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Government owned firms' emphasis on ESG

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Abstract

We investigate 489 firms' emphasis on ESG during the period from 2009 to 2018. We expand existing research by investigating the impact of government ownership on a firm's ESG scores. We find that government ownership causes ESG scores to be significantly higher in the year 2009 in comparison to firms that do not have government ownership. However, this significant difference between ESG scores of government owned firms and non-government owned firms is reduced by the year 2018 as a result of convergence of their scores. Furthermore, we find evidence that for a given government owned firm, an increase in ESG score causes a positive movement in financial performance (Tobin's Q). We also establish evidence of bidirectional causality between ESG and Tobin's Q. Lastly, we document that should both government owned and non-government owned firms be exposed to a single industry-specific factor, the upward trend in ESG score is similar for both groups. Our results collectively indicate that government owned firms are ahead of their non-government counterparts in their ESG focus.

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Contents

1 Introduction

Extensive study and research demonstrate a link between corporate responsibility and financial performance. Right from the early stages of adopting Socially Responsible Investing (SRI) and up until recently with the introduction of Environmental, Social, and Governance (ESG), firms and investors have been increasing their focus on "doing good" and believe that it pays to do good. Due to this, ESG is gaining traction around the world and is being incorporated more frequently in the investment process. Governments, with their policies aimed at improving overall sustainability, have a primary responsibility to influence all firms by engaging themselves in ESG. Hence, can we infer that governments choose to invest in responsible firms? In our thesis, we investigate if government owned firms have a higher emphasis on ESG. Previous academicians have stated about Corporate Social Responsibility (CSR) issues being prioritized in governmental agendas (Albareda, Lozano, & Ysa, 2007). We attempt to make a unique contribution to existing literature by examining and testing if government owned firms have higher ESG focus than non-government owned firms. We define government owned firms as those firms which have a government agency(s) as a minority or a majority owner. We employ ESG scores running from 2009 to 2018, published by Thomson Reuters ESG Research Data, as a proxy to measure the emphasis on ESG.

Previous studies have shown that corporate social accountability is likely to be an increasingly important element of the Western European psyche in the years to follow, evidenced not only by corporate, professional and academic developments, but also by the increasing legislative developments of the European Union (EU) and European Economic Area (EEA) requiring greater corporate social responsibility and accountability (Adams, Hill, & Roberts, 1998). For this reason, we choose to focus our research within Europe. The aim of our thesis is to examine the effect of government ownership on a European firm's ESG score and explore the moving 10-year trend of these scores. More precisely, we analyse how different the ESG scores are for government owned firms in comparison to non-government owned firms in 18 European countries. Furthermore, we incorporate panel models to examine the relationship between ESG and financial performance of government owned firms. While there are academic papers that discuss the integration of ESG

in investment and its impact on financial performance, to our knowledge, there is no concrete study in academic literature that investigates a relation between government ownership and ESG and we believe that our thesis is a valuable contribution to the research field.

Using theory and literature review to frame our study and ESG data on 489 European firms over the years 2009 to 2018, we investigate the following testable hypotheses:

H1: Government owned firms have higher ESG scores than comparable non-government owned firms.

H2: A change in ESG leads to a corresponding change in financial performance.

H3: ESG Granger-causes financial performance: prior values of ESG predict current and future values of financial performance and vice versa.

H4: Difference in trend in ESG scores for government owned firms and non-government owned firms was not significant over the sample period.

We perform a propensity score matching (PSM) technique, based on specified characteristics, to make a fair comparison between two groups: government owned firms and non-government owned firms. Our main finding is that among firms with similar age, earnings and revenue opportunities, government ownership causes ESG scores to be higher. This suggests that firms, in which the government is an investor, have embraced the primarily responsibility of acting towards improving environmental, social and governance ends. Through PSM, we also find that government owned firms display inferior financial performance (Tobin's Q) in comparison and that governments choose to invest in larger-sized firms. Thereafter, through paired t-tests for years 2009 and 2018, we find that ESG scores have been increasing for both groups and that both groups have been growing to be similar in terms of ESG, size and performance over the span of ten years. We make an additional observation that while government owned firms are faster in adopting ESG, non-government owned firms have been catching up to them.

While the PSM technique addresses the cross-sectional variability in our data, we perform panel regressions to address the firm-specific heterogeneity. Through panel regressions, we find that for a given firm with government ownership, when there is an increase in ESG, there is also a subsequent positive movement in financial performance (Tobin's Q). Furthermore, by incorporating a dummy variable to account for changes in ownership from one year to another, we

find that a change in ownership does not lead to a change in ESG. This could mean that once a government invests in a certain firm, the firm maintains the same focus on ESG regardless of the government divesting at a later point. By incorporating another dummy variable to account for majority government ownership, we find that when the government holds a majority stake in a given firm, it causes a positive movement in ESG for all firms, with the exception of certain "special" firms. These special firms display a negative movement in ESG, when associated with majority government ownership. These firms belong to the Banking and Utilities industries; such industries have the ability to worsen a firm's ESG score.

Several previous literatures did not address the endogeneity issue arising from the simultaneous relationship between ESG and financial performance. By including time lags in our analysis, we conduct an additional robustness test through granger causality, where we find that prior values of ESG predict current and future values of financial performance and so do prior values of financial performance predict current and future values of ESG.

Finally, through Difference-in-Difference tests, we find that the effect of an increasing trend in ESG score is constant for government owned firms and non-government owned firms. By performing analysis within six industries, we derive similar increasing trends in ESG scores for both groups over a span of ten years. This, in combination with previous results, helps us infer that should both groups of firms be exposed to the same industry-specific factor, government owned firms will indeed be ahead of non-government owned firms in their focus towards ESG.

As mentioned in (Hebb, Hawley, Hoepner, Neher, & Wood, 2015), since the early 2000s, an increasing number of Government-Sponsored Investment Funds (GSIFs), have taken an active ownership approach by engaging in environmental and social issues. Governments across the world are paying more attention to such issues and the collaboration between governments and investment funds could drive firms to augment corporate policies with ESG factors. Our results, holistically, are expected to broaden the reader's understanding of how European governments emphasize ESG by being quicker in implementing ESG practices. Our paper will also help stakeholders, investors, decision makers, regulators, and scholars to improve their knowledge about ESG with respect to two main aspects: 1) association of ESG scores with ownership and 2) ESG's ability to impact current and future firm performance and vice versa.

2 Defining ESG

The introduction of ESG integration, as a value driver in asset management and financial research, was first mentioned in the U.N. Global Compact's Publication of "Who Cares Wins" in the year 2004 (Compact, 2004). The report suggested that companies that perform better with regard to ESG issues can increase shareholder value by properly managing risks, anticipating regulatory action or accessing new markets, while contributing to the sustainable development of the societies in which they operate. Moreover, these issues can have a strong impact on reputation and brands which is an integral part of company value.

There are several ESG strategies used currently by portfolio managers while constructing a diversified portfolio – negative screening, positive screening, best-in-class investing and shareholder activism and Board's engagement towards undertaking ESG enhancing projects (Van Duuren, Plantinga, & Scholtens, 2016).

The terms Corporate Social Performance (CSP) and Corporate Social Responsibility (CSR) are often used interchangeably in empirical studies. SRI and ESG fall under the umbrella of CSR. We define the three dimensions of ESG in accordance with (Yoon, Lee, & Byun, 2018):

- "E" for environmental performance which indicates a firm's effort to reduce resource consumption and emissions.
- "S" for social performance which indicates a firm respecting human rights, the quality of employment, the responsibility of the product, and community relations.
- "G" for corporate governance performance which indicates the rights and responsibilities of the management of a firm (governance structure).

3 Theory & Literature Review

Our paper refers to the extensive strand of literature studying stakeholder theory, cost of being sustainable and its benefits on financial performance, role of governments and reputational aspects of ESG engagement. ESG is a novel concept, and our thesis contributes to ESG-associated literature in two main aspects. First, previous studies have focused on the importance of engaging in CSR/ESG for all firms in general. Our thesis provides a supplement to them as we analyse the amplitude of ESG engagement specifically for government-owned firms in comparison to other firms. Second, a multitude of previous literature has focused on the relationship between ESG and accounting and/or financial performance of a firm. While most do find a significant relationship, they fail to critically examine the reverse causality hypothesis. In contrast, we analyse this reverse-causal relationship by introducing time lags in our sample period of ten years. This way, we address the issue of endogeneity.

3.1 Stakeholder Theory

Stakeholder theory suggests that as firms engage in social responsibility, they influence and gather stakeholders' trust which eventually improves their ability to transform social investment into profitability. As mentioned in (Peiris & Evans, 2010), stakeholder theory posits that in order to be successful, not only are companies responsible to shareholders (shareholder theory), but they also rely on management of a variety of stakeholders in the social and financial performance of a firm. Successful management of critical stakeholders like owners, employees, management, customers, suppliers, communities, government agencies and the environment is an indication of the quality of a company's corporate social performance, and hence it is positive for financial performance (Peiris & Evans, 2010). A good relationship with stakeholders will positively affect financial performance in the long term (Lin, Chang, & Dang, 2015). We can find evidence of the same in (Ding, Levine, Lin, & Xie, 2020) where the authors found stronger CSR firms to be performing better through the COVID-19 pandemic because CSR built trust with stakeholders, which made workers, suppliers, and customers more

acquiescent to making adjustments to support the business in times of distress. These findings direct us to believe that maintaining a positive relationship with stakeholders controls and reduces costs in the long run.

3.2 Cost of being sustainable

Theory also suggests that it costs to be good (Fabozzi, Ma, & Oliphant, 2008). Several studies show that the amount spent on CSR activities may not be covered by the benefits generated from CSR. There is a positive economic cost to uphold and execute environmental, social and governance values – firstly, corporate expenses to maintain conformity with social standards and secondly, cost of underperformance which results from investors' values constraining their investable universe (Fabozzi et al., 2008). While some scholars argue that good social performance promotes firm value by lowering costs and idiosyncratic risk, others consider CSR initiatives as a waste of resources and a tool used by managers to extract private benefits from shareholders (Aouadi & Marsat, 2018). (Bénabou & Tirole, 2010) showcased two sides of the CSR coin. They claimed that while CSR policies help the firm in the long run by avoiding myopic decisions and strengthening their market position, CSR can also simply be a tool for corporate executives to enhance their own philanthropic abilities. While increasing the value of the firm, the noble CSR can also provide managers the opportunity to expropriate firm's value by capturing private rents at the shareholders' cost. (Lin et al., 2015) also claimed that CSR activities can disperse a company's objective from profit maximization, and thus negatively affect firm financial performance.

Overall, we believe that being responsible brings more benefits than costs in the long run, considering the empirical evidences mentioned in the next section. According to (Yoon et al., 2018), other benefits of CSR activities include enhancement in operating efficiency, improvement in corporate reputation, employee productivity, capital market benefits, risk management, assurance of better operating performance, expansion of the product market, and reinforcement of a firm's association with its society and stakeholders.

3.3 ESG & Firm Performance

On the rise of the COVID-19 pandemic, investments graced with ESG credentials have experienced superior performance than the rest of the stock market (Crabb, 2020). Previous studies of sustainability actions also reveal that CSR or ESG is positively associated with corporate performance, and therefore is in line with stakeholder theory. We examined several literature reviews and empirical studies that analysed the correlation between ESG and two different financial performance measures: accounting financial performance (through ROA – profitability measurement) and market financial performance (through Tobin's Q ratio). (Barber, Morse, & Yasuda, 2019) argued that investor engagement with the management of publicly traded firms on a collection of ESG issues is associated with positive abnormal returns. While (Servaes & Tamayo, 2013) claim that there is no direct link between CSR and firm value as measured by Tobin's Q, the findings in (Eccles, Ioannou, & Serafeim, 2014) show that highly sustainable companies significantly outperform their counterparts over the long term, both in terms of stock market and accounting performance. (Harjoto, Laksmana, & Lee, 2015) find firms to have better operating performance when having stronger environmental and governance polices in place. Even though (Velte, 2017) found no significant ESG impact on Tobin's Q, the author concluded a positive relationship between accounting performance and ESG. (Lo & Sheu, 2007) also stated a significantly positive relation between corporate sustainability and its market value and concluded to support that being sustainable causes a firm to increase its value. In (Dahlberg & Wiklund, 2018), while a significant positive relationship between ESG ratings and market performance was found, no significant positive or negative relationship was found between ESG ratings and accounting performance. A meta-study performed by (Clark, Feiner, & Viehs, 2015) showed that companies with robust sustainability practices demonstrated better operational performance which ultimately translates into cashflows. (Barnett & Salomon, 2012) also tested for the effects of corporate social performance on corporate financial performance and they discovered that firms with the highest CSP generally have the highest Corporate Financial Performance (CFP). According to (Dixon-Fowler, Slater, Johnson, Ellstrand, & Romi, 2013) as well, a positive

relationship does exist between Corporate Environmental Performance (CEP) and CFP.

(Malik, 2015) stated that while in one perspective, CSR activities increased firm cost making it an economic disadvantage, in another perspective, CSR brought potential benefits which are larger than these costs. Difficulty in testing the relation between ESG and firm performance is noted by several previous academicians.

3.4 Role of Governments

In EU countries, it is clearly noted that different governmental authorities are moving since years ago to establish and implement sustainability reporting in order to strengthen the relationship with societies and business communities and to move towards sustainability (Buallay, 2019). Strong policies set in place by the United Nations Principles of Responsible Investment (UNPRI) and EU standards provide economic reason for the intervention of government investors in enhancing a country's holistic view on sustainability. We believe that private investors on the contrary, have meagre incentives to engage in ESG since they primarily focus on maximising profit. Governments have initiated CSR agendas in emerging markets as well, like China, India, Brazil and South Africa, requiring firms to adopt the codes of CSR (Yoon et al., 2018). There is extensive literature that has discussed the role of governments in enabling firms to operate responsibly. National governments and regulators focus on the ESG disclosure in their public function of balancing private companies' and public interests. (Baldini, Dal Maso, Liberatore, Mazzi, & Terzani, 2018). The authors also claim that new reporting policies on ESG disclosures are being developed which are backed by government initiatives. One such example is (Lanis & Richardson, 2012) presenting evidence that higher the level of CSR disclosure of a corporation, the lower is the level of corporate tax aggressiveness. (Lopez & Palacios, 2010) claimed that the tax policies, that most European countries have followed over the last decades, have greatly contributed to reduce pollution.

Having said that, including the government as an active owner in a firm may create a plethora of internal governance issues. Non-government investors may focus only on maximising firm value. Whereas, government investors have to be

attentive to the overall stability of the financial system and hence, they may own firms for reasons other than maximising wealth (Borisova, Brockman, Salas, & Zagorchev, 2012). This conflicting purpose of investment among the two groups of investors thus gives rise to conflicts of interests. Further, governments also have the advantage of demanding information about a firm through regulatory or legal means. They can also easily secure debt-finance for government-controlled firms, and the ease with which such firms secure financing could discourage monitoring, allowing agency problems to develop. (Borisova et al., 2012).

In general, it is the government that creates laws and policies for the orderly functioning of financial markets; governments, through their policies and regulations, can influence a firm's externalities on the environment and the society. For these reasons, we believe that government owned firms could be under scrutiny and be expected to fare well on the ESG front.

3.5 Reputation

(Drempetic, Klein, & Zwergel, 2019) claim that the distribution of CSR information is a strategic investment to promote the reputation of the company. Reputation is a crucial intangible asset, especially for government stakeholders (Thomä, Henning, & Schmid, 2014). Considering the increasing global focus on ESG, we believe that the firms, which the national governments have a minority/majority stake in, need to maintain a reputation of being sustainable.

Furthermore, (Pfau, Haigh, Sims, & Wigley, 2008) claim that CSR campaign is a useful tool to influence stakeholders, and such campaigns help in building both reputation and credibility for a firm. We note that advertising the profound environmental and social benefits of a firm's products or services could attract investor confidence as well as customer attention. Moreover, literature shows that firms with superior quality CSR performance not only receive favourable coverage from the media, but also receive favourable treatment from regulators, which help build a corporate brand and improve the firm's reputation (Malik, 2015).

(Barber et al., 2019) find that investors facing political and/or regulatory pressure (e.g., public pensions, banks and insurance companies, Europeans and

UNPRI signatories have a higher willingness to invest in impact funds focusing on environment, poverty, minority issues, etc. These parties benefit from political or local goodwill and hence exhibit a higher willingness to pay for impact. For these reasons, we believe that European government owned firms could take a relatively higher stance on ESG.

4 Hypotheses

In our thesis, we will test the following 4 main hypotheses:

Testing the relation between ownership & ESG scores:

H1: Government owned firms have higher ESG scores than comparable non-government owned firms.

To test if government owned firms have higher ESG scores, we shall implement propensity score matching (PSM) on Stata. This technique creates a homogenous subclass of firms in our sample based on similar firm characteristics such as Ownership, Size, Age and Performance (proxied by Tobin's Q). This way, we create two groups of firms: the original group consisting of government owned firms and the matched group consisting of similar non-government owned firms. These groups are similar in observable characteristics but show differences in ESG scoring. This lets us make a fair comparison.

After PSM, we shall run a paired t-test to compare the means from 2009 and 2018 of the original group and the matched group. This is done to observe whether there is a growing similarity between government owned firms and non-government owned firms, in terms of ESG, performance and size.

Through these tests, we expect to derive that ESG engagement is increasing over time for both government, and non-government owned firms. We especially expect to prove that ESG scores for government owned firms are higher than comparable non-government owned firms, and that having the government as an owner can influence a firm's externalities on the environment and the society.

Testing the relation between ESG and financial performance:

H2: A change in ESG leads to a corresponding change in financial performance.

As discussed in literature review, highly sustainable companies that give importance to CSR/ESG are able to significantly outperform their counterparts, in terms of financial performance. Applying a linear panel regression ordinary least square (OLS) approach will help us to test the above hypothesis and detect whether a change in ESG brings in a positive change in financial performance (proxied by Tobin's Q). By using this testing methodology, we address the unobserved firm-specific heterogeneity in the ten-year lateral structure of our data. Through the test,

we expect to derive a subsequent positive movement in financial performance as a consequence of a positive change in ESG for government owned firms.

Testing for reverse causality between ESG and financial performance:

H3: ESG Granger-causes financial performance: prior values of ESG predict current and future values of financial performance and vice versa.

We wish to explore the reverse relationship between ESG and financial performance (*H2)*, i.e., does an increase in financial performance result in an increase in ESG?

In other words, if firms are generating more profits, does that mean that they are investing more in ESG? The existence of this bidirectional relationship between ESG and financial performance (proxied by Tobin's Q) shall be analysed by executing a granger causality test. By introducing time lags, we shall also test the impulse response to shocks in ESG and Tobin's Q using vector autoregression (VAR). Through the tests, we expect to confirm the existence of reverse causality.

Testing for difference in trend in ESG scores:

H4: Difference in trend in ESG scores for government owned firms and non-government owned firms was not significant over the sample period.

To make a fair inference of *H1*, it is important to eliminate the possibility of a unique distinguishing factor that may enhance a government owned firm's ESG score. We, therefore, test the above hypothesis and wish to achieve a constant trend for both groups: government owned firms and non-government owned firms. In order to do this, we shall execute a Difference-in-Difference (DiD) linear regression. This will allow us to observe stability in the difference between ESG scores of government owned firms and non-government owned firms over time. For additional robustness, we shall execute DiD with PSM to address both observable and unobservable differences between the two groups.

Lastly, we employ a more specific industry detailed analysis by using the same DiD methodology but with additional industry explanatory variables. We expect to find a similarity in the increasing pattern of ESG scores for both government owned firms and non-government owned firms within a particular industry.

5 Data

5.1 Geography

Our sample of 489 firms consists of 75 government owned firms and 414 non-government owned firms. These firms represent 18 European countries: Belgium, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, and United Kingdom. (Van Duuren et al., 2016) claim that the idea that SRI is close to fundamental investing is more prevalent in Europe and the U.K than in the U.S. Additionally, (Marimon, del Mar Alonso-Almeida, del Pilar Rodríguez, & Alejandro, 2012) stated that Europe and Asia have the first and second highest number of companies that disclose sustainability reports according to the Global Reporting Initiative (GRI) standards. Further, (Grossman & Krueger, 1995) suggest that activity in environmental regulation decreases dramatically for countries with per capita levels below $8,000.00. According to the International Monetary Fund data (IMF, 2019), countries in our sample have an income per capita above this threshold.

By choosing to focus on European countries, we underline the European Commission's action plan on financing sustainable growth. This is a crucial reason why European countries emphasize more on ESG investments. We believe that the magnitude of the current European trend in ESG investment is significant, considering €180 billion of additional investments a year are needed to achieve the EU's 2030 targets, including a 40% cut in greenhouse gas emissions (PressRelease, 2018). The main action goals under the plan (EuropeanCommission, 2018) are:

1. Establishing an EU classification system for sustainable activities;
2. Creating standards and labels for green financial products;
3. Fostering investment in sustainable projects;
4. Incorporating sustainability when providing financial advice;
5. Developing sustainability benchmarks;
6. Better integrating sustainability in ratings and market research;
7. Clarifying institutional investors' and asset managers' duties;
8. Incorporating sustainability in prudential requirements;

9. Strengthening sustainability disclosure and accounting rulemaking;
10. Fostering sustainable corporate governance and attenuating short-termism in capital markets.

5.2 Time Horizon

As mentioned above, ESG is believed to be a long-term measure and we recognize that it takes time to build an ESG-oriented reputation for a firm. According to (Briand, Urwin, & Chia, 2011), today's traditional financial analysis tends to focus on short-term earnings and operates within short-term benchmarks. Therefore, it may be difficult to augment key ESG issues that are aimed at uncovering risks in the medium to long term. For our thesis, we have gathered ESG scores for a sample period of 10 years, from 2009 to 2018. We are of the opinion that government owned firms take a long-term approach by investing in companies that generate positive externalities on the environment and society.

5.3 Main Variables & Statistical Tool

Dependent variable ESG:

With the ESG metric gaining widespread attention, an increasing number of public and private firms around the world are being evaluated and rated on their externalities on environmental, social and governance factors by various third-party providers (Huber, Comstock, Polk, & LLP, 2017). We used Thomson Reuters ESG Research Data (Asset4) wherein we found significant scope and coverage for the geographies and industries that our thesis focusses on. Thomson Reuters ESG data currently covers 6,000 public companies across more than 400 different ESG metrics and the data is updated every two weeks. ESG pillars for both government owned firms and non-government owned firms are rated from 0 to 100, 0 representing the worst possible score and 100 representing the best.

Treatment & Control groups:

For the purpose of executing our testable hypotheses, we will divide the 489 sample firms into two groups: Our focus group, also called the treatment group, represents only government owned firms (75). These are firms which have a government agency(s) as minority (less than 50%) or majority (more than or equal to 50%) owner as of the year 2018. The control group represents non-government owned firms (414), and these are firms that do not receive the treatment of being owned by a government agency(s) as of the year 2018. 17 of the 75 government owned firms in our data lose the treatment status of being owned by a government agency(s) for a few years through 2009 to 2018. We shall address the implications of the change in treatment status on a firm's ESG score later in the main results section.

Control variables:

a) Tobin's Q:

Previous literature uses the following pool of indicators to measure financial performance: price earnings ratio, earnings per share, cash flow per share, dividend pay-out ratio, book value per share and price to book ratio. These indicators lead us to employ Tobin's Q as one single variable to measure financial performance in our hypotheses. Tobin's Q discloses information about the value of a firm and is represented by the following formula:

$$Tobin's\ Q = \frac{Market\ Value\ of\ Equity\ +\ Market\ Value\ of\ Long\ Term\ Debt}{Book\ Value\ of\ Total\ Assets}$$

In simple words, Tobin's Q indicates how much value the firm creates with its asset base. The advantage of using Tobin's Q over profitability is that profitability is a short-term measure, whereas Tobin's Q is a long-term measure. According to (Van Duuren et al., 2016), the successful realization of an ESG policy requires strategic planning because it directly relates to decisions with a future long-term impact. Long-term impact includes production technology, the use of natural resources, and the social dimension, which refers to the long-term and stable relationship with employees and the community. Considering ESG is a long-term forward measure, we decided to use Tobin's Q which is also a forward indicator of firm

performance. Previous studies have found a positive association between CSR and a firm's value represented by Tobin's Q (Yoon et al., 2018).

b) Size:

The size of a firm is another key control variable for our hypotheses which represents the annual revenue of a firm measured in USD. This measure indicates whether a given firm is small, medium or large in comparison to its peers. Previous literature have iterated that firm size is a crucial determinant which consistently and positively affects sustainability reporting (Drempetic et al., 2019) and that large companies are more likely to disclose CSR information (Adams et al., 1998). Hence, we incorporate size as a key control variable in our hypotheses.

c) Age:

The age of a firm is calculated via subtracting a firm's year of foundation from the year 2018. This is a mandatory distinguishing criterion in our testing, which helps address the maturity of the firm and the business stage that the firm is in. Younger firms in the development or growth stage are known to be more passionate about conquering a part of the market share and keeping up with market competition, while middle-age and older firms at the maturity stage may focus on maintaining their market share or planning expansions. Both groups of firms may have different goals, thus pursuing different individual agendas with regards to ESG and therefore, we incorporate age as a key control variable in our hypotheses.

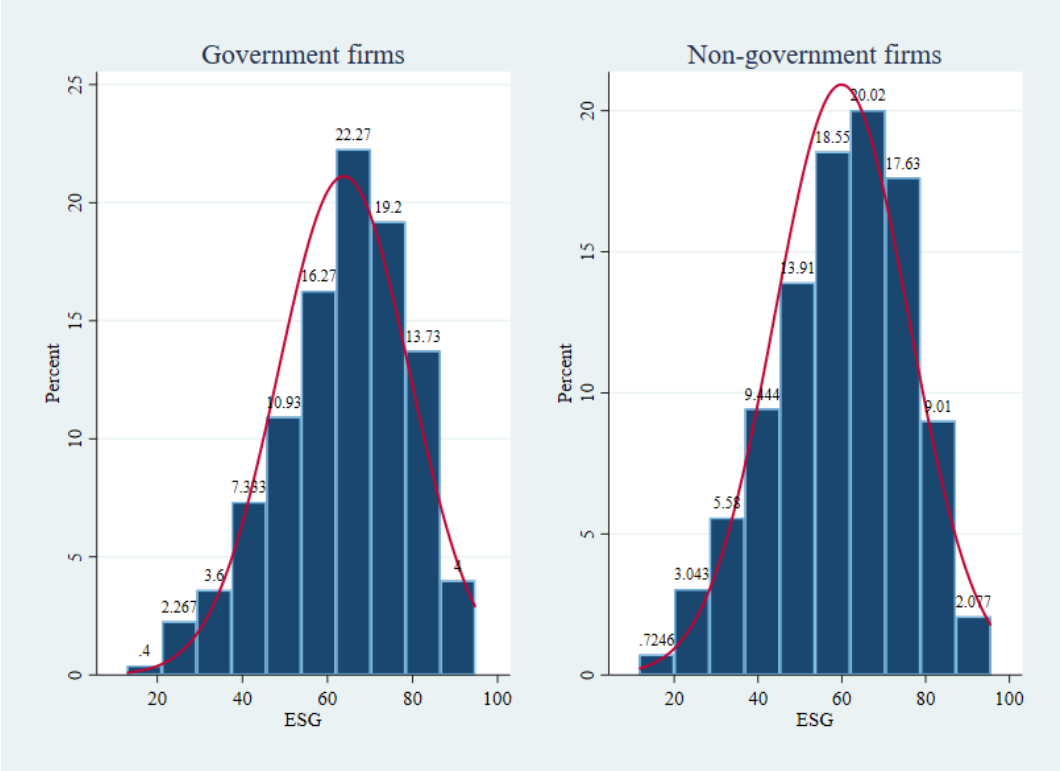
Statistical testing tool:

For testing our hypotheses, obtaining test statistics, performing data analysis and producing graphical visualizations of our tests and our data, we use the statistical program Stata (version 16.0).

6 Preliminary Analysis

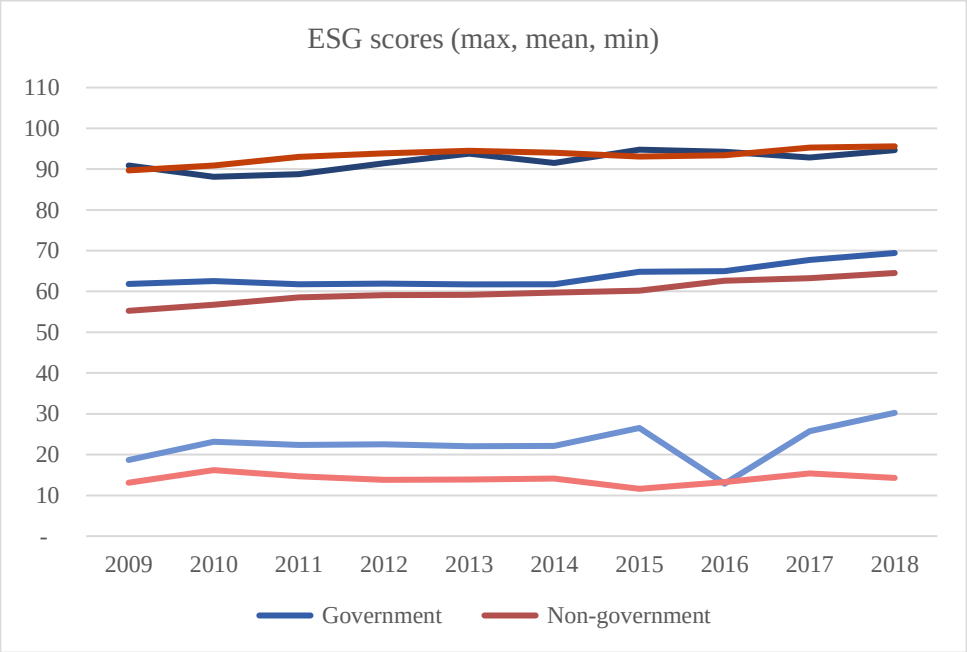
6.1 Contemporaneous Comparison

We performed a comparison of ESG scores for ten years from 2009 to 2018 between both groups (government owned firms and non-government owned firms) by plotting a normal distribution. According to the plots below, 59% of government firms have ESG scores higher than or equal to 60 while only 49% of non-government firms have ESG scores higher than or equal to 60.



The graph below represents max, mean (average) and min scores of both groups of firms. We observe that while government owned firms have higher ESG scores on average, non-government owned firms seem to be on a parallel track with their government owned counterparts. It can be observed that while the minimum score of government owned firms have been increasing since 2009 to 2018 (the range between minimum and maximum has reduced by 5 points), the minimum score of non-government owned firms have been relatively constant.

Although the results of both groups are different, it is important to test if this difference is statistically significant. Can the data from the two graphs mean that government ownership causes ESG scores to be higher than their comparable non-government counterparts? We will address this later through paired t-tests and causality tests.



Finally, we observe that the average scores for both groups is increasing over time and this is consistent with what we discussed in the introduction section about ESG gaining more and more widespread attention.

6.2 Cross-sectional and time-series variation

We also observed a cross-sectional variation in ESG scores. We compute the standard deviation of each firm's ESG score across the 10 years and then average this measure across all firms. The cross-sectional average of these standard deviations is 5.97 and the median is 5.23. This indicates that there is considerable time-series heterogeneity in ESG engagement for each firm. We will address this variation in a later section using panel data regressions. The cross-sectional standard deviation of ESG scores of all 489 firms is 17 in 2009 and 15 in 2018. This indicates that there is more cross-sectional variability than time-series variability

(i.e., there is more variation across firms at a given time than variation across time for a given firm) and we will address this later via propensity score matching.

6.3 Descriptive statistics

We augmented our contemporaneous comparison of ESG scores with the analysis of descriptive statistics. The tables below represent statistics (10 years' average) for each group of firms: government owned group (58 firms), mixed group (17 firms which had government ownership only for a few years out of the ten), and non-government group (414 firms). We also incorporated the respective E, S, and G category scores for each group.

Table A
Descriptive statistics of firms with government ownership

	Min	q25	Median	Mean	q75	Max	SD
Tobin's Q	0.65	0.74	0.79	0.81	0.85	1.01	0.10
Size	17.66	20.33	22.00	21.99	24.04	26.26	2.66
Age	3	19	31	45	68	161	33
ESG	61.57	61.84	62.20	63.96	65.63	70.10	2.87
E	56.20	63.10	64.69	66.55	70.42	77.07	5.91
S	41.47	60.95	62.12	62.88	67.67	73.77	8.24
G	52.26	54.71	55.65	57.46	57.99	70.95	5.05

Table B
Descriptive statistics of firms with non-government ownership

	Min	q25	Median	Mean	q75	Max	SD
Tobin's Q	0.98	1.10	1.15	1.14	1.20	1.27	0.09
Size	11.44	12.74	13.16	13.43	14.26	15.32	1.25
Age	0	20	35	51	75	227	40
ESG	55.26	58.68	59.45	59.92	62.02	64.53	2.74
E	39.64	49.97	51.35	50.96	54.46	56.37	4.61
S	39.06	50.97	54.10	55.26	61.93	65.52	7.65
G	45.82	51.20	52.20	53.69	54.95	64.37	4.66

Table C
Descriptive statistics of firms with mixed ownership

	Min	q25	Median	Mean	q75	Max	SD
Tobin's Q	0.67	0.68	0.75	0.78	0.87	0.98	0.11
Size	24.05	25.80	29.87	28.51	30.79	31.16	2.67
Age	3	17	32	42	51	123	32
ESG	61.49	62.04	62.38	63.51	64.86	67.84	2.28
E	51.71	55.91	58.70	59.23	63.68	66.59	4.99
S	56.84	57.47	58.66	61.77	66.34	73.21	5.61
G	50.44	53.48	55.04	55.23	56.90	60.94	2.88

The results in the above three tables indicate that the average minimum and average maximum ESG score is higher for government firms than for non-government firms. However, the average minimum and average maximum Tobin's Q ratio is higher for non-government owned firms than for government owned firms. The ESG score statistics for firms with mixed ownership are also higher than non-government firms. We believe that the emphasis on ESG is unchanged even if government ownership does not exist for all ten years; we shall address this later through empirical tests.

6.4 ESG Dimensions

The disclosure of relevant information (such as ESG dimensions) has a positive effect on the value of the firm (Zuraida, Houqe, & Van Zijl, 2018) and investors benefit from the disclosure of both aggregate ESG and the individual dimensions, thus motivating the firms to provide additional ESG information. That is why we took a closer look on the separate dimensions and perform an analysis.

From the results in Table A, we see that government owned firms on average have the highest scores in Environment, Governance the next best and Social scoring the least. According to (Dixon-Fowler et al., 2013), environmental performance seems to have the strongest influence on market measures of financial performance. The authors claim that improved efficiency via environmental performance, apart from providing reputational benefits, also lowers costs and increases innovation leading to competitive advantage and reduced organizational risk. (Buallay, 2019) also reported that firms that shape their behaviour with the changes in the external environment are in the best position to mitigate the erosion of their profitability and therefore, the environmental disclosure is necessary to make profit. The author also reported that social activities must be disclosed as well to make investors and stakeholders aware of the social responsibility of the firm.

It is however important to note that for enterprises with both government and non-government shareholders, there could be potential conflicts of interest. Government owned investors exposed to a political environment may pursue different economic interests thereby relinquishing the other investors' primary objective of maximizing firm value. This is in line with previous literature where (Borisova et al., 2012) investigated the relation between the governance dimension and government ownership and found that government intervention is generally harmful to the corporate governance of firm, and thus may reduce firm value.

For firms with zero government ownership (Table B), we see that of all the three dimensions, Social scores are the highest on average. We will dive into the details of the industries and countries that make up the differences in each dimension in sections 6.6 and 6.7.

6.5 Sin Stocks

Sin stocks represent stocks of those firms which directly affect human vice through their industrial production of alcohol, tobacco, and gaming. (Hong & Kacperczyk, 2009) mention that mutual funds and hedge funds are more willing than norm-constrained institutions such as pension funds to invest in sin stocks, since they are natural arbitrageurs in the marketplace and the price for neglected sin stocks is low. The authors also mention that sin stocks have higher expected returns than otherwise comparable stocks. (Eurosif, 2018) identifies the following business fields as top exclusion criteria for socially responsible investors: weapons, tobacco, gambling, pornography, nuclear energy, alcohol, genetically modified organism (GMO), and animal testing.

In light of the above, we may expect to see that sin stocks in our data are held by non-government owned firms and not by government owned firms because government trustees and fiduciaries are subject to social norms and ethical pressures about investing in non-sinful products which align with their value systems. Investing in unethical stocks would place them under public scrutiny. Our data sample includes 12 firms in Alcohol, Tobacco & Gaming industries representing the sin stocks category. We discovered that these firms do not have a government stake holding as we rightly expected. (Fabozzi et al., 2008) showed that sin portfolio is riskier and therefore, we believe that such stocks may not fit the risk-return profile of government investors. Sin industries face more headline risk and litigation risk which government holdings may want to avoid.

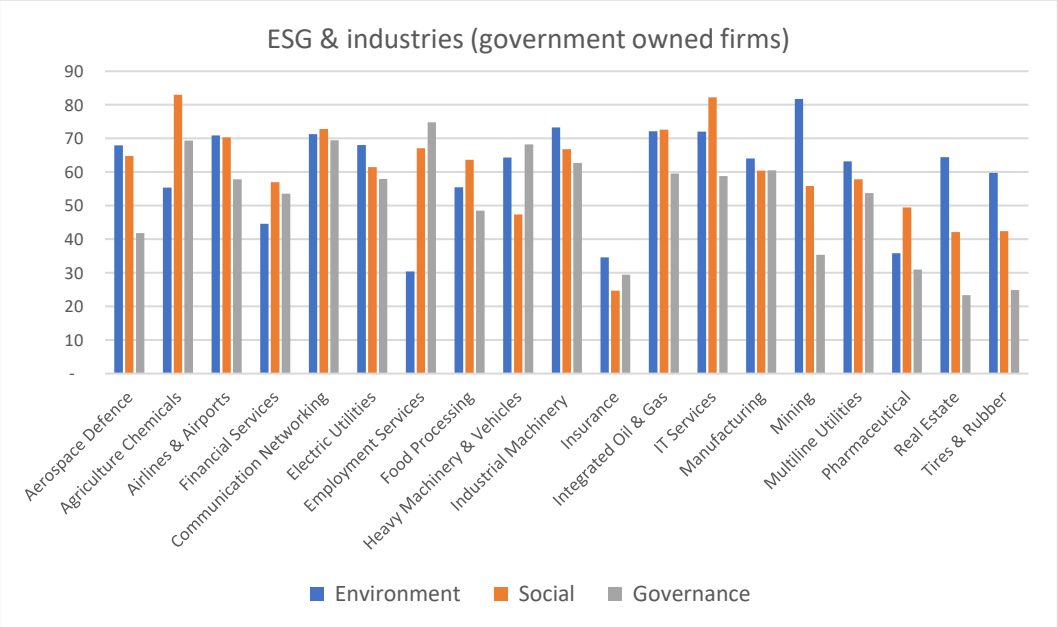
It is worth mentioning that the 12 sin stock firms in our data are represented by a relatively high ESG score (Tobacco: score 71; Wineries: score 73). The distribution under each ESG dimension shows us that the highest allocation is given to the Social aspect, which helps us reason that such companies certainly care to offset their "sinful" reputation via substantial contributions on the social front.

6.6 Industry Analysis

(Baird, Geylani, & Roberts, 2012) demonstrate that a significant overall CSP–CFP relationship exists, and that this relationship is, in part, conditioned on firms' industry-specific context. The firms in our data represent 47 different industries and

we analyse the distribution of average ESG scores across these industries through the graph presented in the Appendix 11.1.

Overall, we note five industries with some of the highest average ESG scores: Cruise Lines (74), Paper Packaging & Products (74), Distilleries & Wineries (73), Integrated Oil & Gas (72), and Diversified Mining (70). Whereas the smallest average ESG scores represent these industries: Home Furnishings (35), Personal Services (41), Biotechnology, Medical & Pharmaceutical (42), Insurance (46) and Investment Services (47). The remaining industries have scores in the range between 47 to 69. Industries that harm the environment (Cruise Lines, Oil & Gas, Mining, etc.) have higher average ESG scores and industries with minimal impact on the environment have the lowest average ESG scores. This supports our argument in section 6.5 that firms in harmful and sin industries contribute more towards ESG, to compensate for the negative outcomes from operating in such industries. (Lin et al., 2015) claimed that environmentally sensitive firms are more likely to disclose their environmental performance; the forces from stakeholders are often more serious and intensive in environmentally sensitive industries than in environmentally non-sensitive industries. It is important to note that in our data, government owned firms in harmful industries have better ESG scores than non-government owned firms in the same industries. We perform a thorough comparison of the two groups of firms on their dimensional scores below:

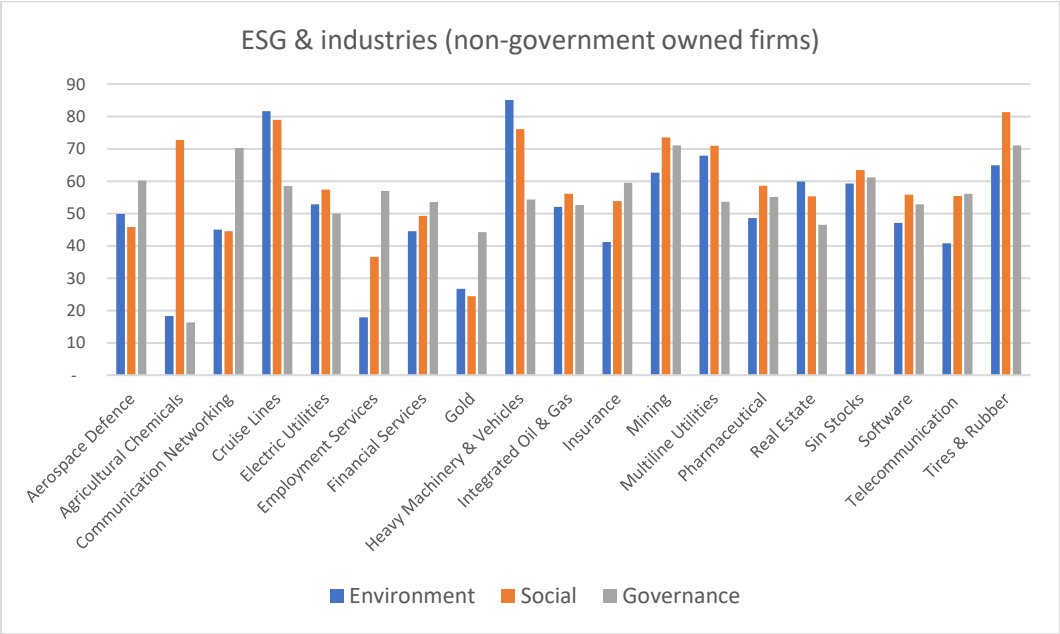


- In our data we observe that among both groups of firms, we observe that industries that are least damaging to the environment have higher S and G scores. For example, Employment Services (facilitating labour force) have the lowest E score but relatively very high S and G scores. Service industries do not influence the environment and therefore, have less disclosure on environmental issues. On the other hand, we observe environmentally sensitive industries to have the highest E scores: the Mining industry in the government owned group has the highest E score of 82 compared to other industries, although having a low S score of 56 and an even lower G score of 35. Integrated Oil & Gas is another high achieving industry in the same group, on both the E and the S fronts (72 & 73) while G being low at 60. If we observe the industry graph for non-government firms below, we find similar findings where Heavy Machinery and Cruise Line industries have the highest E scores of 85 and 82 but low G scores. The general observation of G scores being low for these industries is consistent with the findings of (Yoon et al., 2018), who claim that corporate governance practice negatively influences firm value for environmentally sensitive industries. In both groups, Agriculture Chemicals is another industry that surprisingly has the best S scores. This is another example of how an environmentally harmful industry has done better than others with respect to ESG. Our findings are consistent with (Lin et al., 2015): industries including mining, petroleum, and chemical companies will emphasize the environment, health, and safety, and firms in the finance and service industries will disclose behaviours related to social issues and donations. (Garcia, Mendes-Da-Silva, & Orsato, 2017) also mention that sensitive or controversial industry sectors, that are typically characterized by taboos, moral debates, and political pressure (energy, mining, etc.), show the best environmental performance. It would be reasonable to expect that such harmful industries are being cautious of their sensitive reputation and thus contribute positively to the environment. Also, firms in such industries obtain more recognition and resources from stakeholders as they invest more in CSR. (Lin et al., 2015).

- Tires & Rubber Products also belong to an environmentally sensitive industry, which allows us to assume that their focus on the Environmental dimension would be higher than Social and Governance dimensions. However, this can only be found for the government owned firms: E score of 60 which is higher than S an G. When we observe the graph for non-government owned firms below, we find an interesting observation where Tires & Rubber Industry has one of the highest overall ESG score, with S being the highest of all three dimensions.

- The scores in the Gold industry for the non-government owned firms is interesting to observe. These scores are represented by 1 firm in Russia and UK each. We observe a sudden steep increase in the Social scores for the Russian company, from 6 in 2012 to 72 in 2018. The firm in UK, however, shows no such sudden increase and the ratings are somewhat stable during the 10 years. The general observation is that this industry has the highest G score among the three dimensions, which means that these firms emphasize on aligning interests with shareholders and management than paying heed to the environment and their employees. This is surprising as not only is the industry damaging to the environment, but it also puts its labour force at grave risk.

- In both the groups, financial services have higher S and G scores, consistent with the findings of (Van Duuren et al., 2016) who claimed that for some professional asset managers, the governance dimension is more important.



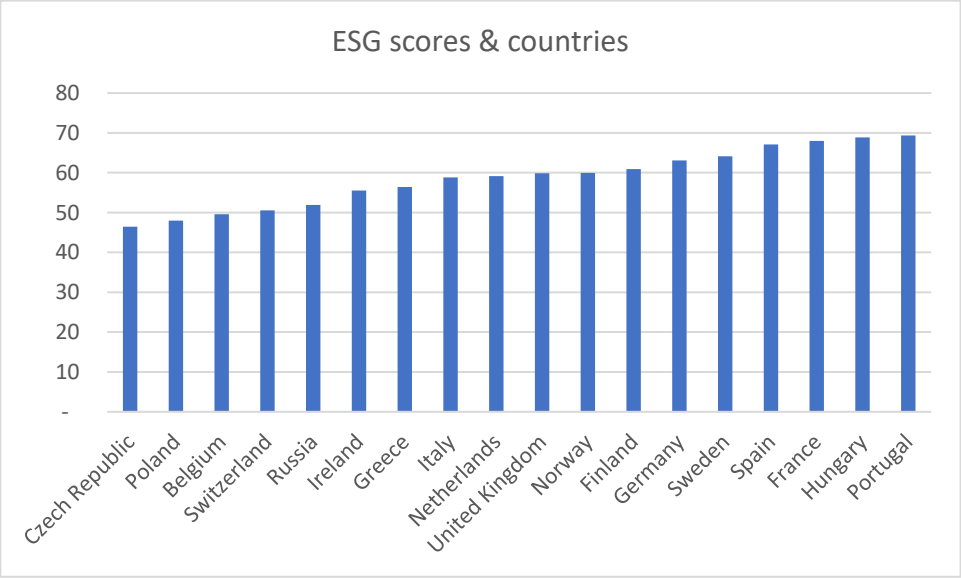
Overall, the comparison enables us to state two main findings:

1) government owned firms have higher E scores and are thus more environment-concerned than non-government owned firms

2) firms that are in harmful (to environment) and sin industries (alcohol, tobacco and gaming) have higher ESG scores than firms in most other industries.

6.7 Country Analysis

The firms in our data sample represent 18 countries. The highest average ESG scores for the period of ten years were found for countries Hungary and Portugal (69), France (68), and Spain (67), and the lowest average scores for the same period were found for countries Belgium (50), Poland (48), followed by Czech Republic (46). Firms in Finland, France and Italy are composed of approximately 50% of government stakeholders and they lie in the medium-high range in the graph below. Whereas firms in the United Kingdom (UK) are composed of majorly non-government stakeholders. UK has the median level average score. It is interesting to observe that with zero government stake, UK has the highest number of firms with ESG scores in our data sample (UK represents 180 firms out of 489). As (Adams et al., 1998) reported, UK has captured the essence of social responsibility since a very early stage: changing portrayal of women in UK's banking and retail companies since 1935; change in the political environment which resulted in value added statements popular over time in the UK; and, the changing patterns of all types of corporate social reporting in the UK since 1979. A more recent literature, (Aaronson, 2003), has also stated that British policymakers have made domestic and global CSR a priority and therefore, businesses in the UK act ethically and offer more extensive disclosures, with better coordinated information, than do US firms.

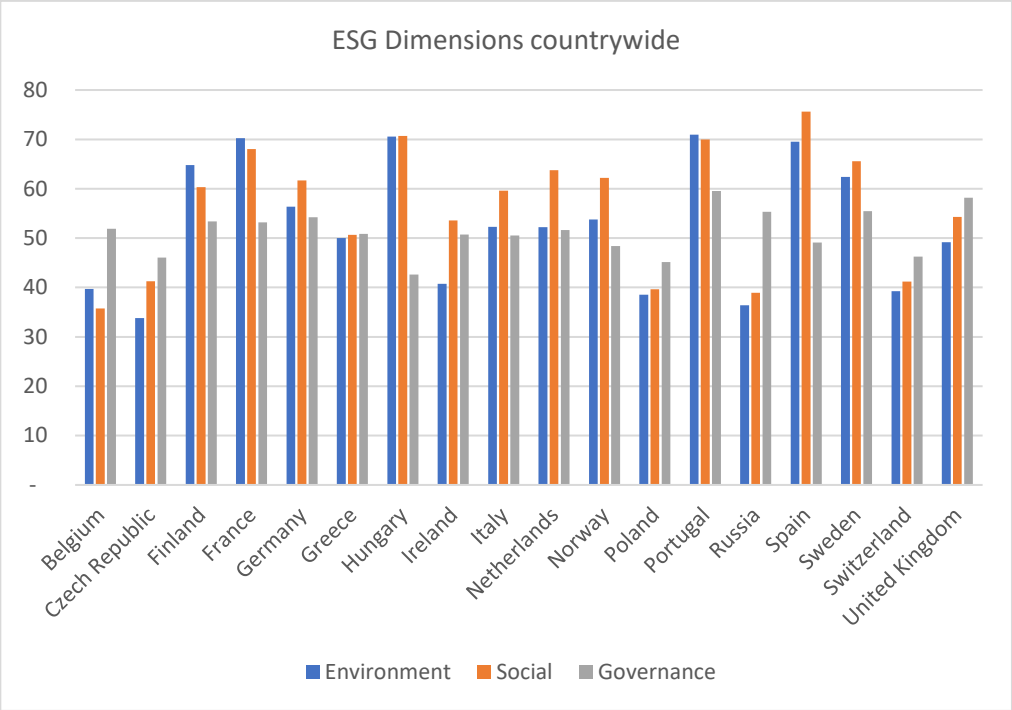


Spain and France have the most firms committed to the United Nations Global Compact with reference to (Ortas, Álvarez, Jaussaud, & Garayar, 2015), and these two countries have the highest average score after Hungary and Portugal in our data.

(Ioannou & Serafeim, 2010) claim that in countries with low levels of corruption, firms are more likely to be socially and environmentally responsible. We refer the Corruption Perceptions Index 2019 (refer Appendix 11.2) to check if this applies to our data. We observe that our findings are only partially consistent with the author's claim. As per the Index, Belgium is a less corrupt country but has the third lowest average ESG score of 50 and Hungary being one of the more corrupt countries has the second highest average ESG score of 69. If we look at the Nordic countries (Sweden, Norway, Finland), they are some of the least corrupt countries and have an average ESG score that lies in the medium-high range in the graph above. We hereby find only partial evidence that countries with low levels of corruption tend to give higher importance to ESG.

It is important to note that a firm's country of residence includes specific economic, social, legal, and political factors that may significantly influence a firm's environmental performance (Dixon-Fowler et al., 2013). For this reason, we believe that a firm could do exceptionally better than their international counterparts due to the measures and regulations that are already set in place in their specific resident countries to promote ESG. For example, two of the world's largest public asset owners, Norway's GPFG (Government Pension Fund of Norway) and Sweden's AP-funds (national pension fund), have adopted negative screening to ensure that their investments exclude unethical businesses and thereby live up to the ethical standards expected from them by the general public (Hoepner & Schopohl, 2018). (Hebb et al., 2015) in their book also established factors that increased the likelihood of government-sponsored investment funds (GSIF) adopting ESG in their investment portfolio. One of the factors in the book was civil society strength: countries like Switzerland, Norway, Denmark, Sweden and Netherlands where citizens and societies participate in public processes and have free press are more likely to lead GSIFs to adopt responsible investment policies. This provides an essential doorway to other firms in the same country to follow suit in adopting ethical and responsible business practices.

We further analyse the country-specific emphasis on ESG by observing the different ESG dimensions:



By observing the graph above, we see that on average, Social scores are the highest among the three dimensions and the average for Governance seems quite low. Hungary in particular seems interesting, as it has one of the highest E and S scores (71) but one of the lowest G scores (43). Apart from Hungary, Spain and Portugal have the two highest E scores among other countries. Although Spain has a low G score of 49, it has the highest S score of 76. (Fernandez-Feijoo, Romero, & Ruiz, 2014) also identified countries such as Spain and Portugal wherein a large number of companies disclose sustainability reports. According to (Ortas et al., 2015), Norway prioritises social policies and our data gives us similar evidence: their S score of 62 is the highest among the three dimensions (E of 54, G of 48).

The varying emphasis on each ESG dimension can depend on which legal system a country follows. Existing legal systems in different countries is divided by common law and civil law, and government owners could encourage stronger corporate governance policies under common law but may shun them under civil law (Borisova et al., 2012). Countries in our sample are mainly civil law countries, except United Kingdom and Ireland representing common law and mixed laws. In our data, we observe that Finland, a civil law country, has the least G score

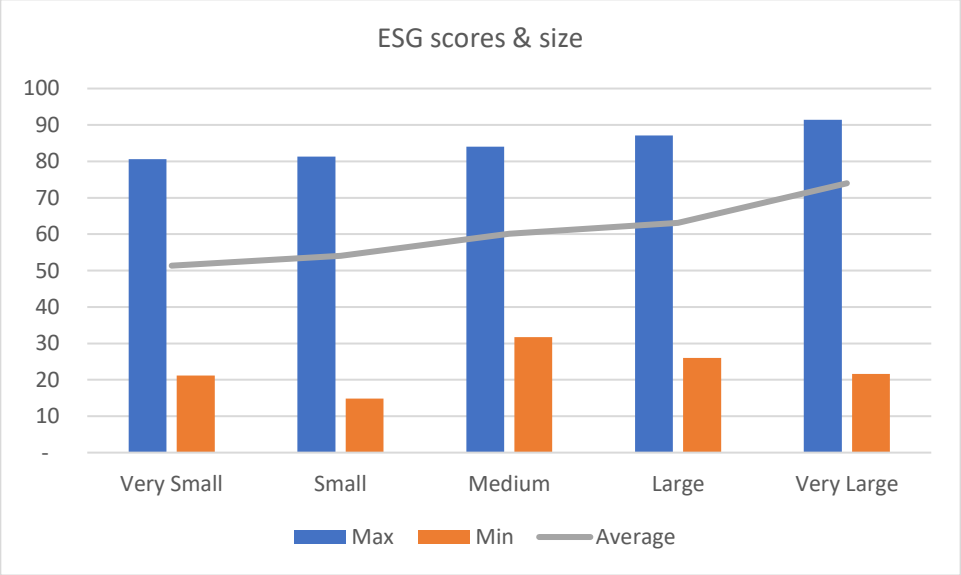
compared to its E and S scores (72% of Finnish firms being government owned). On the other hand, United Kingdom, a common law country, has the second highest Governance focus (58) but it only represents non-government firms. Having said that, we do not observe an obvious pattern where government owners in common law countries tend to implement stronger corporate governance. The average range of the Governance score across all countries in our sample is 43-60, and this is not sufficient to make a noteworthy argument.

We recognize the opportunity for further research in this area. The expansion of sample (increasing number of countries and number of firms within countries) and including additional country-related parameters such as form of government, legal system, GDP, etc would help make more concrete inferences on the relation between a country, its government owned firms and their emphasis on ESG.

6.8 Firm Size Relevance to ESG

The literature section of (Drempetic et al., 2019) presents a paper which concludes that firm size is the only internal determinant which consistently and positively affects sustainability reporting. (Gavana, Gottardo, & Moisello, 2017) state that a number of studies have found the size of a firm to be positively correlated to corporate sustainability disclosure.

On observing our data, we found that large firms have higher ESG scores. To make a reasonable analysis, we divided our sample of 489 firms into 5 sub-groups, classified by revenue (USD), ranging from Very Small, Small, Medium, Large to Very Large and applied the average ESG score for each sub-group across the 10 years. The results in the graph below clearly indicate an increasing trend of average ESG score for very small firms to very large firms, which leads us to believe in the positive correlation between firm size and ESG score.



This chart provides evidence of consistency with previous literature. The study from (Drempetic et al., 2019) hypothesized that larger firms often use more resources for providing ESG data, and consequently, these firms also provide more data for the ESG databases of the rating agencies, which raises the overall sustainability assessment of the company made by these agencies. The study also notes that the ESG score could be distorted in favour of large-sized companies,

because ESG scores are dependent on the firm's capacity to provide data. Small sized companies may have fewer slack resources to provide relevant ESG data.

Additionally, we believe that larger companies are comparatively more exposed and are more susceptible to pressure from the society and civil organizations to do "good". This explains why sin stocks in our database with above average firm size have a better ESG score than other sin stocks of smaller size (Winery firms which are Very Large in size have a score of 73 while Gaming firms which are Small and Medium in size have an average score of 52).

(Dixon-Fowler et al., 2013) claim that large firms may have more resources than small firms, allowing for advantages associated with scale and greater investment in R&D and new technologies; whereas small firms may not have the slack resources to address environmental performance. On the contrary, it is also possible that small firms are not burdened by the inertia of their larger counterparts and are more flexible, making them better able to respond to environmental challenges and execute organizational change. Considering the magnitude of ESG with respect to time and resources, we believe that it could be challenging to implement an ESG outlook company-wide. (Klettner, Clarke, & Boersma, 2014) find evidence of leadership structures being put in place to ensure that board and senior management are involved in strategies relating to sustainable development and are incentivised to monitor and ensure implementation of the strategy through monetary rewards. With such policies in place, it could be faster for firms to shift focus to ESG. In our analysis, we do not investigate the internal governance structure of the firms and we recognize this gap for further research.

Having said that, do government owned firms associate with higher revenue? We will statistically test this later in the main results section.

7 Methodology

7.1 Propensity Score Matching

(Perkins, Tu, Underhill, Zhou, & Murray, 2000) claimed that treatment groups are not directly comparable to control groups due to imbalances in covariate distributions between the two groups. We recognize the fact that there could be dissimilarities between the two sample groups which prevents us from comparing their raw ESG scores. Therefore, to test if the treatment group have higher ESG scores, we choose to implement propensity score matching (PSM) on Stata and perform a paired t-test thereafter.

Literature review suggests that a propensity score analysis has advantages over multiple linear regression for estimating the treatment effect. In our case, "treatment effect" represents the effect of government ownership in a firm. While a multiple linear regression can certainly estimate treatment effects in observational data, the PSM technique works differently by creating homogenous subclasses, thus making the distributions of covariates for treatment and control units well balanced (Zanutto, 2006). Propensity score analysis allows us to control the effects of covariates (our control variables) and obtain a less biased estimate of the treatment effect for our data.

PSM is a technique with which Stata identifies a match for the treatment group from the control group and vice versa, based on similar firm characteristics (including covariates) such as Government ownership, Size, Age and performance proxied by Tobin's Q. The propensity score is the probability of appointing a certain level of ESG score for a specific firm, given a vector of firm characteristics. The closer two firms are in their propensity scores, the more comparable they are. Each firm from the treatment group is matched to a firm from the control group with the closest propensity score. By executing PSM, we create two groups of firms that are similar in observable characteristics but that show differences in ESG scoring. These differences are averaged out to become the average treatment effect or the average unit causal effect. In this way, we measure the difference in average ESG scores between the matched treatment and matched control firms. We will execute

two separate tests: ATE (average treatment effect on the entire sample) and ATET (average treatment effect only on the treated group).

(Bienz, 2016) identified that the PSM system has the advantage of considering many different attributes at once but it does not work particularly well with industries (which cannot be numerically compared) and with years (2007 is close to 2008 but both years were very different). For this reason, we choose to exclude industries as a control variable from our PSM sample. The same author also mentioned that the PSM methodology eliminates any "selection" effect. For instance, in our case, it could mean that ESG scores for government owned firms are higher just because the government invests in "good" firms with a higher focus on ESG. Another possibility to consider is that firms with a higher ESG focus could initiate offering their stock to the government; both groups as stated above are chasing different interests. We therefore deploy the above-mentioned observable firm characteristics in our testing to minimize this "selection" effect. In this way, the PSM technique is equipped to reduce endogeneity problems.

7.2 Panel Regression

As discussed in literature review, previous studies have shown growing evidence that engaging in CSR and ESG practices enhances the value of a firm. We will use a linear panel regression OLS approach to test the hypothesis that an increase in ESG scores brings a positive change in Tobin's Q. As mentioned in our preliminary analysis, in addition to cross-sectional variability, there is substantial time-series variability in our data. While the above PSM test addressed the cross-sectional variability, it did not address the unobserved firm-specific heterogeneity such as cultural factors. Therefore, to address the variation across time within each firm, we perform a panel regression – a suitable technique given the lateral structure of our data, estimating the parameters across ten years for 489 firms.

Model 1:

$$Tobin's\ Q_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 Size_{i.t} + \beta_3 Age_i + \varepsilon_{i,t}$$

Model 2:

$$ESG_{i,t} = \beta_0 + \beta_1 Tobin'sQ_{i,t} + \beta_2 Size_{i.t} + \beta_3 Age_i + \varepsilon_{i,t}$$

7.3 Granger Causality

When we discuss the effect of ESG on a firm's financial performance, there is an issue of endogeneity arising from their simultaneous relationship. The Positive Synergy Hypothesis argues that high levels of CSR lead to an improvement in financial performance, which makes it possible to reinvest in socially responsible actions (Waddock & Graves, 1997). (Hart & Ahuja, 1996) claimed that a 'virtuous circle' existed with regard to the relationship between pollution prevention and firm performance; i.e., firms can realize cost savings and plough these savings back into further emission reduction projects for a number of years until their savings turn negative. Several previous studies have not been able to rule out this reverse causality – where the effect of a value of a variable has the ability to lag around for a while to affect another variable in the future. In our thesis, in addition to testing whether enhancing the ESG score improves performance (through panel regression), we wanted to address the possibility that profitable firms could invest more in ESG, thus enhancing their ESG score. To establish this bidirectional relationship between ESG and financial performance, we will execute a granger causality test. We will also test the impulse response to shocks in ESG and Tobin's Q using vector autoregression (VAR).

Model 1:

$$ESG_{2018} = \alpha_0 + \alpha_1 ESG_{2017} + \alpha_2 Tobin'sQ_{2017} + \varepsilon_{1i}$$

Model 2:

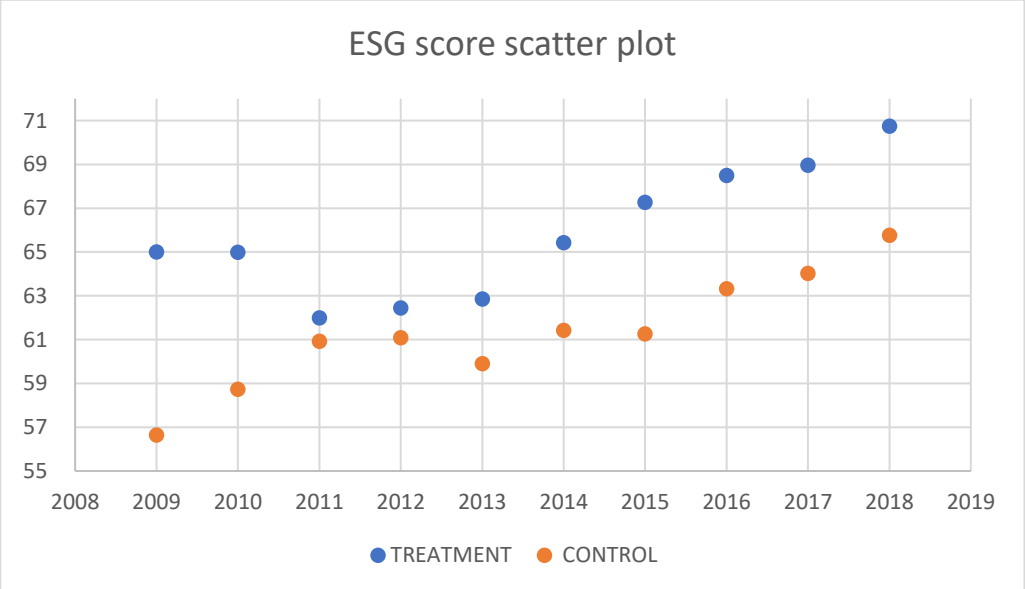
$$Tobin'sQ_{2017} = \beta_0 + \beta_1 Tobin's\ Q_{2016} + \beta_2 ESG_{2016} + \varepsilon_{2i}$$

7.4 Difference-in-Difference

We perform a Difference-in-Difference (DiD) linear regression test to observe if the difference in ESG scores between both the groups is stable over time. The crux of this test is to see whether there exists a constant trend in ESG for both groups and to eliminate the possibility of a unique distinguishing factor influencing ESG scores for the treatment group. If a constant trend does not exist, then it could mean that there is some additional unobservable factor(s) that enhances ESG score for only those firms with government ownership. For additional robustness, we will execute DiD with propensity score matching to address both observable and unobservable differences between both the groups. We consider the parallel trend assumption and augment the test with additional control variables.

$$Diff - in - diff = (ESG_{(T,t+n)} - ESG_{(T,t)}) - (ESG_{(C,t+n)} - ESG_{(C,t)})$$

$ESG_{(T)}$ represents the scores of the treatment group and $ESG_{(C)}$ represents the scores of the control group "before" and "after" the event-date. On analysing the following graph, we observe a clear increasing trend beyond the year 2014 and therefore, we consider 2014 as our n (event-date). "Before" represents scores for the years 2009 to 2013 and "after" represents scores for the years 2014 to 2018.



8 Main Results

8.1 Ownership and ESG

H1: *Government owned firms have higher ESG scores than comparable non-government owned firms.*

In this section, we focus on identifying the relationship between the ownership of firms in our sample and their ESG scores. In addition, we also analyse the link between ownership and size and financial performance. First, we use the PSM technique to perform a fair comparison of both groups of firms. Thereafter, we execute two paired t-tests, one for the start year and one for the end year of our sample period. This is done to examine whether there is any growing similarity between the ESG scores of both groups. We expect to prove that ESG scores are higher for government owned firms than comparable non-government owned firms.

Table 1
PSM results to estimate ATE of government ownership

Matched on	2009	2018
ESG	4.6105**	2.434040
	(1.94479)	(2.131881)
Tobin's Q	-0.270***	-0.057591
	(0.10101)	(0.123101)
SIZE	1.02e+10**	6.14e+09
	(4.06e+09)	(4.62e+09)

This table presents the coefficients for ATE estimation with propensity-scores matched on each variable ESG, Tobin's Q and Size, separately for years 2009 and 2018. A default logistic model predicts each firm's propensity score using control variables Tobin's Q, SIZE, AGE. Dummy variable 1 indicates government ownership and 0 indicates non-government ownership. The sample consists of all 489 firms. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

Impact on ESG score: The results presented in Table 1 indicate that among firms with similar age, earnings and revenue opportunities, government ownership causes ESG score to be higher by 4.610 points in the year 2009. In the year 2018, we observe a mean difference of 2.434 points which, although not statistically significant, is almost 50% smaller than the difference in the year 2009. This decrease from 2009 to 2018 indicates that the difference of average ESG scores between government owned firms and comparable non-government firms is converging with time. These results are consistent with previous literature – the market for ESG information is maturing in quality and getting better with time (Kell, 2018). Whether a firm is government owned or not, there is a growing pool of asset managers, hedge funds, pension funds and other investors craving firm stocks that are ethical, environmentally-friendly, and subject to ESG principles (Crabb, 2020).

As discussed previously in the literature review section, government owned firms are inherently expected to tick all the boxes with respect to ESG and essentially act as a role model for private firms to follow suit. However, we note that due to the bureaucratic administration of government owned firms, it may not be easy to bring about an immediate change in a given firm's outlook towards ESG. On the contrary, while it may be easier for non-government firms to implement ESG, they may pursue catching up with their government counterparts purely to receive attention from new cash-injecting investors. We identified a term "greenwashing" in ESG-related texts – to gain traction, firms may seem very transparent and reveal large quantities of ESG information while really performing poorly on the ESG front. To top it all, ESG information provided in a firm's sustainability report is often unaudited due to the non-existence of a global governing body to ensure accuracy of such information (Yu, Van Luu, & Chen, 2020).

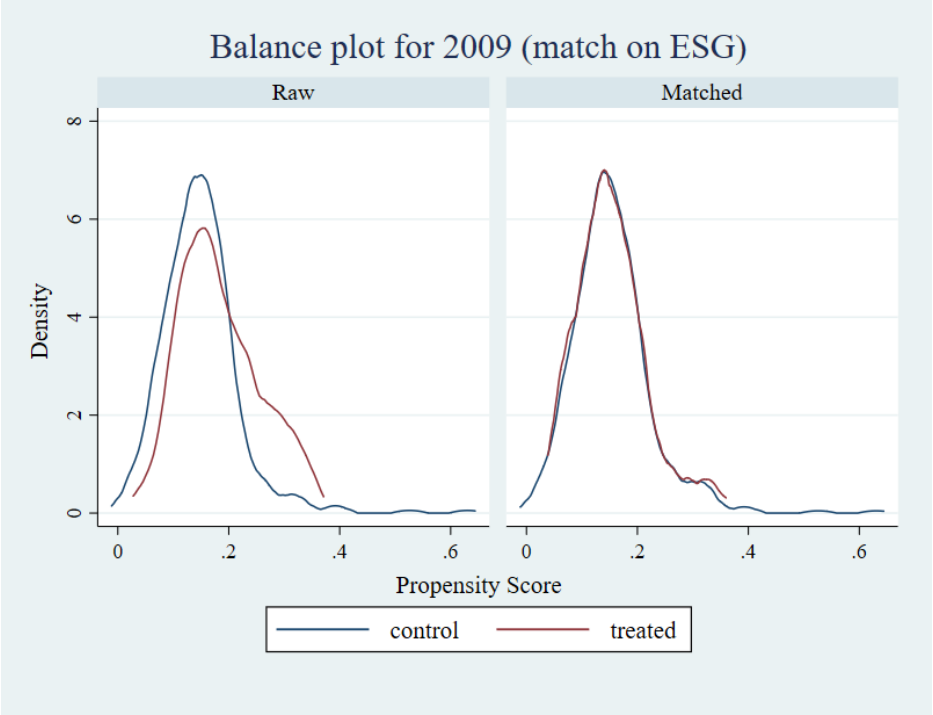
Impact on financial performance: The results presented in Table 1 indicate that among firms with similar age and revenue opportunities, government ownership causes the Tobin's Q ratio to reduce by 0.270 in the year 2009. The decrease of 0.057 in 2018 is not statistically significant. This result could mean that governments either invest in higher value stocks or invest in lesser growth stocks. Our findings are also consistent with previous literature, which suggests that

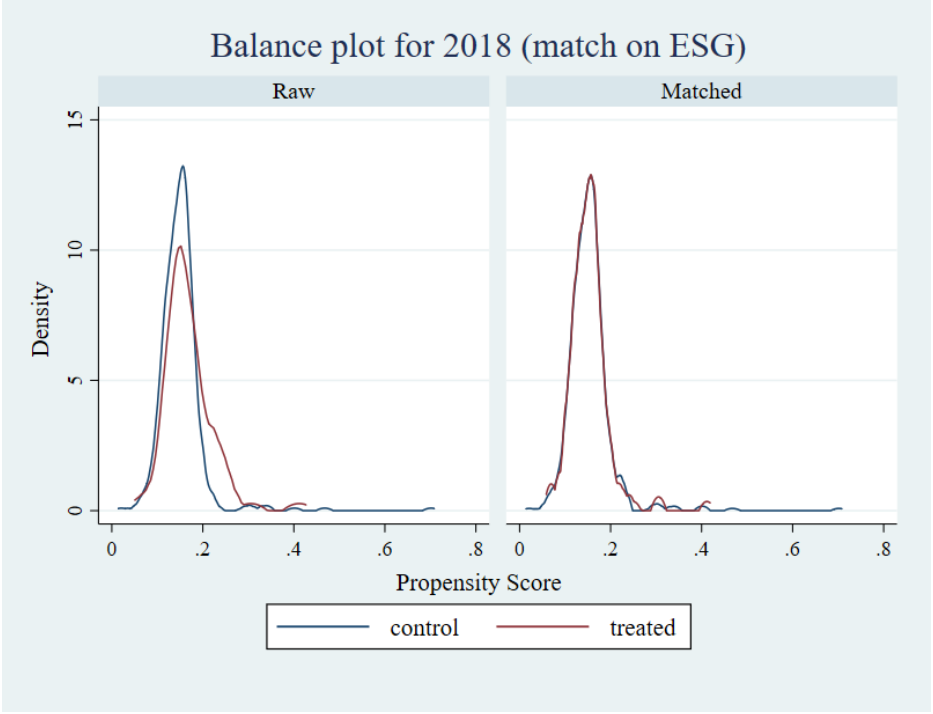
firms in the hands of private investors perform better than firms in the hands of the government (Boycko, Shleifer, & Vishny, 1996), (Shleifer, 1998) and (Dewenter & Malatesta, 2001).

Impact on size: The results presented in Table 1 indicate that among firms with similar age and earnings opportunities, governments choose to invest in larger firms. The average revenue for government owned firms is higher by 10.2 billion USD than the average revenue for non-government firms in the year 2009. The difference of 6.14 billion USD in the year 2018 is not statistically significant. Investing in larger firms could ease the process of economic control for national governments. In our opinion, the existence of large-sized firms is important for a country's overall infrastructure, and in times of political rifts, stringent support from the "big players" would help a party more, rather than that from petty players.

To summarize, we accept the null hypothesis that government owned firms have higher ESG scores than comparable non-government firms. However, we make an additional observation that while the former group is faster in adopting ESG, the latter have been catching up to them by the year 2018.

Below, we present the Balance Density Plots for two years (2009 and 2018) before and after applying the PSM technique, matched on ESG. This shows us that the PSM system is indeed balancing the distribution between the two groups, using our specified characteristics:





The Balance Density plots matched on Tobin's Q and Size are presented in Appendix 11.3.

After matching the firms in our sample by means of PSM with average treatment effects (ATE), we perform the same test again, but with average treatment effects on the treated group (ATET). We discuss the results below the table.

Table 2
PSM results to estimate ATET of government ownership

Matched on	2009	2018
ESG	3.384004	4.67760*
	(-2.684258)	(2.476101)
Tobin's Q	0.016297	-0.022985
	(.061281)	(0.080852)
SIZE	8.05e+08	1.34e+09
	3.20e+09	(3.53e+09)

This table presents the coefficients for ATET estimation with propensity-scores matched on each variable ESG, Tobin's Q and Size, separately for years 2009 and 2018. A default logistic model predicts each firm's propensity score using control variables Tobin's Q, SIZE, AGE. Dummy variable 1 indicates government ownership and 0 indicates non-government ownership. The sample consists of all 489 firms. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results presented in Table 2 indicate that the ATET estimates for the year 2009 are not statistically significant. For the year 2018, while the coefficients for Tobin's Q and SIZE are not statistically significant, the coefficient for ESG is significant. This result indicates that when treated firms are compared to comparable control firms with similar age, earnings and revenue opportunities, treated firms (which have government ownership) have ESG scores that are higher by 4.678 points on average. This further confirms that government owned firms have higher ESG scores than their non-government counterparts.

After PSM, we perform a paired t-test where we compare the two means of the original group and the matched group (matched from our PSM test above). The paired t-test is executed for the years 2009 and 2018 individually, in order to observe if the treatment group and the control group grow to be similar or better than each other over time, in terms of ESG, performance and size. With the growing

focus on ESG, we expect to derive that a firm's engagement and focus on ESG is increasing with time for both treatment and control groups. We particularly expect to see non-government owned firms prioritizing to improve their ESG scores to be in line with government owned firms. We present the table with results below and discuss the results thereafter.

Table 3
Paired t-test results for original group and matched group

Mean difference	2009	2018
ESG	4.669***	2.746***
	(0.987526)	(0.886447)
Tobin's Q	5.481***	1.069000
	(0.049250)	(0.0538724)
SIZE	-5.919***	-2.4704**
	(1.72e+09)	(2.49e+09)

This table presents the t-statistic for our paired t-tests for each variable ESG, Tobin's Q and SIZE, for years 2009 and 2018. The sample consists of all 489 firms with 488 degrees of freedom. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results in Table 3 indicate that for the year 2009, the difference of the means of the original group and matched group for all 3 variables is statistically significant with a combined average t-statistic of 5.356 for the three pairs. For the year 2018, the Tobin's Q t-statistic of 1.069 indicates that the difference of means of the original and matched group (matched on Tobin's Q) is not significant and that the treatment group and control group had similar financial performance in the year 2018. The overall comparison of the paired t-statistics for the two years indicates that in the year 2018, the difference of the means of the original group and the matched group is much lower than the difference of the means in the year 2009. This indicates that government owned firms and non-government owned firms had more similar characteristics in 2018 than in 2009, on all three fronts: ESG, performance and size.

We also perform a paired t-test on the individual mean differences of the year 2009 (mean difference of 4.610 as in Table 1) and of the year 2018 (mean difference of 2.434 as in Table 2) to observe the significance of the difference of the two yearly means. The test presented a t-statistic of 2.059 which indicates that the difference between the mean differences of 2009 and 2018 is statistically significant at the 5% significance level. This means that the difference in ESG scores between government owned firms and non-government owned firms is converging with time.

The above results help us conclude the following about our main hypothesis: firstly, government owned firms do have higher ESG scores than their comparable non-government owned counterparts starting from year 2009 leading to the year 2018, and secondly, non-government firms are catching up to their comparable government owned counterparts because there is evidence of the former group improving their ESG score to catch up to the high levels of the latter group. This is in line with what is discussed above about firms, whether government owned or not, enhancing their focus and engagement on ESG with time.

8.2 ESG and Tobin's Q

H2: *A change in ESG leads to a corresponding change in Tobin's Q.*

In this section, we examine the relationship between ESG scores and financial performance (Tobin's Q). We execute panel regressions with fixed-effects and random-effects models to derive results. We discuss the results below the table.

Table 4a
Panel regression results for dependent variable Tobin's Q

Tobin's Q	*Treatment*	*Control*
Fixed-effects regression		
ESG	0.00279*	-0.000640
	(0.001518)	(0.001095)
SIZE	-2.48e-12**	-5.31e-13
	(1.25e-12)	(9.10e-13)
OWN	-0.004259	
	(0.046757)	
Random-effects regression		
ESG	0.002494*	-0.000927
	(0.001446)	(0.001035)
SIZE	-3.33e-12***	-1.67e-12**
	(1.06e-12)	(7.75e-13)
AGE	0.000302	-0.003***
	(0.002021)	(0.001122)
OWN	-0.014846	
	(0.046029)	

This table presents the coefficients for our panel tests for both Treatment group (75 firms) and Control group (414 firms) for explanatory variables ESG, SIZE, AGE and a dummy variable OWN for the time period 2009 to 2018. The sample consists of all 489 firms. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

We conducted PSM and paired t-test before executing panel regressions for our panel data (refer Appendix 11.4). According to Table 4a, we find that for a given firm in the treatment group, when there is an increase in ESG, there is also a subsequent positive movement in Tobin's Q, and hence we accept the hypothesis. The same cannot be interpreted for the control group, however. This is line with our literature review where we discussed about a higher CSR or ESG performance inducing higher performance for a given firm. For example, (Peiris & Evans, 2010) found a positive relationship between a firm's ESG ratings and its operating performance and market valuation and (Barth, Cahan, Chen, & Venter, 2016) also found that ESG is positively associated with firm value represented by Tobin's Q.

We included a dummy variable "OWN" in our analysis to incorporate the change in government ownership for a given firm during the span of ten years (1 if government investor(s) existed and 0 if they did not, for each year). We observed an instability in the treatment status for 17 firms where government investors did not exist for certain years out of the ten years. The results in table 4a provide us with evidence that a change in treatment status does not cause a change in Tobin's Q. (Friede, Busch, & Bassen, 2015) also highlighted that the positive ESG impact on corporate financial performance appears stable over time.

After running a panel regression on the dependent variable Tobin's Q for both treatment and control groups; in the next step, we panel regress the dependent variable ESG on the same control variables, but this time we focus only on the treatment group. We do not present the results for the control group as the respective coefficients were statistically insignificant. This test is done in order to establish whether an increase in Tobin's Q leads to a subsequent increase in ESG for a given government owned firm. An additional causality test for robustness will be presented in section 8.3. Our results from the panel regression are presented in the table below.

Table 4b
Panel regression results for dependent variable ESG

ESG	*Treatment*
Fixed-effects regression	
Tobin's Q	1.59870*
	(0.960404)
SIZE	-2.47e-11
	(3.12e-11)
OWN	-0.070403
	(1.168550)
MAJORITY	-8.711***
	(1.833995)
Random-effects regression	
Tobin's Q	1.371120
	(0.912482)
SIZE	4.07e-11
	(2.62e-11)
AGE	0.008073
	(0.046580)
OWN	0.472223
	(1.158765)
MAJORITY	-7.813***
	(1.679693)

This table presents the coefficients for our panel tests for Treatment group with explanatory variables Tobin's Q, SIZE, AGE and two dummy variables OWN and MAJORITY for the time period 2009 to 2018. The sample consists of all 75 government owned firms. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results from Table 4b indicate that for a given firm in the treatment group, when there is an increase in Tobin's Q, there is also a subsequent positive movement in ESG. While observing the significance of the dummy variable "OWN", we can

conclude that a change in treatment status does not cause a change in a given firm's ESG score. This could be because once the government invests in a certain firm, the firm maintains the same focus on ESG regardless of the government divesting at a later point. The result could also mean that it may take a long time to bring about a significant change to a firm's ESG score. Our time-series of 10 years may be too short to analyse the long-term impact on ESG score subsequent to the government divesting. Additionally, in case of firms where the government divests after a couple of years and re-invests, the period of a government investor's absence could be too minimal to negatively impact the average ESG score of the firm.

Another interesting dimension to investigate is whether a majority (more than or equal to 50%) ownership makes a difference to ESG scores. We included an additional dummy variable "MAJORITY" in our panel regression as an explanatory variable to examine its impact on ESG. This variable indicates whether a government agency (s) was a minority or a majority shareholder in a certain firm during each of the ten years (1 if government investor(s) was a major shareholder and 0 if they were not).

The results in Table 4b indicate that when the government holds a majority stake in a given firm, it causes a subsequent negative movement in ESG score. This contradicts our expectation as 1) government ownership is known to positively impact ESG, based on our results from the previous section, and 2) governments owning a majority stake gives them control of the firm, thereby enabling the firm to engage more in ESG. This negative impact of majority ownership is an interesting observation which could be caused by certain "special" firms. We shall probe further into this result, by executing a simple pooled OLS regression with additional industry variables.

In the next step, we conduct a deep dive into five industries where the government holds a majority stake. This is done to examine the within-industry impact on ESG. We expect to distinguish certain "worsening" industries that cause majority ownership to significantly reduce ESG scores. In the pooled regression, we include an explanatory dummy variable "ALL" which represents firms that belong to a certain industry (1 if a firm belongs to the industry and 0 if it does not). We also include a second explanatory variable "MAJOR" which represents those firms that belong to a certain industry and also have 50% or more government stake holding. The results from the pooled regression are presented and discussed below.

Table 4c
Pooled OLS regression results for dependent variable ESG

ESG	*Treatment*
Airlines	
ALL	4.815357
	(4.020311)
MAJOR	-0.502517
	(6.689600)
Banks	
ALL	4.4298**
	(2.152273)
MAJOR	-10.985***
	(3.064412)
Integrated Oil & Gas	
ALL	6.496***
	(1.850424)
MAJOR	-1.486720
	(3.032567)
Telecommunications	
ALL	2.070858
	(1.847141)
MAJOR	6.7436**
	(3.501030)
Utilities	
ALL	-2.403349
	(1.896631)
MAJOR	-8.357***
	(2.573332)

This table presents the coefficients for OLS regression for Treatment group with dummy explanatory variables ALL and MAJOR for the entire time period. The sample consists of all 750 government owned firms. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results in Table 4c indicate that majority ownership in the industries Banking and Utilities cause a significant reduction in ESG scores. We address two possible reasons for the same:

1. Since the 2008 financial crisis, banks have been primarily held accountable for irresponsible practices in the financial sector. Despite being criticised, these "too big to fail" banks have been nationalized worldwide. In such banks, while on the road to recovery, CSR/ESG budgets could have been substantially squeezed. Moreover, as discussed in literature review, it could take a long time for a firm to establish an ESG-oriented reputation. Therefore, we believe that banks which have majority government ownership have a long way to go to win back the trust of the society through their focus on ESG.
2. Coal-based firms in the Utilities industry are comparatively old (age of 110 being the oldest) in comparison to newer firms in the Telecommunications industry (age of 53 being the oldest). This leads us to believe that Utilities consist of old (legacy) firms which were established and operated much before the rising importance of CSR/ESG and wherein government investors have tenaciously stayed on despite the firm having a lower ESG-oriented asset base. ESG being a new concept, a positive impact of a major government investor in a "newer" industry like Telecommunications seems to be reasonable.

With the exception of special firms in these two industries, we can summarize and conclude that for "typical" firms, a majority government participation is associated with high ESG scores. However, in "traditional" or "special" firms, a majority government participation can be associated with low ESG scores.

On an additional note, we find through the Hausman test that both fixed effects and random effects models can be applied for our data (refer results in Appendix 11.5). We also find through the unit-root test that our data is stationary (refer results in Appendix 11.6). However, considering our database is a short time-series panel, we have no reason to believe that these tests hold good power.

8.3 Bidirectional causality

H3: *ESG Granger-causes financial performance.*

This section addresses the endogeneity problem arising from the simultaneous relationship between ESG and financial performance. We implement a granger causality test to detect whether there is a bidirectional relationship between ESG and financial performance. We find our assumption of reverse causality to be true, backed by significant results as shown in the table below.

Table 5a
Dumitrescu-Hurlin Granger Causality results

Null Hypothesis	*Z stat*	*P> |t|*
Tobin's Q --> ESG	15.2392	0.0000
ESG --> Tobin's Q	15.3008	0.0000

This table presents the z-statistics and P-values for the granger causality test. The sample consists of all 489 firms. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1.

Thereafter, we analyse the Impulse Response results to shocks in ESG and Tobin's Q using vector autoregression (VAR) to confirm the existence of causality of lags.

Table 5b
Panel VAR Impulse Response results for shocks in ESG &Tobin's Q

ESG	*Result*	*T stat*
Lag 1_Tobin's Q	0.167052	0.74
	(0.226186)	
Lag 2_Tobin's Q	0.609***	2.67
	(0.228312)	

Tobin's Q	*Result*	*T stat*
Lag 1_ESG	0.0027**	2.26
	(0.001216)	
Lag 2_ESG	-0.001437	1.22
	(0.001181)	

This table presents the coefficients and t-statistics for impulse response to a shock each in ESG and in Tobin's Q. The sample consists of all 489 firms. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results from Table 5a indicate that there exists a reverse causality relationship between ESG scores and Tobin's Q (refer Appendix 11.7 for Impulse Response Shock figures). We accept the null hypothesis that ESG and financial performance Granger-cause each other. The results from Table 5b indicate that lag 2 of Tobin's Q causes ESG and lag 1 of ESG causes Tobin's Q. This provides us with evidence that lagged values of financial performance cause a ripple effect on ESG and vice versa**.** Our findings are in line with previous literature where according to (Malik, 2015), the benefits of CSR, such as increased employee productivity, enhanced brand value and corporate reputation, carry over into future periods and therefore, superior quality CSR performance positively affects the value of the firm, not only in the short term, but also in the long run.

8.4 Trend in ESG Scores

H4: *Difference in trend in ESG scores for treatment and control groups was not significant from years 2009 to 2018.*

To observe the existence of a constant increasing trend in ESG for both groups, and to further support our argument from ***H1***, we execute a Difference-in-Difference (DiD) test (with PSM). We exclude one firm from our sample since it could not be matched. We present the results in the table below and discuss them thereafter.

Table 6
Difference in difference estimation results for 488 firms

Outcome variable	*ESG*	*T stat*	*P> |t|*
Before:			
Control	54.313		
Treatment	56.750		
Diff (T-C)	2.437	2.76	0.006***
		(0.884)	
After:			
Control	58.866		
Treatment	61.211		
Diff (T-C)	2.345	2.57	0.0100**
		(0.912)	
Diff. in Diff.	-0.092	0.07	0.946
		(1.360)	
R-square	0.14		

This table presents the coefficients, t-statistics and P-values estimated by linear regression where "Before" presents results for the years 2009 to 2013 and "After" presents results the years 2014 to 2018. The sample consists of 488 firms and we incorporate additional covariates: Tobin's Q, SIZE and AGE. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results from Table 6 indicate that the effect of an increasing trend in ESG score is similar for both the treatment and control groups and thus we accept the null hypothesis. Even though their respective scores might differ across time, we can infer that if and when an exposure to a unique factor(s) causes an increase in ESG scores for the treatment group, then it will also cause a similar increase in ESG scores for the control group. We thereby accept the null hypothesis that the trend in ESG scores were not significantly different from each other for both groups from years 2009 to 2018. This result, in combination with the previous results, helps us conclude that should both groups of firms be exposed to the same unique factor, government owned firms will indeed be ahead of comparable non-government owned firms in their focus towards ESG.

We believe that the extent of ESG engagement, stakeholder management and performance dynamics are different for firms belonging to different industries. Therefore, we choose 5 industries from our data which have relatively larger sub-samples and perform a similar DiD analysis for each industry. We add industry as an additional control dummy variable in our tests. Our analysis shows the same results as for the general DiD test – an increasing trend for both groups. Below are the results for each industry:

Table 6a
DiD estimation results for Oil & Gas firms

Outcome variable	*ESG*	*T stat*	*P> |t|*
Before:			
Control	50.769		
Treatment	62.365		
Diff (T-C)	11.596	5.97	0.000***
		(1.943)	
After:			
Control	54.222		
Treatment	66.882		
Diff (T-C)	12.660	5.18	0.000***
		(2.446)	
Diff. in Diff.	1.064	0.31	0.755
		(3.405)	
R-square	0.36		

This table presents the coefficients and t-statistics estimated by linear regression where "Before" presents results for the years 2009 to 2013 and "After" presents results the years 2014 to 2018. The sample consists of 400 firms and we incorporate additional covariates: Tobin's Q, SIZE and AGE. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

Table 6b
DiD estimation results for Banking firms

Outcome variable	*ESG*	*T stat*	*P> |t|*
Before:			
Control	58.183		
Treatment	41.175		
Diff (T-C)	-17.008	-5.81	0.000***
		(2.926)	
After:			
Control	66.169		
Treatment	46.219		
Diff (T-C)	-19.949	7.43	0.000***
		(2.686)	
Diff. in Diff.	-2.941	0.76	0.446
		(3.862)	
R-square	0.43		

This table presents the coefficients and t-statistics estimated by linear regression where "Before" presents results for the years 2009 to 2013 and "After" presents results the years 2014 to 2018. The sample consists of 210 firms and we incorporate additional covariates: Tobin's Q, SIZE and AGE. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

Table 6c
DiD estimation results for Telecommunication firms

Outcome variable	*ESG*	*T stat*	*P> |t|*
Before:			
Control	50.660		
Treatment	57.740		
Diff (T-C)	7.080	2.65	0.008***
		(2.676)	
After:			
Control	54.608		
Treatment	61.820		
Diff (T-C)	7.212	2.7	0.007***
		(2.668)	
Diff. in Diff.	0.132	0.04	0.972
		(3.706)	
R-square	0.44		

This table presents the coefficients and t-statistics estimated by linear regression where "Before" presents results for the years 2009 to 2013 and "After" presents results the years 2014 to 2018. The sample consists of 190 firms and we incorporate additional covariates: Tobin's Q, SIZE and AGE. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

Table 6d
DiD estimation results for Electric Utilities firms

Outcome variable	*ESG*	*T stat*	*P> |t|*
Before:			
Control	22.300		
Treatment	26.306		
Diff (T-C)	4.007	1.23	0.221
		(3.270)	
After:			
Control	23.028		
Treatment	31.058		
Diff (T-C)	8.030	3.38	0.001***
		(2.378)	
Diff. in Diff.	4.023	1.07	0.285
		(3.766)	
R-square	0.66		

This table presents the coefficients and t-statistics estimated by linear regression where "Before" presents results for the years 2009 to 2013 and "After" presents results the years 2014 to 2018. The sample consists of 110 firms and we incorporate additional covariates: Tobin's Q, SIZE and AGE. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

Table 6e
DiD estimation results for Biotech, Medical & Pharmaceutical firms

Outcome variable	*ESG*	*T stat*	*P> |t|*
Before:			
Control	37.391		
Treatment	29.872		
Diff (T-C)	-7.520	-2.26	0.024**
		(3.330)	
After:			
Control	45.831		
Treatment	33.835		
Diff (T-C)	-11.996	3.34	0.001***
		(3.596)	
Diff. in Diff.	-4.477	0.9	0.368
		(4.973)	
R-square	0.18		

This table presents the coefficients and t-statistics estimated by linear regression where "Before" presents results for the years 2009 to 2013 and "After" presents results the years 2014 to 2018. The sample consists of 80 firms and we incorporate additional covariates: Tobin's Q, SIZE and AGE. The statistical significance levels are the following:
*** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

The results presented in the above tables indicate that the effect of an increasing trend in ESG score is similar for both the treatment and control groups in each of these five industries. This result and the above results in entirety help us finally conclude that should both groups of firms be exposed to the same industry-specific heterogeneity, government owned firms will indeed have a higher ESG emphasis than comparable non-government owned firms.

9 Conclusion

Do government owned firms have higher emphasis on ESG than non-government owned firms? We perform analysis by evaluating the relationship between ownership and ESG by using ESG scores of 489 sample firms over a period of 10 years (2009 to 2018). Our thesis provides unique evidence that firms which have governments as a minority/majority owner have a higher ESG focus than firms which do not.

In the preliminary analysis of our data, we find the ESG scores to be increasing over time for both government owned firms and non-government owned firms. Further, firms that are in environmentally harmful and sin (alcohol, tobacco, and gaming) industries have a relatively high ESG score. A thorough analysis of the separate ESG dimensions (environment, social, governance) lead us to conclude that government owned firms are more focussed on the environment than non-government owned firms. Additionally, the adoption of ESG has been largely enforced by government owned firms in countries like Finland, Italy, and France.

We executed propensity score matching to compare government owned and non-government owned firms and derive the following results with respect to ESG:
1) Our main takeaway is that ESG scores are higher in firms where government ownership exists; we observe this in the year 2009. This means that government owned firms are ahead of non-government firms in adopting practices that enhance ESG.
2) the difference of average ESG scores between government owned firms and comparable non-government owned firms is converging with time; we observe this when comparing the results of 2009 to those of 2018. This means that non-government owned firms are gradually catching up to the high ESG scores of their government owned counterparts.

With respect to Tobin's Q, we find that private investors are more concerned about a firm's financial performance than government-oriented investors. With respect to size, we conclude that the government chooses to invest in firms with larger revenues.

The relationship of ESG with firm value is still an unresolved topic in ESG literature. To test the association, we conducted panel regressions and conclude that when there is an increase in ESG for a given firm, there is also a subsequent positive

movement in financial performance (measured through Tobin's Q) and vice versa. This is consistent with a growing number of studies that have indicated that firms' CSR/ESG activities positively influence the value of a firm. By incorporating two additional explanatory (dummy) variables (OWN and MAJORITY), we find that a year to year change in ownership does not affect a given firm's ESG score; and when the government holds a majority stake in a certain firm, it causes a positive movement in ESG scores for "typical" firms but a negative movement in ESG scores for "special" firms within the Banking and Utilities industries.

We then explored if ESG and financial performance Granger-cause each other. To achieve this, we incorporated time lags in our analysis. We find evidence that firms which have good prior financial performance can impact the future ESG score of the firm. This indicates that firms which generate profits in the past, have the resources to invest or engage more in ESG-enhancing projects.

Further, we analysed the extent of similarity between both the ownership groups and find that both government owned firms and non-government owned firms have more similar characteristics in 2018 than in 2009, on all three fronts: ESG, performance and size. This is in line with what is discussed in literature review, about firms, whether government owned or not, increasing their focus and engagement towards ESG over time.

Additionally, through Difference-in-Difference tests, we conclude that should both groups of firms within the same industry be exposed to a factor, the emphasis on ESG over ten years moves in the same direction for both government owned and non-government owned firms. This indicates that there is no special effect for government owned firms to have higher scores than non-government owned firms as both groups display a constant increasing trend in ESG. This result in combination with the previous results further supports our argument that even though ESG scores of all firms are increasing over time, government owned firms have been faster in adopting ESG practices since an early stage.

Overall, we confirm that ownership is consequential. Even though ESG scores for all firms have been higher now than before, we demonstrate that having the government as an owner in a European firm makes a difference to ESG scores. We add value to existing literature by finding evidence that even though the ESG scores of all firms are increasing constantly over time, government owned firms (where government is minority/majority owner) have been quicker in adopting ESG

practices. However, for some special firms belonging to the Banking and Utilities industries, we observed that majority ownership was associated with negative ESG scores. Furthermore, ESG can impact current and future firm performance and so can firm performance impact current and future values of ESG. Through this evidence, our paper takes supplementary steps towards a refined understanding of the novel ESG and its importance for government stakeholders.

10 Future Research

We anticipate that the demand for ESG data, reporting, and ESG-related investment strategies will continue to grow. ESG is a relatively younger term and it has the potential to extend existing academic research. While we find an important relation between government ownership and ESG, additional research is needed in the following areas to further test the strength and scope of this relationship. Successful implementation of these areas could give interesting new results and theories:

- Firstly, it is necessary to expand the sample observations by adding more countries to establish ownership links outside the 18 countries in our sample. It is also important to augment regression tests with additional country-related parameters. Each country may have dissimilar legal systems (common law/civil law) or corruption rates, which could have a direct inference on a particular government's emphasis on ESG. We also recognize the omitted variable bias. Adding other important variables in our models could potentially affect the outcome.
- A more robust industry analysis can be conducted to help address which industry-specific heterogeneous characteristics enable a stronger relation between government ownership and ESG.
- Governments might undertake active ownership in a firm. Being an active owner could lead to government-controlled firms having higher emphasis on ESG.
- Considering dispersed or concentrated ownership in the ownership structure of the sample firms can help make additional inferences on the corporate governance structure. Dispersed ownership can mean that the shareholders pursue their own private benefits which could lead to disagreements, thereby deflecting focus from ESG. While with concentrated ownership, it can be easier for shareholders to work towards a common goal.
- Examining the existence of managerial compensation, one that is tied to ESG, is a crucial yardstick to gauge a firm's ESG focus. Further, setting an ESG-oriented leadership structure makes managers more ESG-friendly.
- Our time span of 10 years observed a convergence of ESG scores between government owned firms and non-government owned firms. It would be insightful to expand the time series to investigate whether the convergence

continues into the future or if ESG scores for non-government owned firms end up being higher than the scores of comparable government owned firms. It is also important to note that although non-government owned firms are seen to be catching up with their government owned counterparts in our results, it would be necessary to investigate if they are genuinely engaging in ESG activities or providing misleading information to rating agencies to artificially enhance their ESG scores (engage in "greenwashing" as mentioned before).

- (El Ghoul, Guedhami, Kwok, & Mishra, 2011) investigated the relation between CSR and cost of capital and found that investments towards improving responsible employee relations, environmental policies, etc. contribute substantially to reducing a firms' cost of equity. Future research with respect to ESG and cost of capital of government owned firms could be implemented, especially considering that governments find it easier to seek financing as discussed in literature review.

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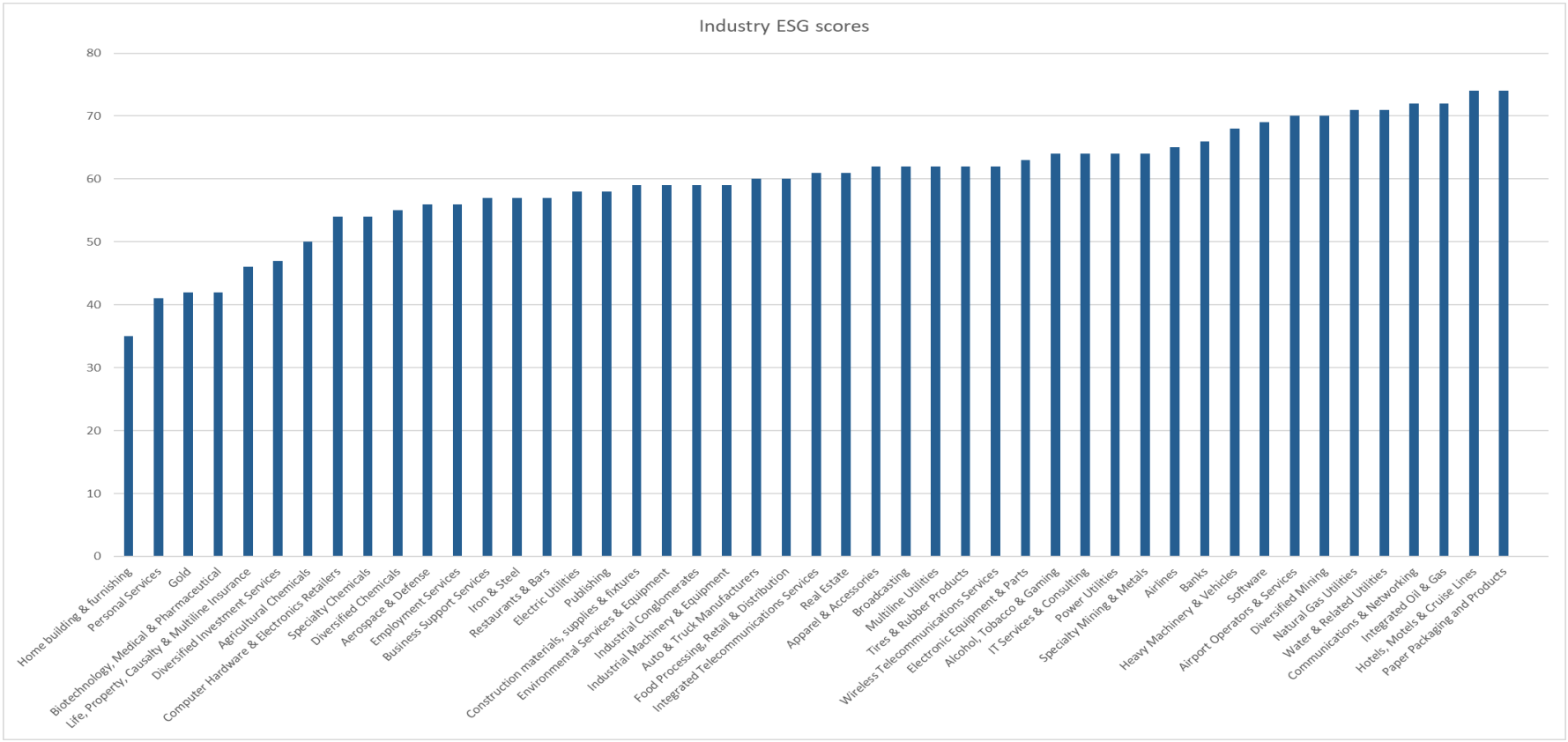
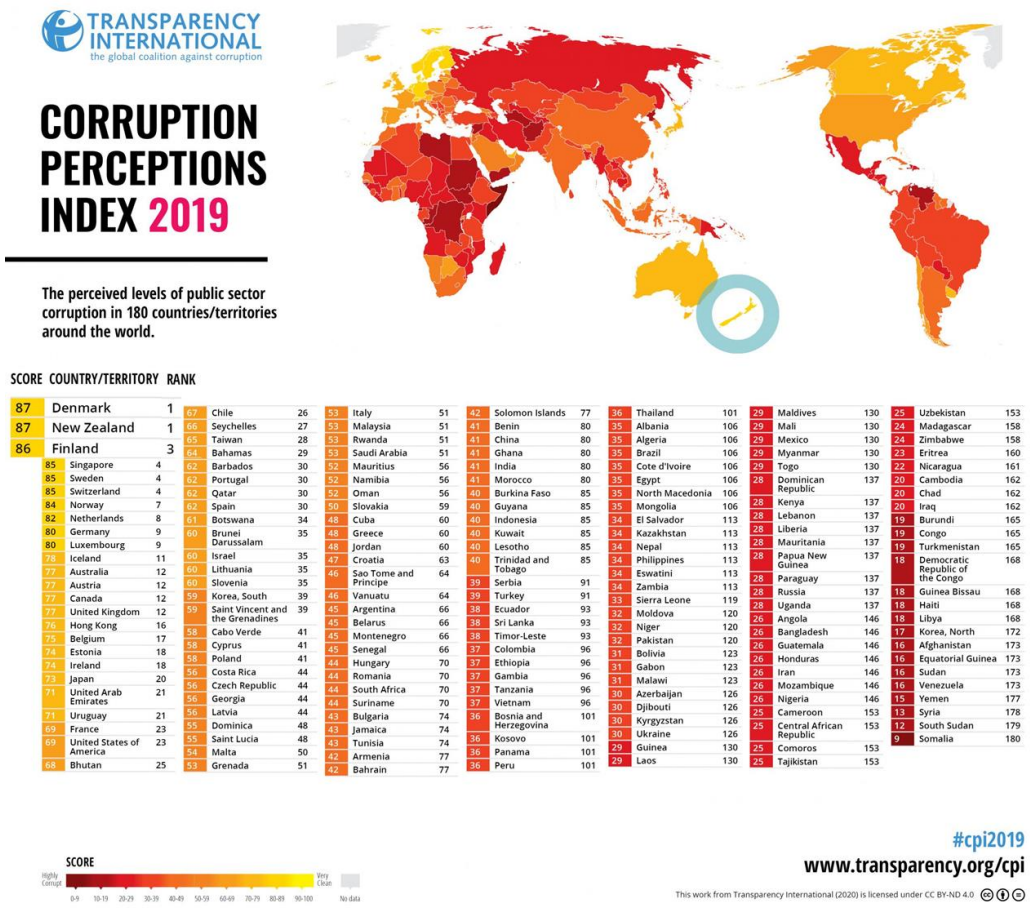
11 Appendices

11.1 Industry vide ESG scores



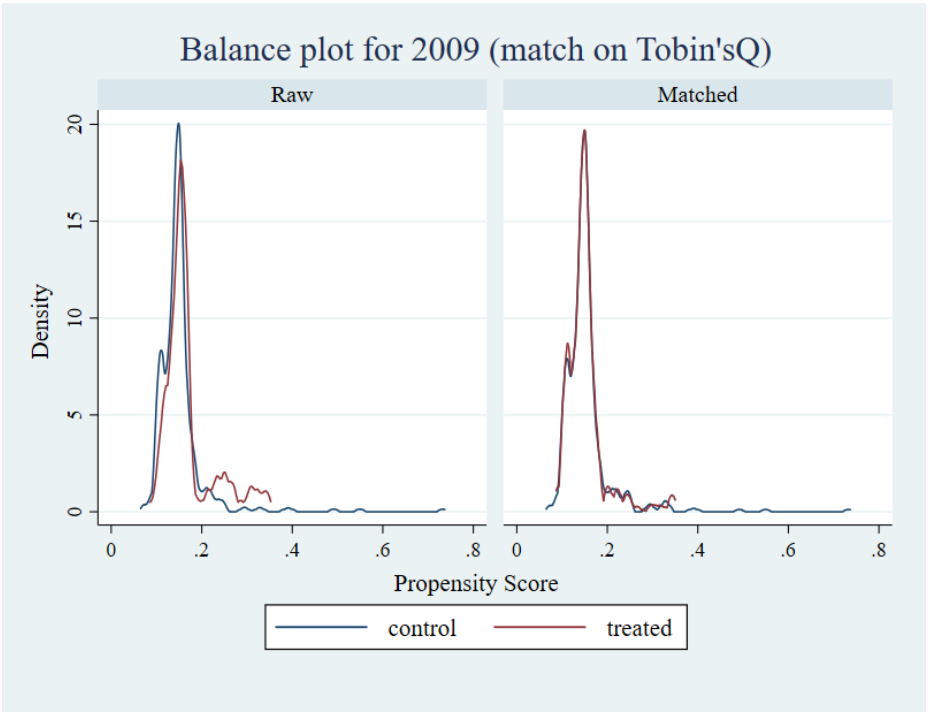
11.2 Corruption Index

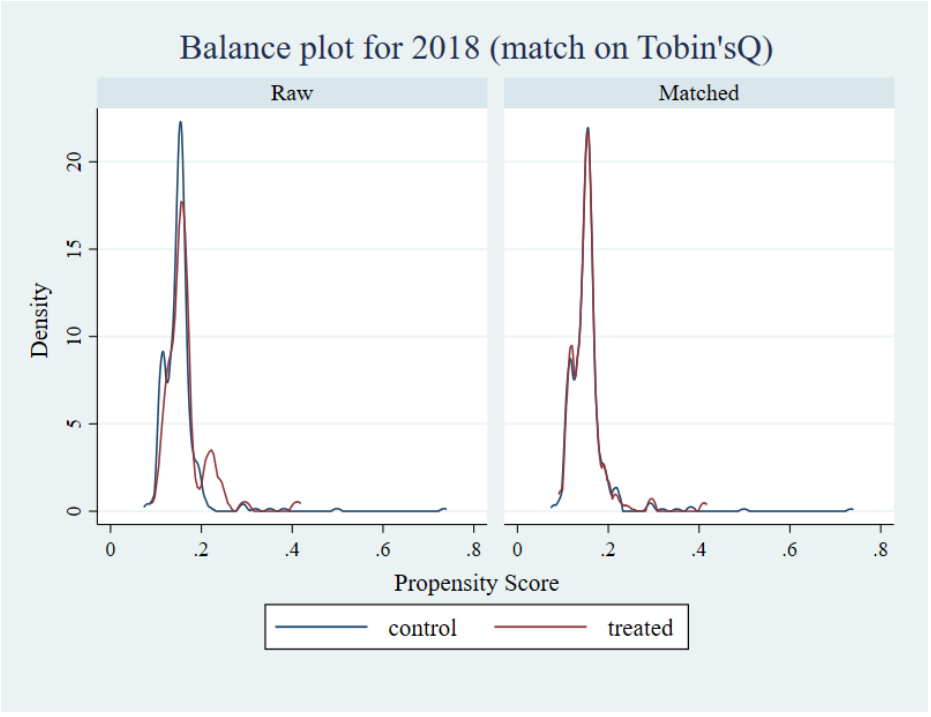


11.3 Density Plots

- ***Match on Tobin's Q:***

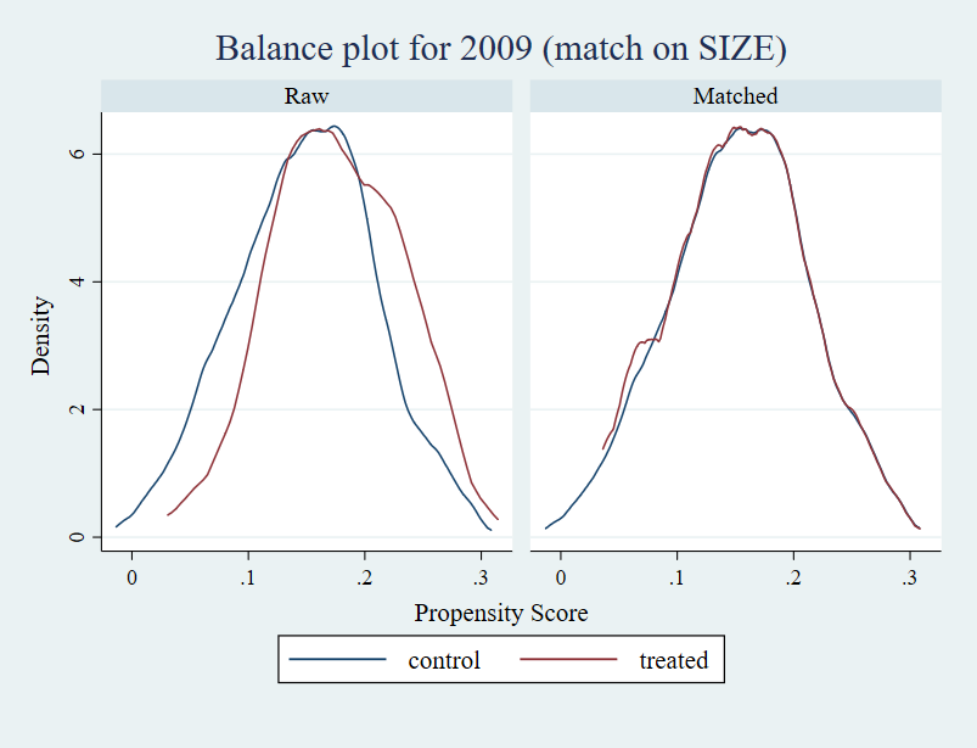
The Balance Density Plots for Tobin's Q for two years (2009 and 2018) before and after matching, showing us that the PSM system is indeed balancing the distribution between the two groups using our specified characteristics:

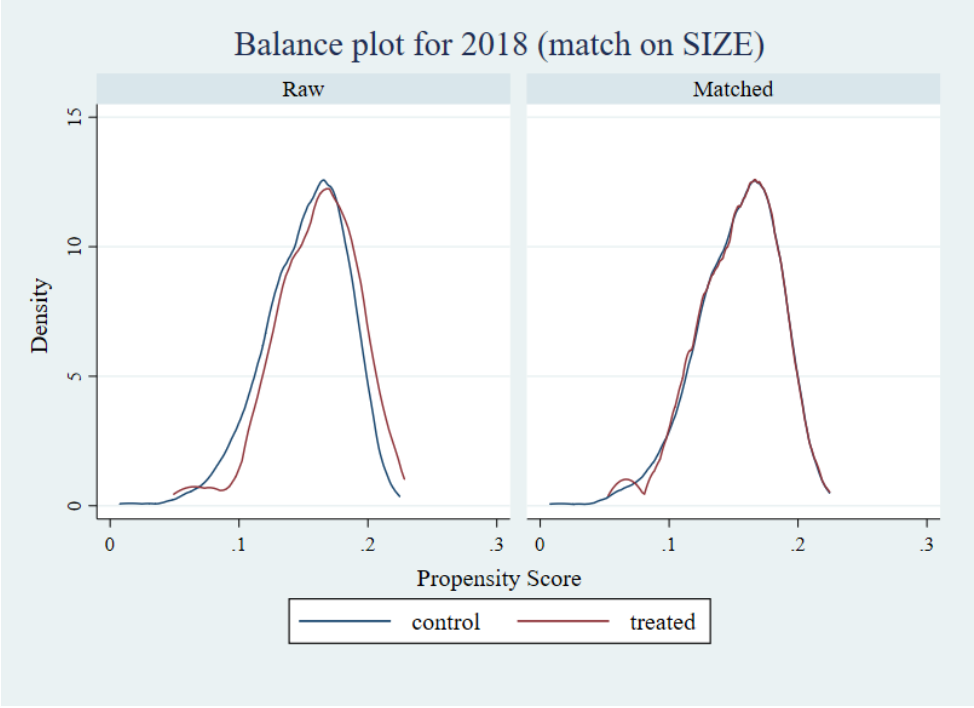

Balance plot for 2009 (match on Tobin'sQ)
Raw
Matched
Density
0
5
10
15
20
0
.2
.4
.6
.8
Propensity Score
control
treated


Balance plot for 2018 (match on Tobin'sQ)
Raw
Matched
Density
0
5
10
15
20
0
.2
.4
.6
.8
Propensity Score
control
treated

- ***Match on Size:***

The Balance Density Plots for Size for two years (2009 and 2018) before and after matching, showing us that the PSM system is indeed balancing the distribution between the two groups using our specified characteristics:





11.4 PSM and Paired T-Test for Panel data

Matched on	2009-2018
ESG (coefficient)	3.148***
	(0.803090)
Mean difference (t-stat)	10.278***
	(0.306295)

This table presents coefficient for ATE estimation with propensity-scores matched on ESG, and t-statistic for paired t-test for the period 2009-2018. A default logistic model predicts each firm's propensity score using control variables Tobin's Q, SIZE, AGE Dummy variable 1 indicates government ownership and 0 indicates non-government ownership. The sample consists of all 489 firms. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors are reported in parentheses.

11.5 Hausman Test

H0: Both fixed effects and random effects methods can be applied and there is no correlation between the errors and the regressors in the model

H1: Random effects estimator is inconsistent and so fixed effects model applies

Variable	*Fixed (I)*	*Random (II)*	*Difference (I-II)*	*S.E.*
Size	-2.47e-12	-3.29e-12	8.24e-13	6.37e-13
ESG	0.00279	0.00249	0.000298	0.000464

Chi-square = 0.41

Prob > Chi-square = 0.5213 > 0.05

This table presents results from the Hausman test detecting endogenous regressors (predictor variables) in a regression model to decide on the best regression method: fixed effects or random effects model. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1. Standard Errors reported in the last column.

11.6 Unit Root Test

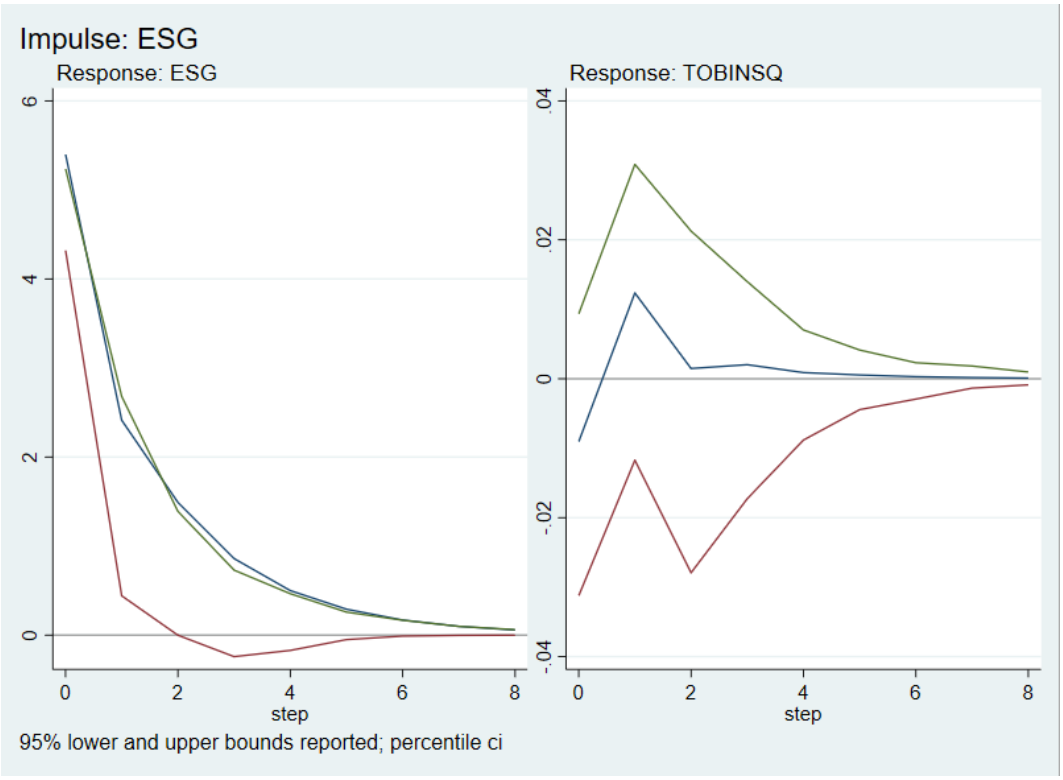
H0: Panel data contains unit roots

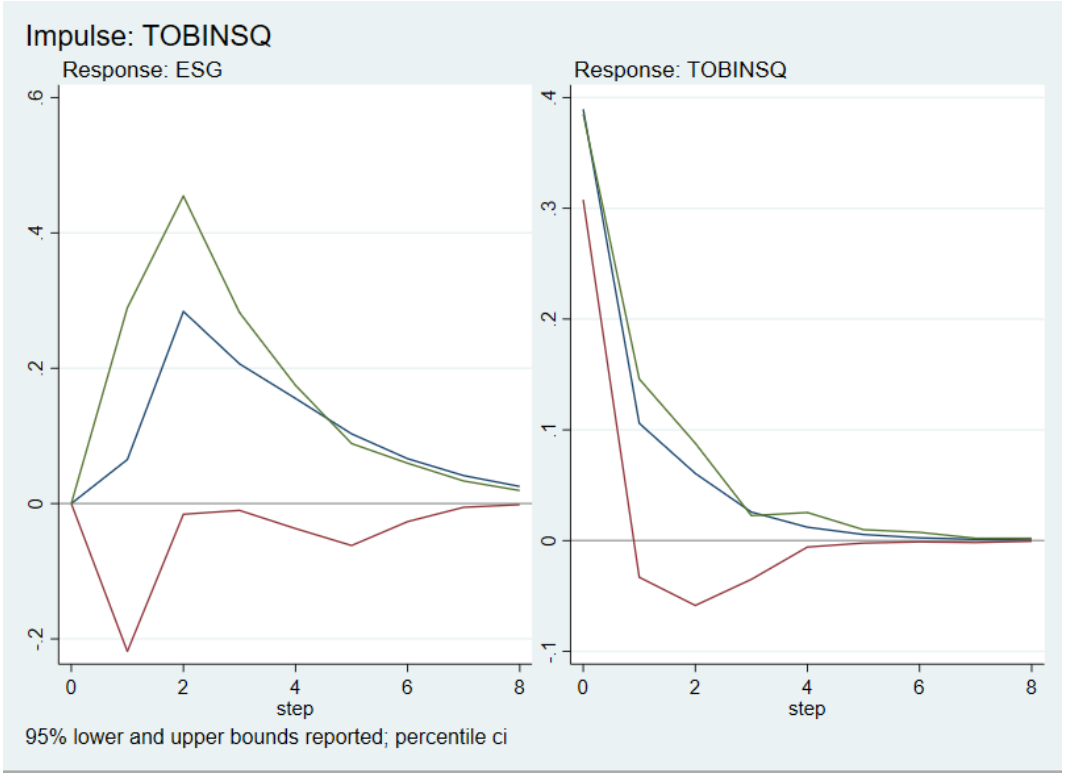
H1: Panel data is stationary

Variable	Unadjusted t	Adjusted t*	P-value	Periods	Decision
Tobins Q	-50.1211	-33.876***	0.0000	10	1 (0)
ESG	-38.9158	-21.546***	0.0000	10	1 (0)

The table presents results from augmented Dickey–Fuller regression for each panel. The test assumes a common autoregressive parameter for all panels. Xtunitroot uses the Bartlett kernel with 6 lags as selected by the method proposed by Levin-Lin-Chu. The statistical significance levels are the following: *** p<0.01, ** p<0.05, * p<0.1.

11.7 Impulse Response Shock results




Impulse: TOBINSQ
Response: ESG
Response: TOBINSQ
-.2
0
.2
.4
.6
-.1
0
.1
.2
.3
.4
0
2
4
6
8
step
step
95% lower and upper bounds reported; percentile ci