge, Augusto Lopez-Claro, who directed the Global Indicators Group from 2011 to 2017, explains why "the Doing Business indicators have been subject to substantial methodology changes during the last several years."[15] The reasons that follow are entirely sensible.

However, major methodological changes, including those that constitute genuine improvements, can compromise the usefulness of the indicators to policy makers, researchers and the media. The challenge to the Ease of Doing Business indicators thus has two parts.

1. Were Chile's Ease of Doing Business indicators manipulated?

2. Have methodology changes compromised the social value of the indicators?

The following sections investigate both. The investigation uses unpublished survey data from the Doing Business years of 2015 to 2017 (DB2015 to DB2017) and published historical data available on the World Bank's Doing Business website. Doing Business years lag calendar years – that is, DB2016 indicators reflect conditions in 2014/2015. The World Bank has made survey responses from Chile and a set of 12 comparison economies available to us. World Bank staff have cooperated by answering repeated queries about data, methodology, and changes in methodology.

The first allegation is unfounded. The second is a concern, but is readily reparable going

[14] My Unclear Comments about the Doing Business Report. Paul Romer's blog, Jan. 16, 2018.

[15] Lopez-Claros Replies to Charges of Gaming World Bank Rankings. *Mother Jones*, by Kevin Drum, Jan. 15, 2018. *Mother Jones* provides the full text of the reply to Romer at `http://www.motherjones.com/wp-content/uploads/2018/01/blog_lopez_claros_reply_wsj.pdf`.

forward.

4.5. No Evidence Chile's Indicators Were Manipulated

An automated Global Indicators & Analysis Data Management System (GIADMS or simply DMS) generates the Ease of Doing Business indicators from survey responses the World Bank collects from around the world. There is no visible discrepancy between the survey responses written on the questionnaires from Chile and those stored in the DMS.

Manipulation of the DMS itself would cause inconsistencies between the survey responses and the Ease of Doing Business indicators the system generates for Chile. Examination by the independent auditors of Chile's Ease of Doing Business indicators shows the published values of the indicators to follow from the survey responses the World Bank received from Chile. There is no discrepancy between the World Bank's published historical Distance to Frontier scores and manually recalculated ones for Chile over DB2015 through DB2017.

The World Bank conducts multi-level inter-departmental reviews of the data coding process. Thorough and comprehensive reviews make manipulating the data or programming to affect the indicators of a single country exceedingly improbable. Based on this analysis, we conclude that there was no manipulation of Chile's Ease of Doing Business indicators.

4.6. But Frequent Methodology Changes Do Cause Problems

The broader concern that methodology changes render the Ease of Doing Business Indicators of Chile – and of other economies – non-comparable over time is a separate issue. Methodology changes might have affected the data in two ways. One possibility is that methodology changes in how the World Bank constructs the indicators mechanically changed economies' standing. A second possibility is that the methodology changes treated some economies in ways that affected their standing more than that of the average economy.

The first possibility can be tested directly because, in years when the World Bank makes major changes to the way it calculates the Ease of Doing Business indicators, it publishes two versions of the affected indicators for the previous year. One uses the new methodology and another uses the old methodology. Subtracting the old from the new version lets us assess how each methodology change affected Chile.

Table 4.2 lists these changes, and shows that eight of the eleven methodology changes moved Chile farther below the Ease of Doing Business best practice frontier, two methodology changes moved Chile closer to the frontier, and one had no discernable impact on Chile's position. The methodology change with the largest impact on Chile was that to the Resolving Insolvency indicator, which abruptly moved Chile up from 31.5% of the way towards global best practice to 47% of the way towards the best practice. The methodology change with the largest adverse impact on Chile was that for the Getting Credit indicator, which moved Chile from 68.8% down to only 50% of the way towards global best practice.

These changes affected many economies, not just Chile. Table 4.2 therefore presents means of each indicator's DTF scores across all economies under the new and old methodologies and the change to the average economy's DTF score due to each methodology change. The average economy ended up farther below the global best practice frontier after every methodology change except that to the Trading Across Borders and Resolving Insolvency indicators. The Resolving Insolvency and Getting Credit methodology changes had the largest positive and negative impacts, respectively, on the average economy's DTF scores.

If these methodology changes moved Chile's indicators more than they moved the indicators of the average economy, they could be said to have disproportionately affected Chile. The last column in Table 4.2 explores this. Chile gains relative to other countries from four methodology changes and loses relative to other countries from seven methodology changes. The net effect on Chile's overall Ease of Doing Business indicator is a very small relative gain in DB2016 and very small relative losses in DB2015 and DB2017. The methodology

change that affects Chile the most is that to the Resolving Insolvency indicator, which moves Chile up by 11.3 points more than the average economy. Chile's 18.8-point loss from the methodology change to the Getting Credit indicator is 6.9 points worse than that methodology change's impact on the average economy. The methodology change to the Protecting Minority Investors indicator, which affects the average economy relatively little, stands out in reducing Chile's DTF score by 5.4 points relative to the global average.

Chile is not uniquely sensitive to methodology. The approach in Table 4.2 reveals other methodology-sensitive economies. Narrowing the search to economies roughly as large as Chile's and with roughly similar populations, we selected a comparison economy affected by each major methodology change in Table 4.2. We first ranked economies by their distance-from-Chile, defined as an equal-weighted mean of the absolute percentage (log) differences between the economy and Chile in population, GDP, and per capita GDP. We then measured each economy's sensitivity to a given indicator's methodology change by the mean squared difference (MSD) in the value of its indicator's DTF scores under the new and old methodologies, where the mean is across the DB years for which such data are available.

For each methodology change, we sorted all economies in the Doing Business database on their sensitivities to the change and their distances-from-Chile. Then, we selected one economy that was especially sensitive to the methodology change and reasonably close to Chile on the aforementioned three dimensions. The final selection also took into account geographic representation from around the world in the list of comparison economies. The virtue of this approach is that it assembled a set of comparison economies for which the challenges the World Bank confronts in assembling the data are not too different from those for Chile, and for which methodology changes also appear important. If Chilean data alone were manipulated and the comparison economies' data were not, its methodology-driven revisions would stand out as different. If a more general pattern of manipulation were occurring, these are the likeliest places to find corroborating evidence of problems.

Table 4.3 lists these comparison economies and contrasts how much each methodology change affected their Ease of Doing Business indicator with how much the same change affected the same indicator for Chile and for the average economy. These figures differ from those in Table 4.2 because the focus here is the magnitudes of changes, rather than their directions. Table 4.2 focuses solely on the years in which methodology changes occurred. Table 4.3 uses all years for which old and new versions of the indicators are available. Positive and negative changes enter symmetrically by squaring each change, averaging the squared changes, and then taking the square root.

For each Ease of Doing Business indicator, World Bank staff provided original survey results and computer data from DB2015 to DB2017 for all comparison economies. Detailed inspection of them likewise reveals no evidence of impropriety, bias, or manipulation. We found no discrepancy between the responses to the questionnaires from these economies and the data the World Bank used to calculate their Ease of Doing Business indicators. Nor did we find any discrepancy between their DTF scores and manually recalculated ones.

The comparison economies' DTF scores, selected for their sensitivity to methodology changes, changed precisely as the methodology changes dictated. In all cases, we found no evidence of manipulation.

Table 4.3 shows that Chile is less affected by methodology changes than many other economies. Unsurprisingly, the comparison economies are more affected than Chile: they were, after all, selected precisely because of their high sensitivity to the methodology changes. More importantly, most methodology changes affect Chile less than they affect the average economy.

Indeed, the first row shows that Chile is affected only 62.5% as much as the average economy by changes in the overall Ease of Doing Business indicator. The root mean squared difference between Chile's old and new versions of the Ease of Doing Business composite indicator across all years is only 1.0; that for the average economy is 1.6.

Chile is less affected than the average economy by five of the eleven major methodology changes to specific Ease of Doing Business indicators (Dealing with Construction Permits in 2016, Getting Electricity in 2016, Trading across Borders in 2016 and Enforcing Contracts in 2016 and 2017). Chile is more affected than average by six methodological changes to specific indicators (Registering Property in 2016 and 2017, Getting Credit in 2015, Protecting Minority Investors in 2015, Paying Taxes in 2017 and Resolving Insolvency in 2015). Luck of the draw would imply a fifty-fifty split (5 to 6 one way or the other), which is roughly what we observe here.

While every number and calculation for every one of the economies covered by the Doing Business Report for every year cannot be rechecked, our complete validation of the data and calculations for Chile and the 12 comparison economies from DB2015 to DB2017 strongly suggests that the Ease of Doing Business indicators are what they are presented to be. In every case we checked, the indicators are based on unaltered survey data, faithfully entered into an automated data management system, and are mechanically constructed free of manipulation by World Bank staff.

4.7. Methodology-Invariant Versions of the Ease of Doing Business Database

A second set of issues concerns the impact of methodology changes on the longer-term comparability of the Ease of Doing Business indicators over multiple years. The previous section could not address this because both versions of indicators constructed using old or new methodologies are not available for all years. This section compares methodology-invariant (stable) versions of the Ease of Doing Business indicators to the published indicators. This comparison lets us see how much the methodology changes affect the indicators over longer stretches of time.

On his blog, Paul Romer describes how he constructs a stable version of the indicators. The World Bank has generated an alternative set of stable indicators (dubbed "simulation"

internally) based on a methodology more aligned with that used in the published indicators. We have replicated both methodologies closely enough to relegate discrepancies to rounding errors. We have experimented with further methodology invariant-versions of the indicators to isolate the factors most influential in explaining the differences between alternative versions of the indicators.

The methodology-invariant versions of the Ease of Doing Business indicators are based largely on sub-indicator components free of major methodology changes. Because major methodology changes to the subcomponents underlying the Getting Credit, Protecting Minority Investors, and Resolving Insolvency indicators are confined to the transition from DB2014 to DB2015, the new methodology version of those subcomponents can be used for DB2014 so stable versions of these indicators can be constructed from DB2014 onwards. This is adequate for investigating the years we audited; however, stable versions of these indicators spanning all years would differ from these.

Stable versions of the other indicators are based only on subsets of their subcomponents that are unaffected by methodology changes. Subcomponents affected by methodology changes are discarded. The methodology changes to the Trading across Borders indicator are too extensive to permit construction of a stable version of that indicator, so it drops from the comparisons in this section.

Table 4.4 compares the construction of three versions of the Ease of Doing Business indicators: the latest published version, the World Bank stable version (simulation) and Paul Romer's stable version. Stable rankings are determined by sorting economies on stable indicators' DTF scores. For large-population economies, only the largest business city is included when rankings are calculated.

Depending on the version, a methodology-invariant approach removes the following information:

1. The revamped trading across borders indicator and all its components (Romer stable version)
2. The building quality control index (both stable versions)
3. The reliability of supply and transparency of tariffs index (both stable versions)
4. The quality of land administration index (both stable versions)
5. The extent of shareholder rights index (World Bank stable version)
6. The extent of ownership and control index (World Bank stable version)
7. The extent of corporate transparency index (World Bank stable version)
8. The post-filing index (both stable versions)
9. The quality of judicial processes index (both stable versions)
10. The strength of insolvency framework index (World Bank stable version)

This list illustrates the cost of both methodology changes and of sidestepping them. A major cost is discarding the trading across borders indicator and all its subcomponents, whose earlier and later values are essentially incomparable because of a sweeping methodology change in terms of case scenario. The list also highlights the limited scope of the stable versions of the indicators, which must exclude newly added indexes that capture other important aspects of the business environment. Methodology changes force researchers to trade-off fewer comparable years for less comprehensive indicators. Policy-makers and journalists must likewise narrow their focus to a smaller set of stable elements of the data to make longer-term assessments of the pace of institutional development.

We replicated Romer's calculations of his set of stable Ease of Doing Business indicators as described on his blog. Romer's approach deviates from the conventions the World Bank uses in calculating its published indicators in three ways. Specifically,

1. The global best and worst practice boundaries Romer uses to calculate Distance to Frontier scores are the highest and lowest values of that variable across all economies in all the years he considers. In contrast, the World Bank uses predefined global best

and worst practice values. Economies whose ease of doing business is better or worse than these boundaries are considered at the boundaries in calculating their DTF scores. Assessing the World Bank's approach to establishing these endpoints is beyond the scope of this study.

2. Romer does not employ the World Bank's nonlinear transformation

$$DTF_\tau = \begin{cases} 0 & \text{if } \tau \geq \tau_H = 84.0 \\ (\frac{\tau_H - \tau}{\tau_H - \tau_L})^{0.8} \times 100 & \text{if } \tau_L < \tau < \tau_H \\ 100 & \text{if } \tau \leq \tau_L = 26.1 \end{cases} \tag{4.1}$$

to calculate the DTF score of τ, the Total Tax and Contribution Rate subcomponent of the Paying Taxes indicator. This is the only subcomponent of any indicator subject to such a transformation. World Bank staff have indicated that the purpose of this nonlinear transformation is to mitigate biasing the indicator toward economies that do not levy significant taxes on companies. Assessing this transformation is beyond the scope of this study.

3. Romer calculates the Distance to Frontier score of the Getting Credit indicator in the same way as all the other indicators are calculated. In every case except this, the World Bank first calculates a DTF score for each subcomponent and then averages these to arrive at the DTF score for the Ease of Doing Business indicator. For the Ease of Getting Credit indicator alone, the World Bank calculates an economy's distance-to-frontier by first adding its score on the 12-point Strength of legal rights index and its score on the 8-point Depth of credit information index to arrive at a 20-point combined index and then assigns best and worst practice endpoints to this 20-point scale to arrive at the economy's published Ease of Getting Credit Distance to Frontier score. This implicitly assigns legal rights 1.5 times the weight assigned to credit information in the final indicator. World Bank staff argues that this deviation from their standard practice of weighting

all subcomponents equally is economically justifiable. Assessing this argument is beyond the scope of this study.

Table 4.5 lists the global best and worst practice endpoints for calculating the Distance to Frontier scores of each subcomponent of the Ease of Doing Business indicators. The table also lists the economies at the global best practice frontier, if any are, for each subcomponent of each indicator. In most cases, the best-practicing economies are those generally thought to have highly developed institutions, though a few might be thought surprising.

Obviously, the frontiers cannot move whenever the best or worst-practice economy gets even better or even worse. The World Bank therefore fixes endpoints for DTF calculations. This means that, in some cases, some economies actually do better or worse than the global best or worst practice endpoints. In calculating the DTF scores, the World Bank quite reasonably takes these economies as being at the endpoints, rather than beyond them. In other cases, no economy has attained the best practice frontier.

World Bank staff provided us with their in-house stable version of the indicators, which they dub "simulation" indicators. Except for the Trading across Borders indicator, the World Bank's stable indicators are largely based on subcomponents free of methodology changes across all years, whereas Romer used a larger set of subcomponents free of methodology changes in the years he considered – DB2014 to DB2018. The World Bank's in-house stable version of the indicators also follows the World Bank's conventions regarding the above three points. Specifically, the World Bank's stable indicators are transformed into Distance to Frontier scores using the same endpoints as in the published versions; employing the nonlinear transformation on the tax rate in calculating the DTF score of Paying Taxes; and calculating the DTF score of Getting Credit as the DTF of the sum of its subcomponents, rather than the mean of the DTFs of the subcomponents, the procedure used for all other indicators.

In each case, World Bank staff were able to provide explanations of why they do what

they do. The World Bank may wish to augment its website with explanations of

1. Why best and worst practice endpoints for Distance to Frontier scores are defined as they are

2. Why a nonlinear transformation is applied to the tax rate subcomponent of the Paying Taxes indicator when calculating its DTF score, but to no other subcomponent of any other indicator

3. Why the Getting Credit indicator has a Distance to Frontier score defined as the DTF of the sum of its subcomponents, while all other Ease of Doing Business indicators have DTF scores that are the simple averages of the distances to frontier of their individual subcomponents.

We were able to reproduce the World Bank's in-house stable version of the indicators to a good approximation, after following closely the method implied by the simulation spreadsheet they provided. This exercise revealed that the best and worst practice endpoints used to calculate the Distance to Frontier scores are of first order importance in explaining the differences in variability of the Romer-style and World Bank in-house stable versions of the indicators. To illustrate this, we focused on an intermediate stable version of the indicators that replicates Romer's methodology in every way except in using the World Bank's worst and best practice endpoints when calculating the DTF scores.

Table 4.6 summarizes differences in the variability of the published and alternative stable versions of the indicators. The upper panel compares the variability in terms of the Distance to Frontier scores. The DTF scores under Romer-style stable version vary less than those under the published version, for the overall composite Ease of Doing Business indicator and for six of the nine specific Ease of Doing Business indicators. The two versions of the Protecting Minority Investors and Resolving Insolvency indicators have statistically indistinguishable variances. The Romer-style stable version is more variable only for the Getting

Credit indicator.

The World Bank's in-house stable versions are more variable than the published versions in four cases, less variable in one case, and have statistically indistinguishable variability in all other cases. Recalculating the Distance to Frontier scores of Romer-style stable indicators, but using the global best and worst practice endpoints defined by the World Bank, generates an intermediate set of stable indicators whose variability is almost identical to that of the World Bank's in-house stable indicators. This highlights the important role the definition of the endpoints played in calculating the Distance to Frontier scores.

The lower panel repeats the exercise comparing rankings based on the Distance to Frontier scores under different stable versions with inferred rankings based on the published historical Distance to Frontier scores. This inference is necessary because the World Bank does not report historical rankings in the Doing Business historical dataset. The various stable and inferred rankings have statistically indistinguishable variances. This is reasonable because the rankings necessarily have the same uniform distribution (the number of economies for which all indicators are reported does not change in these years). In statistical tests presuming a common variance, researchers might prefer rankings to DTF scores.

Of course, methodology-invariant or stable versions of the indicators might be calculated in other ways. World Bank staff are equipped to do this with far more sophistication than we can muster.

A second application of the stable versions of the Ease of Doing Business indicators from Table 4.4 reexamines the possibility that, even if the methodology changes did not systematically diminish Chile's standing when they occurred, the revised methodologies might still have affected Chile's Ease of Doing Business indicators more than those of the other economies over longer stretches of years. This exercise reaffirms our conclusion that such concerns are unfounded.

Table 4.7 explores whether differences between the published and stable versions of the Ease of Doing Business indicators are disproportionately more variable for Chile than for other economies. Wherever Chile stands out against all other economies in the world, Chile's difference actually varies less. That is, published Ease of Doing Business indicators deviate from our stable versions of those indicators less for Chile than for the average economy.

4.8. Conclusions

Allegations that World Bank staff have manipulated individual economies' Ease of Doing Business indicators are without foundation. All Ease of Doing Business indicators for the years DB2015 through DB2017 for Chile and 12 other economies whose indicators changed substantially when methodologies used to calculate the indicators changed were reexamined starting from survey responses. The published indicators are consistent with the data entered into the World Bank's automated Global Indicators & Analysis Data Management System and with the methodologies the World Bank uses for the year in question. The data entered into the system are consistent with the survey responses the World Bank collected.

Methodology changes reflect World Bank staff's genuine efforts to improve the indicators. World Bank staff have explained that these changes followed from consultations of World Bank Group staff, governments and the private sector. In each case, World Bank staff concluded that the changed methodologies were genuine improvements and worth the sacrifice of comparability over time.

However, the recommendation of the 2013 Independent Review Panel that "*For the purposes of international benchmarking and monitoring progress, measures also have to be comparable over time and across countries.*"[16] might have been insufficiently forceful. Recent trends in empirical research make comparability across as many years as possible increasingly

[16] See pp. 28-9 of the Doing Business Independent Panel Review Report. The full report is available at `http://pubdocs.worldbank.org/en/237121516384849082/doing-business-review-panel-report-June-2013.pdf`.

important, and the media and policy-makers pay increasing attention to how the indicators and rankings change over many years. Going forward, the World Bank may wish to assign a greater weight to preserving comparability over multiple years.

A fallacy of composition problem may have arisen. Each methodology improvement can seem incontrovertibly sensible viewed in isolation, yet frequent methodology improvements can combine to reduce the social value of the Ease of Doing Business indicators by compromising their comparability across years. If changes in the indicators come to reflect methodology changes, more than changes in the real ease of doing business, an economy ascending or descending in the Doing Business rankings no longer reliably reflects its real progress or backsliding in improving its business environment.

Changes in economies' Ease of Doing Business scores are followed intensely by international and domestic media, often without attention to notes on methodology changes, and can plausibly affect national policies and even elections. This speaks to the importance of the Doing Business project and serves as a testament to its social value. However, this very success gives the World Bank reasons to be cautious about methodology revisions:

The indicators are sufficiently prominent that methodology changes might lead voters to reward or punish elected officials for changes in their rankings that have nothing to do with economic reality. Publicity surrounding Romer's comments about Chile makes this less likely going forward. Politicians and the media now know the indicators can change for methodological reasons and therefore can diffuse such charges.

Unfortunately, this rejoinder to the one concern gives rise to a second and more serious concern. Frequent methodological changes create scope for discounting the integrity and objectivity of the Ease of Doing Business indicators. Political leaders who preside over institutional deterioration can blame lagging standing in the indicators on methodology changes. Methodology changes attenuate the link between changes in the Ease of Doing Business rankings and changes in real business environments, and this undermines their effectiveness

as goalposts of institutional reform. Goalposts that move about, even for entirely innocuous reasons, invite challenges.

A third concern follows. Methodology-driven variability in the Ease of Doing Business data compromises the credibility of economic studies based on that data. Many important economic questions can only be addressed using data that are comparable across years. Such studies rely on changes in one set of variables to explain changes in another. Methodology revisions to how the Ease of Doing Business indicators are constructed cause changes in the indicators that do not reflect real changes in business environments.

In years of methodology changes, the World Bank provides two sets of data for the previous year (and for subsequent years too for certain indicators, as discussed in Table 4.3). One is calculated using the old methodology; another uses the new methodology. This practice is certainly helpful, but cannot really remedy the above concerns effectively unless comparable data across all years are provided.

These are largely avoidable problems. The World Bank may therefore wish to revisit its policies about methodology changes to the Ease of Doing Business indicators.

4.9. Recommendations

The World Bank may wish to consider a range of measures that safeguard comparability across time in the Ease of Doing Business indicators.

1. The World Bank may wish to minimize methodology changes in existing indicators except to fix confirmed problems with existing methodology.

The World Bank undertook broad consultative efforts preceding the DB2015-2017 methodological changes, including input from an Independent Panel of Experts in 2013 and from World Bank Group staff, governments and the private sector. The World Bank then implemented a set of major methodological changes, whose scope for creating problems may not

have been adequately anticipated. Major methodology changes move the indicators about for reasons other than changes in the ease of doing business, compromising their value to researchers, policy makers, and the media. Providing old and new versions of indicators subject to methodology changes highlights the magnitude of these issues, but does not permit comparability across multiple years. Paul Romer drew attention to these concerns, but others would almost surely have voiced similar concerns eventually, if less prominently.[17]

To minimize future controversy over methodology revisions, the World Bank may wish to adopt a conservative approach: limiting methodology changes in existing indicators to cases where substantive problems are identified and must be corrected. Substantiality might be inferred from peer-reviewed criticisms confirmed to be valid and economically significant. Minor improvements in methodology, such as improved wordings, might be avoided to safeguard the comparability and credibility of the indicators.

If methodology changes to existing indicators are necessary, the World Bank may wish to favor changes that can be applied retrospectively to prior years' data as well as current and future years' data. Prior versions of the Doing Business database using abandoned methodologies should be readily available to researchers so studies using earlier versions of the data remain replicable. The World Bank may also wish to consider allocating resources to back-calculate prior years data where this is feasible.

2. The World Bank may wish to incorporate additional aspects of the ease of doing business with new indicators, rather than with methodological changes to existing indicators.

Avoiding all methodology changes is obviously unrealistic. To remain useful, the indicators must change to reflect newly appreciated aspects of the ease of doing business. Previously neglected but clearly important issues, such as gender parity, are certain to arise

[17] See, e.g., "Chart of the Week #3: Why the World Bank Should Ditch the 'Doing Business' Rankings—in One Embarrassing Chart" by Justin Sandefur and Divyanshi Wadhwa at the Center for Global Development, Washington, D.C., Jan. 18, 2018.

from time to time. Comparability of the indicators and rankings across years cannot be the World bank's only concern.

If a previously ignored dimension of the business environment is important enough to justify the attention of the World Bank, it is presumably important enough to justify its own Ease of Doing Business indicator. Gender parity is an obvious example. Modifying the methodologies used to construct the Starting a Business, Registering Property, and Enforcing Contracts indicators to reflect gender parity mars the comparability of these indicators over time. A new Gender Parity in the Ease of Doing Business indicator encompassing gender parity in starting a business, registering property, and enforcing contracts avoids this and arguably gives gender parity greater prominence.

The Starting a Business indicator was less affected because the World Bank was able to retrospectively alter its value for prior years using the revised methodology. If methodology changes to existing indicators are unavoidable, changes that facilitate backfilling are preferable.

3. Developments in how researchers, policy-makers, and the media use the indicators suggest that, going forward, the World Bank may wish to consider assigning a much greater weight to preserving comparability in the indicators across all years.

The World Bank weighs comparability of the indicators across multiple years against keeping the indicators relevant in implementing methodology changes. Such compromises might be avoidable if the World Bank produced an alternative set of stable indicators, specifically designed to be comparable across years, which meaningfully tracked economies' institutional development or backsliding. Changes in economies' rankings by these measures would then also be meaningful.

4. The World Bank may wish to provide a set of stable Doing Business De-

velopment indicators and rankings, based solely on subcomponents of the Ease of Doing Business indicators free of major methodology changes.

To avoid confusion, the stable indicators might be given a different name – we suggest Doing Business Development Indicators – to stress that their purpose is tracking institutional development relevant to the ease of doing business. This would also distinguish them from the primary Ease of Doing Business Indicators, whose methodologies could be modified to reflect newly appreciated issues.

World Bank staff have generated a stable version of each indicator, based largely on subcomponents not subject to methodology changes, for internal use. This exercise might be fine-tuned to produce a publishable set of Doing Business Development indicators spanning all years. These might be based on methodology-invariant subcomponents such as the number of procedures, cost and delay associated with different aspects of doing business where available. A Doing Business Development indicator is likely not possible for the Ease of Trading across Borders, whose case scenario was completely rewritten in DB2016. The Getting Credit and Protecting Minority Investors indicators derive from checklists; their Doing Business Development analogs might derive only from those checklist items that do not change from year to year.

The World Bank publishes the subcomponents of each indicator that are comparable across all years. Researchers can use these data to construct their own stable versions of the indicators; but this risks leaving studies based on alternative stable versions of the indicators non-comparable. Government offices might or might not also build their own indicators; but journalists, often operating under pressing deadlines, are unlikely to undertake such exercises. Users of the indicators would be better served were the World Bank to provide a standard well-designed set of stable Doing Business Development indicators. These would sacrifice information in the primary indicators, but let users needing comparability make ready use of one set of standard well-designed stable indicators.

Changes in such stable indicators across multiple years would be economically meaningful, so the rankings they generate would also be meaningful. The media and politicians appear most interested in rankings. The World Bank may wish to consider harnessing this interest to promote institutional reforms by publishing Doing Business Development rankings that reflect real changes in the ease of doing business, rather than emphasizing the incomparability of rankings due to methodological changes.

5. The World Bank may wish to establish objective methodologies to continuously update distance-to-frontier endpoints needing updating to avoid renewed controversy about methodology changes.

From DB2015 on, Ease of Doing Business rankings are solely based on the Distance to Frontier (DTF) scores. If the global best practice gets something done in two days and the global worst practice endpoint is 502 days, an economy in which the task takes 52 days is (502 – 52)/(502 -2) = 450/500 = 90% of the way towards the best practice frontier. Each subcomponent is normalized into a DTF score. These are averaged (except for "Getting Credit") to generate each of the Ease of Doing Business indicators' DTF score. These are then averaged again to generate the overall Ease of Doing Business score for an economy, on which its Ease of Doing Business ranking is based.

Somewhat confusingly, a larger distance-to-frontier value indicates that an economy is actually less distant from the best practice frontier. The World Bank may wish to rename these measures Doing Business Scores.

As institutions develop worldwide, some DTF endpoints may need to change. The World Bank currently contemplates revising these endpoints every five years. Such abrupt changes invite renewed controversy about methodology-driven changes in the indicators every five years. The World Bank may wish to consider developing objective and mechanical ways of gradually adjusting DTF endpoints likely to require revision to avoid renewed problems associated with abrupt methodology changes.

Table 4.1 Methodology Changes in the Calculation of the Ease of Doing Business Indicators

This table documents the components of the indicators as distance to frontier (DTF) measures. Changes in the wording of case descriptions and survey questions are frequent, but not included in this table. Items affected by major methodological changes are in bold red. Items whose values in earlier years are recalculated to be consistent with methodological changes are in blue italics.

DB 2004-2014	DB 2015	DB 2016	DB 2017 -2018	Stable Elements
Starting a Business				
■ Procedures ■ Time ■ Cost ■ Paid-in min. capital ■ *Adj. for gender parity backfilled*	■ Procedures ■ Time ■ Cost ■ Paid-in min. capital ■ *Adj. for gender parity backfilled*	■ Procedures ■ Time ■ Cost ■ Paid-in min. capital ■ *Adj. for gender parity backfilled*	■ Procedures ■ Time ■ Cost ■ Paid-in min. capital ■ **Adj. for gender parity**	■ Procedures ■ Time ■ Cost ■ Paid-in min. capital ■ Adj. for gender parity
Dealing with Construction Permits				
■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost ■ **Qualitative building quality control index**	■ Procedures ■ Time ■ Cost ■ Qualitative building quality control index	■ Procedures ■ Time ■ Cost
Getting Electricity				
■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost ■ **Qualitative supply reliability & tariff transparency index**	■ Procedures ■ Time ■ Cost ■ Qualitative supply reliability & tariff transparency index	■ Procedures ■ Time ■ Cost
Registering Property				
■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost ■ **Quality of land admin. index**	■ Procedures ■ Time ■ Cost ■ Quality of land admin. index ■ **Adj. for property rights gender parity**	■ Procedures ■ Time ■ Cost
Getting Credit				
■ Strength of legal rights 10-point original checklist ■ Depth of credit info. 6-point original checklist	■ **Strength of legal rights 12-point checklist** ■ **Depth of credit information 8-point checklist**	■ Strength of legal rights 12-point checklist ■ Depth of credit information 8-point checklist	■ Strength of legal rights 12-point checklist ■ Depth of credit information 8-point checklist	■ Modifications combine, improve, add and delete points. No elements are clearly stable.
Protecting Minority Investors				
■ Extent of conflict of interest regulation index	■ Extent of conflict of interest regulation index ■ **Extent of shareholder governance index**	■ Extent of conflict of interest regulation index ■ Extent of shareholder governance index	■ Extent of conflict of interest regulation index ■ Extent of shareholder governance index	■ Extent of conflict of interest regulation index

Paying Taxes				
■ Payments ■ Time ■ Total tax rate	■ Payments ■ Time ■ Total tax rate ■ **Total tax rate with nonlinear DTF transformation**	■ Payments ■ Time ■ Total tax rate ■ Total tax rate with nonlinear DTF transformation	■ Payments ■ Time ■ Total tax rate ■ Total tax rate with nonlinear DTF transformation ■ **Post-filling index**	■ Payments ■ Time ■ Total tax rate without nonlinear DTF transformation
Trading Across Borders				
Given a case study: ■ Documents to export ■ Time to export ■ Cost to export ■ Documents to import ■ Time to import ■ Cost to import	Given a case study: ■ Documents to export ■ Time to export ■ Cost to export ■ Documents to import ■ Time to import ■ Cost to import	**Entirely new case study** **Time to export** ■ **Documentary compliance** ■ **Border compliance** **Cost to export** ■ **Documentary compliance** ■ **Border compliance** **Time to import** ■ **Documentary compliance** ■ **Border compliance** **Cost to import** ■ **Documentary compliance** ■ **Border compliance**	Entirely new case study Time to export ■ Documentary compliance ■ Border compliance Cost to export ■ Documentary compliance ■ Border compliance Time to import ■ Documentary compliance ■ Border compliance Cost to import ■ Documentary compliance ■ Border compliance	■ None
Enforcing Contracts				
■ Procedures ■ Time ■ Cost	■ Procedures ■ Time ■ Cost	■ ~~**Procedures**~~ ■ Time ■ Cost ■ **Quality of judicial processes index added**	■ ~~Procedures~~ ■ Time ■ Cost ■ Quality of judicial processes index **adjusted to cover weight of women's testimony in court**	■ Time ■ Cost
Resolving Insolvency				
■ Recovery rate	■ Recovery rate ■ **Strength of insolvency framework index**	■ Recovery rate ■ Strength of insolvency framework index	■ Recovery rate ■ Time ■ Strength of insolvency framework index	■ Recovery rate

Source: Authors annotations based on `http://www.doingbusiness.org/Methodology/Distance-to-Frontier-Metrics`, the World Bank's Doing Business webpage entitled "Distance to Frontier metrics" as of June 6, 2018.

Table 4.2 List of Major Methodology Changes and Impacts on Chile

In years of major methodology changes, the World Bank provides two versions of the Distance to Frontier (DTF) scores for each economy for the previous year – one using the old methodology and another using the new methodology. This table assesses the effects on each affected *Ease of Doing Business* indicator for Chile by reporting the new version, the old version, and the difference between the two. Averages of these figures across all economies are also reported for comparison. The *Chile effect* is the difference between the new and old indicators for Chile relative to the average difference across all economies. Positive values of the Chile effect flag methodology changes that boosted Chile's standing more than the average economy, negative numbers indicate that the methodology change diminished Chile's standing more than the average economy.

Indicator Affected	***DB year***	***Methodology change***	***Average Impact across all economies***			***Impact on Chile***			***Chile effect***
			New	***Old***	***Change***	***New***	***Old***	***Change***	
Ease of Doing Business	2015	Resulting from the methodology changes of its sub-indicators	60.3	61.2	-0.9	71.8	72.8	-1.0	-0.1
	2016		60.0	61.1	-1.1	70.9	71.9	-1.0	0.1
	2017		60.2	60.5	-0.3	70.4	71.2	-0.7	-0.4
Dealing with Construction Permits	2016	Building quality control index introduced	63.8	64.3	-0.5	80.0	77.7	2.2	2.7
Getting Electricity	2016	Reliability of supply and transparency of tariff index introduced	64.5	71.2	-6.7	82.5	85.0	-2.5	4.2
Registering Property	2016	Quality of the land admin. index introduced	60.3	65.0	-4.7	71.7	79.0	-7.2	-2.5
	2017	Quality of land admin. index expanded to cover equal access to property rights	60.5	60.6	-0.1	70.9	71.7	-0.8	-0.7
Getting Credit	2015	Strength of legal rights index and Depth of credit information index changed	43.5	55.4	-11.9	50.0	68.8	-18.8	-6.9
Protecting Minority Investors	2015	Extent of shareholder governance index introduced	50.2	51.5	-1.3	60.0	66.7	-6.7	-5.4
Paying Taxes	2017	Post-filling index introduced	67.1	69.6	-2.5	77.1	83.6	-6.5	-4.0
Trading Across Borders	2016	Replacement of case study on which respondents base assessments	68.8	66.9	1.9	80.6	82.1	-1.5	-3.4
Enforcing Contracts	2016	Quality of judicial processes index introduced	55.2	55.8	-0.6	62.8	63.9	-1.0	-0.4
	2017	Quality of judicial processes index changed to include weight of women's testimony in court	55.1	55.3	-0.2	62.8	62.8	0.0	0.2
Resolving Insolvency	2015	Strength of insolvency framework index introduced	42.2	38.0	4.2	47.0	31.5	15.5	11.3

Source: Authors calculations based on Doing Business historical dataset available at `http://www.doingbusiness.org/~/media/WBG/DoingBusiness/Documents/Data/DB18-Historical-data-complete-data-with-DTFs.xlsx`.

Table 4.3 Old versus New Methodology Differences: Chile versus Comparison Economies

In years of major methodology changes, the World Bank provides two versions of the Distance to Frontier (DTF) scores for each economy for the previous year - one using the old methodology and another using the new methodology. Because both versions of certain indicators[18] are available for subsequent years as well, the numbers in this table are not exactly absolute values of those in Table 4.2, which focuses on the years of the methodology charges. This table contrasts the effects of each methodology change on Chile, a comparison economy, and the average economy. Positive and negative changes enter symmetrically by squaring the changes, averaging the squares, and then taking the square root of the resulting average. Larger numbers indicate larger methodology-driven changes.

Indicator	**Year of methodology change**	**Comparison economy**	**Root mean squared difference between new & old versions**		
			Chile	**Comparison economy**	**Average economy**
Ease of Doing Business	DB2015, 16&17	Singapore	1.0	5.4	1.6
Dealing with Construction Permits	DB2016	Sri Lanka	2.2	10.6	4.8
Getting Electricity	DB2016	Lebanon	3.5	20.0	8.7
Registering Property	DB2016	Greece	7.2	11.5	5.8
Registering Property	DB2017	Ecuador	0.8	0.5	0.1
Getting Credit	DB2015	Malaysia	18.8	30.0	12.1
Protecting Minority Investors	DB2015	Hong Kong	6.7	15.0	6.6
Paying Taxes	DB2017	Peru	6.2	15.5	5.3
Trading Across Borders	DB2016	Kazakhstan	1.5	52.5	15.6
Enforcing Contracts	DB2016	Guatemala	1.0	11.8	5.5
Enforcing Contracts	DB2017	Qatar	0.0	1.9	0.2
Resolving Insolvency	DB2015	Romania	17.5	23.1	9.9

Source: Authors calculations based on the Doing Business historical dataset available at `http://www.doingbusiness.org/~/media/WBG/DoingBusiness/Documents/Data/DB18-Historical-data-complete-data-with-DTFs.xlsx`.

[18] These indicators are "Dealing with Construction Permits", "Getting Electricity", "Registering Property", "Paying Taxes", and "Resolving Insolvency". "Starting a Business" is not included here, because it is back-calculated entirely after the gender parity adjustment in DB2017.

Table 4.4 Published versus Alternative Stable Versions of the Ease of Doing Business Indicators

Changes in the wording of case descriptions and survey questions are frequent, but not included in this table. Components in the published version constituting major methodological changes are in bold red. Items that differ in Romer's stable versions are in blue italics.

Indicator	Published version[19]	World Bank stable version	Romer stable version[20]
Starting a business	■ Procedures, time, cost, paid-in min. capital, **gender parity** ■ Worst practice: Set by WB[21] ■ Best practice: Set by WB	■ Procedures, time, cost, paid-in min. capital ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost, paid-in min. capital ■ *Worst practice: minimum*[22] ■ *Best practice: maximum*
Dealing with Construction Permits	■ Procedures, time, cost, **building quality control index** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost ■ *Worst practice: minimum* ■ *Best practice: maximum*
Getting Electricity	■ Procedures, time, cost, **reliability of supply and transparency of tariff index** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost ■ *Worst practice: minimum* ■ *Best practice: maximum*
Registering Property	■ Procedures, time, cost, **quality of land admin. index, gender parity** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Procedures, time, cost ■ *Worst practice: minimum* ■ *Best practice: maximum*
Getting Credit	■ Strength of legal rights index **(12 points)**, depth of credit information index **(8 points)** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Indicator is DTF of sum of two sub-indexes ■ Sub-indexes rescaled for years prior to DB2015 when each had 10 and 6 points in total ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ *Indicator is mean of DTFs of sub-indexes as all other indicators* ■ *Rescaling of sub-indexes unnecessary for DB2014-18* ■ *Worst practice: minimum* ■ *Best practice: maximum*
Protecting Minority Investors	■ Extent of conflict of interest regulation index, **extent of shareholder governance index** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Extent of conflict of interest regulation index ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Extent of conflict of interest regulation index, *extent of shareholder governance index* ■ *Worst practice: minimum* ■ *Best practice: maximum*
Paying Taxes	■ Payments, time, **nonlinear transformation of the DTF of total tax rate,**[23] **post-filling index** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Payments, time, nonlinear transformation of the DTF of total tax rate ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Payments, time, *DTF of total tax rate is calculated in the same way as other indicators, i.e., without a nonlinear transformation* ■ *Worst practice: minimum* ■ *Best practice: maximum*

[19] This version is as of DB2018. Table 4.1 details the evolution of published versions from DB2004 to DB2018.

[20] We replicated Prof. Paul Romer's calculations as he described on his blog: `https://paulromer.net/wp-content/uploads/2018/01/DB-calcs.pdf`

[21] Table 4.5 elaborates.

[22] Calculated using DB2014-18 data.

[23] The World Bank calculates the Distance to Frontier score of the Total Tax and Contribution Rate subcomponent after applying the transformation

$$DTF_\tau = \begin{cases} 0 & \text{if } \tau \geq \tau_H = 84.0 \\ (\frac{\tau_H - \tau}{\tau_H - \tau_L})^{0.8} \times 100 & \text{if } \tau_L < \tau < \tau_H \\ 100 & \text{if } \tau \leq \tau_L = 26.1, \end{cases}$$

Trading Across Borders	■ **Entirely new case scenario used from DB2015 onwards** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Mechanical appendage of the new-methodology time series to the old-methodology time series	■ *Dropped due to non-comparability across DB2014-18*
Enforcing Contracts	■ Time, cost, **quality of judicial processes index, gender parity** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Time, cost ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Time, cost ■ *Worst practice: minimum* ■ *Best practice: maximum*
Resolving Insolvency	■ Recovery rate, **strength of insolvency framework index** ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Recovery rate ■ Worst practice: Set by WB ■ Best practice: Set by WB	■ Recovery rate, *strength of insolvency framework index* ■ *Worst practice: minimum* ■ *Best practice: maximum*
Ease of Doing Business Composite Index	■ Economy-level indicators are population-weighted averages of two major business cities for 11 large population economies from DB2015 onwards	■ Economy-level indicators use only one major business city for all economies, the same methodology prior to DB2015	■ Economy-level indicators use only one major business city for all economies, the same methodology prior to DB2015

where τ is the total tax and contribution rate. The Ease of Paying Taxes indicator is the mean of this and the DTF scores of the other subcomponents.

Table 4.5 Global Best and Worst Practice Standards Used to Define Distances-to-Frontiers

Topic and indicator	Who sets global best practice frontier	Best	Worst
Starting a business			
Procedures (number)	New Zealand	1	18[a]
Time (days)	New Zealand	0.5	100[b]
Cost (% of income per capita)	Slovenia	0.0	200.0[b]
Minimum capital (% of income per capita)	Australia; Colombia[c]	0.0	400.0[b]
Dealing with construction permits			
Procedures (number)	No economy at frontier (June 1, 2017)	5	30[a]
Time (days)	No economy at frontier (June 1, 2017)	26	373[b]
Cost (% of warehouse value)	No economy at frontier (June 1, 2017)	0.0	20.0[b]
Building quality control index (0–15)	Luxembourg; New Zealand; U.A.E.	15	0[b]
Getting electricity			
Procedures (number)	Germany; S. Korea[e]	3	9[a]
Time (days)	S.Korea; St. Kitts Nevis; UAE	18	248[b]
Cost (% of income per capita)	Japan	0.0	8,100.0[b]
Supply reliability rate transparency index (0-8)	Belgium; Ireland; Malaysia[f]	8	0[b]
Registering property			
Procedures (number)	Georgia; Norway; Portugal; Sweden	1	13[a]
Time (days)	Georgia; New Zealand; Portugal	1	210[b]
Cost (% of property value)	Saudi Arabia	0.0	15.0[b]
Quality of land administration index (0–30)	No economy at frontier (June 1, 2017)	30	0[b]
Getting credit			
Strength of legal rights index (0–12)	Brunei; Colombia; Montenegro; New Zealand	12	0[d]
Depth of credit information index (0–8)	Ecuador; U.K.[g]	8	0[d]
Protecting minority investors			
Extent of disclosure index (0–10)	China; Malaysia[h]	10	0[d]
Extent of director liability index (0–10)	Cambodia	10	0[d]
Ease of shareholder suits index (0-10)	No economy at frontier (June 1, 2017)	10	0[d]
Extent of shareholder rights index (0-10)	India; Kazakhstan	10	0[d]
Extent of ownership and control index (0-10)	No economy at frontier (June 1, 2017)	10	0[d]
Extent of corporate transparency index (0-10)	France; Norway; Taiwan, China	10	0[d]
Paying taxes			
Payments (number per year)	Hong Kong; Saudi Arabia	3	63[b]
Time (hours per year)	Singapore	49[i]	696[b]
Total tax and contribution rate (% of profit)	Canada; Singapore[j]	26.1[k]	84.0[b]
Postfiling index (0-100)	None with CIT VAT at frontier (June 1, 2017)	100	0
Time to comply with VAT refund (hours)	Croatia; Netherlands[l]	0	50[b]
Time to obtain VAT refund (weeks)	Austria; Bahamas; Estonia	3.2	55[b]
Time to comply with corp. income tax audit (hr.s)	Lithuania; Portugal[m]	1.5	56[b]

Time to complete corp. income tax audit (weeks)	Sweden; USA[n]	0	32[b]
Trading across borders			
Time to export			
Documentary compliance (hours)	Canada; Poland; Spain[o]	1[p]	170[b]
Border compliance (hours)	Austria; Belgium; Denmark[q]	1[p]	160[b]
Cost to export			
Documentary compliance (US$)	Hungary; Luxembourg; Norway[r]	0	400[b]
Border compliance (US$)	France; Netherlands; Portugal[s]	0	1,060[b]
Time to import			[b]
Documentary compliance (hours)	S. Korea; Latvia; New Zealand[t]	1[p]	240[b]
Border compliance (hours)	Estonia; France; Germany[u]	1[p]	280[b]
Cost to import			
Documentary compliance (US$)	Iceland; Latvia; U.K.[v]	0	700[b]
Border compliance (US$)	Belgium; Denmark; Estonia[w]	0	1,200[b]
Enforcing contracts			
Time (days)	Singapore	120	1,340[b]
Cost (% of claim)	Bhutan	0.1	89.0[b]
Quality of judicial processes index (0–18)	No economy at frontier (June 1, 2017)	18	0[d]
Resolving insolvency			
Recovery rate (cents on the dollar)	Norway	92.9	0[d]
Strength of insolvency framework index (0–16)	No economy at frontier (June 1, 2017)	16	0[d]

Source: Table 9.1 in *Doing Business 2018: Reforming to Create Jobs*. The World Bank. Washington, DC.

a. Worst performance is defined as the 99th percentile among all economies in the Doing Business sample.

b. Worst performance is defined as the 95th percentile among all economies in the Doing Business sample.

c. Another 112 economies also have a paid-in minimum capital requirement of 0.

d. Worst performance is the worst value recorded.

e. In 17 other economies it also takes no more than 3 procedures to get an electricity connection.

f. Another 25 economies also have a score of 8 on the reliability of supply and transparency of tariffs index.

g. Another 32 economies also have a score of 8 on the depth of credit information index.

h. Another 10 economies also have a score of 10 on the extent of disclosure index.

i. Defined as the lowest time recorded among all economies in the Doing Business sample that levy the three major taxes: profit tax, labor taxes and mandatory contributions, and VAT or sales tax.

j. Another 30 economies also have a total tax and contribution rate equal to or lower than 26.1% of profit.

k. Defined as the highest total tax and contribution rate among the 15% of economies with the lowest total tax and contribution rate in the Doing Business sample for all years included in the analysis up to and including Doing Business 2015.

l. Another 8 economies also have a compliance time for VAT refund of 0 hours.

m. Another 10 economies also have a compliance time for corporate income tax audit of no more than 1.5 hours.

n. Another 92 economies also have a completion time for corporate income tax audit of 0 weeks.

o. Another 22 economies also have a documentary compliance time to export of no more than 1 hour.

p. Defined as 1 hour even though in many economies the time is less than that.

q. Another 15 economies also have a border compliance time to export of no more than 1 hour.

r. Another 16 economies also have a documentary compliance cost to export of 0.0.

s. Another 16 economies also have a border compliance cost to export of 0.0.

t. Another 26 economies also have a documentary compliance time to import of no more than 1 hour.

u. Another 22 economies also have a border compliance time to import of no more than 1 hour.

v. Another 27 economies also have a documentary compliance cost to import of 0.0.

w. Another 24 economies also have a border compliance cost to import of 0.0.

Table 4.6 Variability in Published v. Stable Versions of the Ease of Doing Business Indicators

Standard deviations of the published and alternative stable versions of the composite Ease of Doing Business indicator and of each individual Ease of Doing Business indicator are compared. The upper panel uses Distance to Frontier scores; the lower panel uses rankings. Published rankings for prior years are no longer available as part of the Doing Business historical dataset, so equivalents to published rankings are inferred from published Distance to Frontier scores in the historical dataset. Stable versions whose variances are significantly different (F-test to reject the null hypothesis of equal variances has a p-value of 5% or less) from that of the published version are in bold. The Trading Across Borders indicator is omitted because its methodology modifications are too extensive to allow stable versions to be constructed.

	World Bank's Published Version	**Romer's Stable Version**	**Romer's version with WB Endpoints**	**World Bank's Stable Version**
Distance to Frontier scores (DTFs)				
Ease of Doing Business	12.1	**8.9**	**11.1**	11.7
Starting a Business	13.5	**8.0**	13.5	13.5
Dealing with Construction Permits	12.9	**7.9**	**14.0**	**14.0**
Getting Electricity	18.0	**9.6**	**16.1**	**16.1**
Registering Property	15.8	**9.8**	15.4	15.4
Getting Credit	22.5	**24.1**	22.4	22.3
Protecting Minority Investors	14.2	15.0	13.7	**15.3**
Paying Taxes	17.0	**10.1**	17.0	17.0
Enforcing Contracts	13.2	**11.1**	**15.2**	**15.2**
Resolving Insolvency	24.4	24.2	23.5	**27.3**
Rankings				
Ease of Doing Business	53.4	52.5	53.5	53.4
Starting a Business	54.2	52.7	54.7	54.3
Dealing with Construction Permits	53.4	52.8	53.5	53.1
Getting Electricity	54.4	52.6	54.6	54.4
Registering Property	53.3	52.8	53.7	53.3
Getting Credit	53.1	51.8	53.5	52.6
Protecting Minority Investors	53.5	52.4	53.9	53.7
Paying Taxes	55.3	52.9	55.6	55.1
Enforcing Contracts	55.0	52.6	55.0	54.8
Resolving Insolvency	52.0	51.0	52.0	51.8

Table 4.7 Variability of Differences between Published and Stable Versions

A higher standard deviation indicates greater variability in the differences between the published and stable versions of the Ease of Doing Business indicators. The upper panel compares the standard deviations of the differences between published and stable versions in terms of Distance to Frontier scores; the lower panel presents the same comparison in terms of rankings. Published rankings for prior years are no longer available as part of the Doing Business historical dataset, so equivalents to published rankings are inferred from published Distance to Frontier scores in the historical dataset. Cases where Chile's variability differs significantly from that of all other economies (F-test to reject the null hypothesis of equal variances has a p-value of 5% or less) are in bold. The Trading Across Borders indicator is omitted because its methodology modifications are too extensive to allow stable versions to be constructed.

	Published versus Romer-style stable version		**Published versus Romer-style stable version with World Bank DTF endpoints**		**Published versus World Bank's stable version**	
	Chile	**Rest of World**	**Chile**	**Rest of World**	**Chile**	**Rest of World**
Distance to Frontier scores (DTFs)						
Ease of Doing Business	**1.3**	4.3	1.2	2.8	1.1	2.4
Starting a Business	**0.0**	6.7	**0.0**	0.3	**0.0**	0.3
Dealing with Construction Permits	**1.3**	7.3	**1.2**	4.4	**1.1**	4.4
Getting Electricity	**2.3**	10.9	**2.3**	7.3	**2.3**	7.3
Registering Property	4.3	7.7	4.3	4.6	4.3	4.6
Getting Credit	8.4	7.3	8.4	5.7	8.4	6.3
Protecting Minority Investors	3.0	3.9	3.0	3.7	4.5	7.0
Paying Taxes	4.0	9.1	3.4	4.2	3.3	4.2
Enforcing Contracts	**0.6**	6.4	**0.6**	6.8	**0.6**	6.8
Resolving Insolvency	6.8	5.8	6.9	5.6	8.3	11.0
Rankings						
Ease of Doing Business	8.8	14.3	8.2	11.3	7.5	9.9
Starting a Business	**1.9**	14.8	**0.5**	2.4	**0.5**	2.3
Dealing with Construction Permits	12.1	28.0	12.3	20.5	12.0	20.4
Getting Electricity	**6.5**	28.5	**6.5**	22.6	**6.5**	22.5
Registering Property	7.5	18.8	8.6	14.3	8.6	14.2
Getting Credit	8.2	10.7	8.0	7.6	8.5	10.4
Protecting Minority Investors	12.0	14.5	11.2	13.9	13.8	27.5
Paying Taxes	16.2	26.2	13.2	15.5	13.0	15.5
Enforcing Contracts	**1.0**	27.9	**2.1**	28.0	**2.1**	28.0
Resolving Insolvency	16.9	13.1	16.5	12.7	17.3	24.7

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Appendix A. Supplementary Information on Variable Construction

Table A1 Subcomponents of ESG Ratings

ESG Subcomponent	Description
Panel A: Environmental Score	
Resource Reduction	Measures a company's management commitment and effectiveness toward achieving an efficient use of natural resources in the production process and reflects the capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.
Emission Reduction	Measures a company's management commitment and effectiveness toward reducing environmental emission in the production and operational processes. It reflects a company's capacity to reduce air emissions (greenhouse gases, F-gases, ozone-depleting substances, NOx and SOx, etc.), waste, hazardous waste, water discharges, spills or its impacts on biodiversity and to partner with environmental organizations to reduce the environmental impact of the company in the local or broader community.
Product Innovation	Measures a company's management commitment and effectiveness toward supporting the research and development of eco-efficient products or services. It reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability.
Panel B: Social Score	
Employment Quality	Measures a company's management commitment and effectiveness toward providing high-quality employment benefits and job conditions. It reflects a company's capacity to increase its workforce loyalty and productivity by distributing rewarding and fair employment benefits, and by focusing on long-term employment growth and stability by promoting from within, avoiding lay-offs and maintaining relations with trade unions.
Health and Safety	Measures a company's management commitment and effectiveness toward providing a healthy and safe workplace. It reflects a company's capacity to increase its workforce loyalty and productivity by integrating into its day-to-day operations a concern for the physical and mental health, well-being and stress level of all employees.
Training and Development	Measures a company's management commitment and effectiveness toward providing training and development (education) for its workforce. It reflects a company's capacity to increase its intellectual capital, workforce loyalty and productivity by developing the workforce's skills, competences, employability and careers in an entrepreneurial environment.
Diversity and Opportunity	Measures a company's management commitment and effectiveness toward maintaining diversity and equal opportunities in its workforce. It reflects a company's capacity to increase its workforce loyalty and productivity by promoting an effective life-work balance, a family friendly environment and equal opportunities regardless of gender, age, ethnicity, religion or sexual orientation.

Table A1 continued.

Human Rights	Measures a company's management commitment and effectiveness toward respecting the fundamental human rights conventions. It reflects a company's capacity to maintain its license to operate by guaranteeing the freedom of association and excluding child, forced or compulsory labor.
Community	Measures a company's management commitment and effectiveness toward maintaining the company's reputation within the general community (local, national and global). It reflects a company's capacity to maintain its license to operate by being a good citizen (donations of cash, goods or staff time, etc.), protecting public health (avoidance of industrial accidents, etc.) and respecting business ethics (avoiding bribery and corruption, etc.).
Customer/Product Responsibility	Measures a company's management commitment and effectiveness toward creating value-added products and services upholding the customer's security. It reflects a company's capacity to maintain its license to operate by producing quality goods and services integrating the customer's health and safety, and preserving its integrity and privacy also through accurate product information.
Panel C: Corporate Governance Score	
Board Structure	Measures a company's management commitment and effectiveness toward following best practice corporate governance principles related to a well-balanced membership of the board. It reflects a company's capacity to ensure a critical exchange of ideas and an independent decision-making process through an experienced, diverse and independent board.
Compensation Policy	Measures a company's management commitment and effectiveness toward following best practice corporate governance principles related to competitive and proportionate management compensation. It reflects a company's capacity to attract and retain executives and board members with the necessary skills by linking their compensation to individual or company-wide financial or extra-financial targets.
Board Functions	Measures a company's management commitment and effectiveness toward following best practice corporate governance principles related to board activities and functions. It reflects a company's capacity to have an effective board by setting up the essential board committees with allocated tasks and responsibilities.
Shareholder Rights	Measures a company's management commitment and effectiveness toward following best practice corporate governance principles related to a shareholder policy and equal treatment of shareholders. It reflects a company's capacity to be attractive to minority shareholders by ensuring equal rights and privileges and by limiting the use of anti-takeover devices.
Vision and Strategy	Measures a company's management commitment and effectiveness toward the creation of an overarching vision and strategy integrating financial and extra-financial aspects. It reflects a company's capacity to convincingly show and communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes.

Table A2 Variable Definitions and Data Sources

Variable	Definition	Source
Panel A: Firm-level		
ESG Ratings		
Environmental Score	Rank-based score that gauges a firm's environmental performance relative to all other firms in a given year; the higher the better	ASSET4 ESG
Social Score	Rank-based score that gauges a firm's social performance relative to all other firms in a given year; the higher the better	ASSET4 ESG
Governance Score	Rank-based score that gauges a firm's corporate governance performance relative to all other firms in a given year; the higher the better	ASSET4 ESG
Firm Characteristics		
Tobin's Q	Market value of equity, plus total assets minus book value of equity, scaled by total assets	Datastream, Worldscope
Investment	Capital expenditure scaled by total assets	Worldscope
Cash Flow	Net income before extraordinary items, minus dividends plus depreciation and amortization, scaled by total assets	Worldscope
Dividends	Cash dividends scaled by total assets	Worldscope
Firm Size	Natural logarithm of total assets in constant 2010 US dollars	Worldscope
Cash Holdings	Cash and short-term investments scaled by total assets	Worldscope
Leverage	Current portion of long-term debt plus long-term debt, scaled by total assets	Worldscope
EBIT	Earnings before interest and tax scaled by total assets	Worldscope
Tangibility	Property, plant, and equipment scaled by total assets	Worldscope
R&D	Research and development expense scaled by total assets	Worldscope
Sales Growth	Geometric average growth rate of net sales over the past two years	Worldscope
Panel B: Country-level		
Culture		
IDV Index	Measures the level of individualism in a nation's culture	Hofstede (2001)
UAI Index	Measures the level of uncertainty avoidance in a nation's culture	Hofstede (2001)
Embeddedness	Assesses the emphasis on collectivistic behavior in a nation's culture	Schwartz (2012)
Harmony	Assesses the emphasis on social harmony in a nation's culture	Schwartz (2012)
E&S Awareness	Gauges the perceived importance and value of social and environmental issues in a country	World Value Survey (WVS)
Trust	Gauges the subjective trustworthiness of strangers in a country	WVS
Perceived Fairness	Gauges the perceived level of social justice in a country	WVS
Country Characteristics		
GDP Per Capita	Natural logarithm of GDP per capita in constant 2010 US dollars	The World Bank
Human Capital Index	Assesses the level of education, standardized test performance, and health of a country's population	The World Bank
Common Law	Equals one for countries whose legal origin is common law; zero otherwise	La Porta et al. (2008)
Rule of Law	Perceptions of the extent to which agents have confidence in and abide by the rules of society, in particular the quality of property rights and law enforcement	Kaufmann et al. (2011)
Control of Corruption	Perceptions of the extent to which public power is exercised for private gain, as well as "capture" of the state by elites and private interests	Kaufmann et al. (2011)
Regulatory Quality	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	Kaufmann et al. (2011)

Appendix B. Derivation of Test Statistics

In Chapter 3, 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 chapter, 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 3.1 about here]

Figure 3.1 shows an event timeline. Table B1 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 B1 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:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \tag{B.1}$$

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 (B.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:

$$AR_{it} \triangleq R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \tag{B.2}$$

where t is now in the event period τ_1 to τ_2 as in Figure 3.1. 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:

$$CAR_i \triangleq \sum_{t=\tau_1}^{\tau_2} AR_{it}. \tag{B.3}$$

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:

$$SAR_{it} \triangleq \frac{AR_{it}}{s_i \sqrt{C_{it}}} \sim t(T-K). \tag{B.4}$$

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 (B.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 (B.1),

which is given by:

$$s_i^2 = \frac{1}{T-K}\sum_{t=1}^{T}\hat{\epsilon}_{it}^2 \tag{B.5}$$

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:

$$\overline{SAR}_t = \frac{\sum_i \sum_j \sum_k SAR_{ijk,t}}{\sum_j \sum_k n_{jk}} \tag{B.6}$$

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 (B.6) as:

$$\overline{SAR}_t = \frac{\sum_{i=1}^{n_{11}} SAR_{i11,t} + \sum_{i=1}^{n_{12}} SAR_{i12,t} + \cdots + \sum_{i=1}^{n_{qN}} SAR_{iqN,t}}{n_{11} + n_{12} + \cdots + n_{qN}}. \tag{B.7}$$

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 (B.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:

$$E[\overline{SAR}_t] = 0 \tag{B.8}$$

and

$$Var(\overline{SAR}_t) = \frac{1}{n^2} \sum_{j=1}^{q} \sum_{k=1}^{N} n_{jk} \sigma_{jk}^2 (1 + (n_{jk} - 1)\bar{\rho}_{jk}) \tag{B.9}$$

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:

$$t_{AR} = \frac{\sum_i \sum_j \sum_k SAR_{ijk,t}}{\sqrt{\frac{T-K}{T-K-2}} \cdot \sqrt{\sum_j \sum_k n_{jk}(1 + (n_{jk} - 1)\bar{r}_{jk})}} \tag{B.10}$$

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:

$$CAR_i \triangleq \sum_{t=\tau_1}^{\tau_2} AR_{it}. \tag{B.11}$$

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:

$$CSAR_i \triangleq \frac{1}{\sqrt{\tau_2 - \tau_1 + 1}} \sum_{t=\tau_1}^{\tau_2} SAR_{it} \sim t(T - K). \tag{B.12}$$

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:

$$t_{CAR} = \frac{\sum_i \sum_j \sum_k CSAR_{ijk}}{\sqrt{\frac{T-K}{T-K-2}} \cdot \sqrt{\sum_j \sum_k n_{jk}(1 + (n_{jk} - 1)\bar{r}_{jk})}}. \tag{B.13}$$

Table B1 Notations Used in the Derivation 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 B.

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 (B.1)
T	Length of the estimation period
K	Number of explanatory variables in the index model (B.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