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Ara Jo

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Trust, Compliance and International Regulation*

Ara Jo†

LSE

May 2018

Abstract

In contrast to the documented negative relationship between trust and regulation, high-trust countries tend to be more stringent with their regulatory policies than low-trust countries when it comes to climate change. I reconcile these two conflicting observations by focusing on the role of trust in compliance at the micro level. Specifically, I test if trust positively affects compliance decisions, which allows the government to implement more stringent regulations that deal with global externalities, given the same level of international pressure. For this goal, I take advantage of a unique setting where countries face the same regulation but may differ in compliance behavior due to the differences in trust shared among their population by looking at the European Union Emissions Trading Scheme (EU ETS). The findings reveal that trust prevalent in the country where the installation operates has a strong positive influence on its compliance decision. To probe causality, I look within countries and exploit the differences in the location of central headquarters of multinational firms. This exercise reveals that installations owned by firms headquartered in high-trust countries were more likely to comply with the regulation than those owned by MNEs based in low trust countries even when they operate in the same geographic area.

JEL Classification: Q54, Z1, K32.

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†London School of Economics, Department of Geography and Environment and Grantham Research Institute, Houghton Street, London, WC2A 2AE, UK. Email: a.jo@lse.ac.uk.

1 Introduction

The importance of generalized trust – the expectation that a random member of society is trustworthy – in economic outcomes has gained recognition in the literature. In particular, a number of papers have studied the influence of trust in the design of formal institutions and demonstrated that the stringency of a wide range of state regulations can be explained by average trust in a cross-section of countries. They have emphasized a strong negative relationship between trust and government regulation in the context of business entry and labor market regulations (Algan and Cahuc, 2009; Aghion et al., 2010, 2011).

With climate change legislation, however, we observe the opposite: there is a *positive* correlation between the stringency of regulatory policies addressing climate change and the average level of trust. Countries associated with high trust (northern European countries, for instance) tend to have higher CO_2 emissions reduction targets, require larger shares of energy consumption to come from renewable sources, and were the first to introduce carbon tax schemes.[1] Indices that measure the stringency of climate change policies across countries provide further support for this relationship.

In this article, I attempt to reconcile these two conflicting observations by focusing on the role of trust in compliance at the micro level. Trust or trustworthiness may positively affect compliance decisions through strong internalized norms or strong social punishment for non-cooperative behavior in high-trust societies. It is then plausible that higher compliance in high-trust countries might have induced their governments to implement more stringent regulations that address global externalities such as climate change, particularly when there is a binding international goal to be reached as in the case of the European Union. Indeed, the potential differences in enforcement costs across countries are starting to be recognized. A recent policy report published by the European Commission documents that there is substantial variation in the cost of implementing EU-wide environmental laws across member states, some of which are directly measured and also others that are "difficult to quantify, but nevertheless real (Farmer et al., 2015)." My analysis in this paper adds support to their conclusion by providing empirical evidence on a potential source of different enforcement costs across countries associated with the differences in trust and civicness of their population.

I study how trust affects compliance decisions in the context of the European Union

[1]For example, Norway and Sweden have climate change legislation that requires themselves to achieve carbon neutrality by 2030 and by 2045, respectively. This is markedly stringent given the collective goal of 80 percent reduction in CO_2 emissions in the European Union by 2050. In contrast, related policies in several countries fall short in their ambition and stringency to contribute to this collective target. France and Greece (relatively low-trust countries) aim to reduce their emissions 75 percent and 60 to 70 percent by 2050, respectively (Nachmany et al., 2016).

Emissions Trading Scheme (EU ETS): the world's largest carbon trading market operating in 31 countries (all 28 EU countries plus Iceland, Liechtenstein and Norway). This setting offers a number of advantages. First, it provides an ideal environment in which the same legislation is implemented in multiple countries, thus allowing me to investigate the systematic differences in compliance behavior caused by cultural traits such as trust, which largely varies at the country level.[2] Relatedly, the penalty for noncompliance is set at the EU level. This feature substantially reduces the problem of differential levels of stringency in formal enforcement. Finally, the European Union Transaction Log (EUTL), a system harmonized at the EU level, provides detailed installation level compliance data comparable across countries. Existing papers that studied compliance decisions of firms have used data on a single industry or several industries in a single country (e.g. Gray and Deily, 1996; Shimshack and Ward, 2005, 2008; Dasgupta et al., 2000; Nyborg and Telle, 2006; Duflo et al., 2014; Evans, 2016). I address this lacuna by taking advantage of this unique international dataset that contains over 16,000 installations operating in 31 different countries.

Identifying the role of trust in compliance is confounded by the task of having to disentangle the effect of legal enforcement from the role of trust. Although the stringency of formal enforcement is harmonized at the EU level, it is likely that country-specific regulatory environment or institutional capacity is correlated with how the rules are enforced in each country. Given that previous studies have documented a strong influence of trust on the design of institutions and regulations (Algan and Cahuc, 2009; Aghion et al., 2010, 2011), it is then likely that trust picks up the effect of formal institutions on compliance, rather than trust per se. It is also possible that there exist unobservable national features correlated with trust and compliance in the EU ETS simultaneously such as geography or past efforts to reduce emissions.

I attempt to circumvent this difficulty with two approaches. First, I instrument the average level of trust in each country with trust inherited by second-generation immigrants whose parents came from these countries. Given the evidence that trust is highly persistent across generations (Rice and Feldman, 1997; Putnam, 2000; Guiso et al., 2006), inherited trust observed in second-generation immigrants is expected to be correlated with the level of trust in their countries of origin where their parents came from, and yet unlikely to directly affect compliance behavior of firms operating in their source countries since they are born and reside in their adopted countries. This measure of inherited trust helps isolate the role of trust from other country-specific factors that may affect compliance. Second, I look

[2]Some papers have also exploited within-country variation in trust. For instance, Guiso et al. (2004) study the effect of trust on financial development in Italy, a country known for its substantial cultural variation across regions. Tabellini (2010) also exploit regional variation in trust across 8 large European countries.

within countries and exploit the fact that a large share of the installations are operated by multinational subsidiaries. A number of papers have documented the influence of the source-country characteristics in MNEs' operation abroad (Bloom and Van Reenen, 2007; Burstein et al., 2009; Bloom et al., 2012b). Based on this insight, I investigate if trust in the country where the multinational is headquartered has influence on compliance decision in the affiliate's foreign location. This specification allows me to include country of operation fixed effects, which removes any bias associated with unobservable national characteristics that may be spuriously correlated with trust and compliance. I then investigate whether MNEs operating in the same country, thus exposed to the same external environment, differ in their compliance behavior due to the level of trust prevalent in their source countries.

Consistent with the main prediction of the conceptual framework, I find that trust prevalent in the country where the installation is located has a strong positive influence on its compliance decision. This finding is robust to including a full set of year and industry dummies, country-level controls and also firm-level characteristics that may affect compliance decisions. Second, exploiting the differences in the location of global headquarters of MNEs reveals that installations owned by firms headquartered in high-trust countries are more likely to comply with the regulation than installations owned by firms based in low-trust countries, even when they operate in the same geographic area (country as well as region): for example, in Germany, an installation operated by a multinational firm headquartered in Norway (a high-trust country) would be more likely to be in compliance with the EU ETS than an installation owned by another firm whose global headquarters are located in Greece (a low-trust country). The magnitude of the estimated effect is economically meaningful: a change in ownership from a multinational firm based in the lowest-trust country in my sample (Philippines) to another MNE headquartered in the highest-trust country (Norway) would be associated with a 1.5 percentage point decrease in the probability of noncompliance when the average noncompliance rate is 3.2 percent. This effect is comparable to the previous estimates for the effectiveness of traditional formal enforcement measures.

These findings have two interesting implications. First, the results imply that local norms, such as trust, could play a significant role in global cooperation problems such as climate change. In this article, I have argued that trust may affect the design of climate change legislation through its positive influence on compliance. Second, despite the growing evidence on the effect of culture on economic outcomes, understanding the mechanisms at the micro level has not been straightforward. As a remedy, Guiso et al. (2015a) argue that corporations and corporate culture offer economists a chance to develop a deeper insight into the specific workings of culture and how it relates to formal institutions. The strong firm-level empirical evidence regarding the effect of trust on compliance behavior documented

in my article adds support to this insight of using corporations as a laboratory in which to study the role of culture.

This paper contributes to several distinct strands of literature. First, it is related to the well-established literature on the effect of trust, or social capital at large, on various economic outcomes. Previous studies have documented that trust affects economic growth (Knack and Keefer, 1997; La Porta et al., 1997; Zak and Knack, 2001; Tabellini, 2010; Algan and Cahuc, 2010), financial development (Guiso et al., 2004), patterns of trade (Guiso et al., 2009) and global cooperative behavior (Carattini and Jo, 2018). Furthermore, trust has been shown to have a strong influence on the design of institutions and regulations (Tabellini, 2008a; Algan and Cahuc, 2009; Aghion et al., 2010, 2011). Despite the growing evidence for the importance of trust at the macro level, mechanisms that drive the observed cross-country relationships are not fully understood. I contribute to this literature by providing the first microevidence on the effect of trust on compliance behavior at the firm level.

Also related is the literature that investigates enforcement and compliance of environmental regulations. A number of papers have documented strong deterrent effects of formal enforcement actions (Gray and Deily, 1996; Deily and Gray, 2007; Shimshack and Ward, 2005, 2008; Dasgupta et al., 2000; Nyborg and Telle, 2006; Telle, 2013; Duflo et al., 2014).[3] Reecently, Evans (2016) has also shown the effectiveness of information-based enforcement tools on compliance using the Clean Air Act (CAA) watch list. On the other hand, Decker and Pope (2005) and Arguedas and Rousseau (2012) provide evidence for strategic complementarities between firms' compliance decisions whereby increased compliance by one firm diverts the regulator's attention to its rivals, which in turn increases the rival firms' compliance. My paper differs from the existing literature as I study compliance behavior in an international environmental regulation – the EU ETS – and show that the culture of generalized trust could also play a significant role in compliance decisions by exploiting country-level variation in trust in two ways: first, the variation in the location of installations and second, the variation in the location of the firm (that operates the installation)' global headquarters.

Finally, this paper is related to the literature on the transmission of culture by individuals across countries. This literature provides evidence that a wide range of economic decisions such as fertility, labor market participation (Fernández and Fogli, 2006, 2009) or living arrangements (Giuliano, 2007) of second-generation immigrants living in the US are strongly predicted by the practice in their source countries. Another interesting example is provided

[3]While focusing on the impact of formal enforcement measures on compliance, Gray and Deily (1996) and Deily and Gray (2007) also point out the influence of corporate culture or firms' 'unobserved propensity to comply' on compliance behavior.

by Fisman and Miguel (2007). They show that corruptive behavior of diplomats (measured by unpaid parking fines) stationed in the same city is predicted by the level of corruption in their home countries. Closely related to my analysis here is Bloom et al. (2012b) where they provide empirical evidence that supports this line of argument at the *firm* level. They find that trust in the country where multinational firms are headquartered has a strong positive correlation with decentralization in the affiliate's foreign plants, even when the managers in the plants are hired locally. I add to this literature by providing firm-level evidence that trust in the country where firms are headquartered has a strong positive influence on the compliance decisions of their installations even when they operate in a foreign country.

The article is organized as follows. In Section 2, I provide some motivating evidence on the correlation between trust and compliance behavior. Section 3 presents a simple conceptual framework. Section 4 provides background information for the setting and Section 5 describes data used for the analysis in detail. Section 6 presents the empirical analysis and Section 7 concludes.

2 Motivating evidence

In this section, I provide motivating evidence that gives rise to the hypothesis put forward in this paper. I begin by documenting a positive cross-country relationship between trust and the stringency of climate change regulation, which stands in contrast to the hitherto documented negative relationship between trust and other regulations. As a potential explanation, I focus on the role of trust in compliance and show that compliance is substantially higher in high-trust countries from micro-level regressions.

2.1 Data

I build trust measures using the European Social Survey (ESS). I pool data from the seven waves collected so far (from 2002 to 2014), which includes all European countries that participate in the ETS. The ESS measures generalized trust – the expectation that a random member of the society is trustworthy – by asking the classical question, "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?". Respondents' answers are given on a scale of 0 to 10, where 0 implies "You can't be too careful" and 10 means "Most people can be trusted". The variable that I use in the econometric regression is the average of this answer within the country where the installation is located.

To compare different patterns of correlation between trust and regulation depending

on the type of regulation, I use the stringency of regulation of product and labor markets commonly studied in the literature (Algan and Cahuc, 2009; Aghion et al., 2010; Alesina et al., 2015) and that of climate change regulations. The OECD indicator of the stringency of job protection over temporary and regular contract provides a measure for the stringency of labor market regulation that is comparable across countries.

The nationally determined, legally binding target share of renewable energy in gross final energy consumption by 2020 is used to reflect the stringency of climate change policies in EU countries. These targets, which are part of the National Renewable Energy Action Plan, are voluntarily chosen (not assigned) under the Renewable Energy Directive (2009/28/EC) that constitutes an important part of climate change legislation at the EU level. I also use the Climate Laws, Institutions and Measures (CLIM) Index, a globally comparative index that measures the stringency of climate change legislation developed by the European Bank of Reconstruction and Development (EBRD, 2011).

To look at the relationship between trust and compliance, I turn to the European Union Emissions Trading Scheme (EU ETS). Data on compliance in this international regulation between 2005 and 2015 comes from the European Union Transaction Log (EUTL), a system harmonized at the EU level that publishes information on compliance status, permit allocation, verified emissions and surrendered allowances at the installation level. I will save detailed descriptions of this key data for a later section.

2.2 Evidence

Figure 1 depicts what has been documented in the literature – a negative cross-country relationship between trust and domestic regulation of labor markets (measured by the stringency of employment protection legislation). High-trust countries such as Nordic countries as well as the United Kingdom tend to impose fewer restrictions on employers' hiring and firing decisions, whereas relatively low-trust countries such as Eastern European and Mediterranean countries tend to impose strict regulations. The correlation holds for a wide range of standard indicators for other regulations such as product market regulations as shown in Figure A1.[4]

[Figure 1]

On the other hand, Figure 2 shows a positive correlation between trust and the stringency of climate change legislation measured by the percentage of renewable energy in gross final

[4]The data of Djankov et al. (2002) on the number of steps that an entrepreneur must complete before opening a business proxies the stringency of regulation of product market entry.

energy consumption by 2020. High-trust countries (again such as Nordic countries and Switzerland in this graph) tend to require larger shares of their energy consumption to come from renewable sources than other countries. The stringency of this regulation in these countries (for instance, 67.5 percent in Norway and 50 percent in Sweden and Switzerland) is noteworthy especially given that the EU wide collective target is set at 20 percent. The correlation is statistically significant at the 1 percent level even after controlling for the log per capita GDP and the share of population with tertiary education (EBRD, 2011).[5] Similarly, composite indices such as the Climate Laws, Institutions and Measures (CLIM) Index in Figure 3 and the Environmental Policy Stringency (EPS) Index in Figure A2 are also positively correlated with trust across countries.

[Figure 2,3]

How can we explain this puzzle? To begin, I note that regulations previously studied in the literature are domestic regulations whose impact lies within the boundary of their nations and primarily deal with local (or within counties) demand. Their negative relationships with trust arise since trust tends to be associated with low public demand for state regulation. Regarding the stringency of labor market regulations, for example, Algan and Cahuc (2009) argue that governments in high-trust countries tend to insure their workers against unemployment through more generous unemployment benefits due to lower threats of moral hazard (i.e. workers are less likely to cheat on government benefits). It then leads to lower public demand for employment protection regulation in those countries. Similarly, Aghion et al. (2010) show that distrust creates public demand for business regulations since individuals prefer government regulation to unbridled economic activity by corrupt and uncivic entrepreneurs.[6] However, climate change regulation addresses *global* externalities and as such, there exists demand that applies to all relevant countries at the international level.

[5]It is reassuring that the correlation remains strong even when I control for a measure of national wealth because richer economies tend to be significantly more active in climate change mitigation and also given the documented relationship between trust and wealth across countries (e.g. Algan and Cahuc, 2010). To further support my argument that trust could matter (independently or in addition to the country's wealth) via lower enforcement costs when countries are voluntarily choosing their own policies to contribute to joint objectives, I contrast this correlation with another case using an *assigned* policy measure in Section A1 in Appendix A. As expected, the correlation between trust and this involuntary measure of climate policy disappears once I control for wealth (Table A6).

[6]Additional evidence for the importance of demand in explaining the stringency of regulation is provided by Alesina et al. (2015) where they demonstrate that strong family ties and the resulting immobility of workers give rise to stronger public demand for more stringent labor market regulations so that firms are less able to extract rents from their workers' immobility. They find empirical evidence that individuals with strong family ties are more likely to demand labor regulation and accordingly, there exists a strong positive relationship between family ties and labor market regulations across countries.

This is particularly true when there is a collective goal to be reached through cooperation of multiple countries as in the case of the European Union.[7]

It is then plausible that trust may affect the way governments deal with this international pressure through its positive influence on compliance. Governments that anticipate higher compliance due to trust and civic virtue shared among their citizens and therefore face lower enforcement costs may implement more stringent regulations in order to ensure that the collective goal is reached.[8] Despite the seemingly contradictory macro-level correlation, this conjecture suggests that the mechanism is in fact consistent with the previous studies in that trust affects institutional outcomes through how law-abiding people are (Tabellini, 2008a).

To investigate the effect of trust on compliance as a potential channel, I check if there is any pattern in the relationship between trust and compliance in the EU ETS. This unique international regulation allows comparing compliance behavior across countries with respect to the same regulation. Figure 4 illustrates that there is indeed a negative correlation between trust and noncompliance rates in the ETS across countries. While some countries are close to full compliance, other countries such as Bulgaria, Italy and Slovakia (relatively low-trust countries according to several international social surveys) display very high noncompliance, over or close to 10 percent.

[Figure 4]

Micro-level regressions in Table 1 confirm the negative correlation between trust and noncompliance. I begin by regressing the binary noncompliance variable that takes 1 if the installation is noncompliant and 0 otherwise against the trust measure of the country where the installation is located, without any controls (column (1) of Table 1). Standard errors are clustered at the country level. The correlation between noncompliance and trust is negative and highly significant – a 1 standard deviation increase in trust (0.95) from the mean is associated with a 1.6 percentage point decrease in the probability of noncompliance.

[7]Unlike demand for regulation that deals with business markets and wages, public demand for environmental regulation does not appear to be correlated with trust across countries, which also explains why the public demand channel emphasized in the previous papers is not at play in my context. I use the International Social Survey Programme (ISSP) data to document the weak association between demand for environmental regulation and trust in Section A2 in Appendix A. This aspect, together with the presence of international demand, points to the supply side dynamics of climate change regulations such as enforcement costs.

[8]One might argue that high-trust countries should also have more stringent regulations for other domestic economic activities if they face lower enforcement costs. However, as explained before, previous studies tend to emphasize the importance of demand in explaining the heterogeneity in the stringency of regulations rather than supply costs with domestic regulations. Furthermore, Aghion et al. (2011, 2010) show that formal regulations may disrupt the formation of civic virtues such as trust and cooperativeness (i.e. crowding out), which suggests another reason why governments in high-trust countries may be cautious about implementing more regulations than demanded.

Column (2) shows that the inclusion of year dummies and a full set of industry dummies hardly affects the correlation. To deal with the concern that trust might simply reflect higher levels of economic development (Algan and Cahuc, 2010; Tabellini, 2010; Zak and Knack, 2001; Knack and Keefer, 1997) or educational attainment (Tabellini, 2010; Alesina and La Ferrara, 2002), column (3) includes log gross domestic product (GDP) per capita, percentage of population with tertiary education, and log population.

[Table 1]

In column (4), I also include governance indicators developed by the World Bank in an attempt to control for the effect of formal law enforcement or institutional capacity on compliance. These are country-wide 'rule of law' and the perceived regulatory quality.[9] The correlation between trust and noncompliance, however, seems to exist independently over and above these institutional factors.

In column (5), I include firm-level controls in order to isolate the role of trust in the country where the installation operates, from firm-specific characteristics that could affect compliance decisions. I control for the number of installations each firm operates as well as several key financial variables such as the number of employees, operating revenue and total assets. The financial data comes from Bureau Van Dijk's Orbis Database (which I will discuss more in Section 5.3) and the descriptive statistics of firms in each country is reported in Table A1 in Appendix A. The coefficient in column (5) shows that the correlation between trust and noncompliance remains strong even when firm-specific variables are controlled for. In column (6) I try a logit model and find similar results.

Overall, this casual inspection provides suggestive evidence for the role of trust in compliance behavior of regulated firms, which warrants a more rigorous investigation.

3 Conceptual framework

In this section I discuss two main mechanisms for the association between trust and compliance based on the existing literature. I then focus on the common prediction of both theories that higher levels of generalized trust positively affect compliance.

[9]The precise definitions of these indicators are given in Kaufmann et al. (2011). Rule of law captures "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence". Regulatory quality measures "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development".

3.1 Internalized norms

Sociologists have documented that individuals in high-trust societies tend to have strong internalized norms: they donate to charity, obey traffic rules, and pay taxes because they feel obligated to do so (Portes, 1998). In a similar spirit, trust shared in an area may positively affect compliance in environmental regulation.

The growing literature on corporate culture suggests such internalized norms are also present at the firm level. Most firms have clearly defined corporate culture – principles and values that should inform the behavior of all the firm's employees (Guiso et al., 2015b).[10] It is then likely that these self-declared values are influenced by internalized norms of the individuals who form the organizations and those of the region where they operate.

In parallel to the literature on the transmission of culture by immigrants that emphasizes the strength and persistence of internalized norms (Fernández and Fogli, 2006, 2009; Giuliano, 2007), there is a growing interest in the influence of source-country characteristics in multinational firms' operation abroad. For instance, Bloom et al. (2012b) provide empirical evidence that firms in high-trust areas tend to be more decentralized since trust facilitates delegation of decision making power from the CEO to managers. More interestingly, they find that trust in the country where multinational firms are headquartered has a strong positive correlation with decentralization in the affiliate's foreign plants, even when the managers in the plants are hired locally. This finding suggests that firms also take some of their home country culture abroad and emphasizes the strong presence of internalized corporate culture within firms. Thus, I expect trust in the country where firms operate to be positively correlated with their compliance behavior and to potentially affect their foreign subsidiaries' compliance decisions through shared corporate culture.

3.2 Social punishment for noncompliance

Alternatively, assuming that social sanctions for noncompliance are stronger when compliance rate is higher, trust may affect compliance decisions of firms through a high expected compliance rate in society. In reality, the 'name-and-shame' sanction in the EU ETS whereby member states "ensure publication of the names of operators and aircraft operators who are in breach of requirements to surrender sufficient allowances" (Article 16(2) of the Directive 2003/87/EC, henceforth the Directive), clearly embodies the threat of social punishment for noncompliance.[11]

[10] Guiso et al. (2015b) report that when they looked at companies' web pages, they found that 85% of the Standard and Poor's 500 (S&P 500) companies had a section dedicated to corporate culture.

[11] Several papers have already noted social motivations behind compliance decisions such as reputation, shame and guilt arising from not being in line with the behavior of other firms (Posner and Rasmusen, 1999;

I provide a simple analytical model of firms' pollution behavior in the presence of regulation to formalize this reasoning.[12] Let firm i with emission intensity (or simply type) $\theta_i \in [0,1]$ choose an action $b_i \in [0,1]$ when there is a regulation $L \in [0,1]$ that imposes an upper bound on firms' actions.[13] The payoff is represented by:

$$u_i(b_i, \theta_i) = -a(b_i - \theta_i)^2 - (1-a)(b_i - B_j)^2 - \gamma \sum_{i \in N} b_i - \mu I_{\{b_i > L\}} \phi \tag{1}$$

where the element of trust shared in society j is introduced by B_j as the expected action of other firms. I assume that higher trust leads to a lower expected polluting action of other firms. The parameter $a \in (0,1)$ is an (inverse) measure of social sensitivity that governs the relative importance of matching one's own type versus matching the expected average action of other firms as shown in the first two terms.[14] γ captures negative externalities from the total emissions in society. It justifies interpreting lower B_j as higher trust because given this society-wide externality, trust or perceived trustworthiness of other firms leads to the expectation that other firms will choose lower actions for the common good. The last term subtracts the fine ϕ imposed on noncompliant firms, those choosing $b_i > L$, conditional on there being a formal inspection by the authority with probability μ.

Given the set-up, there is a threshold type $\theta^* = f(B_j, L, \mu, \phi)$, beyond which all types violate the regulation and below which all types comply with the regulation.[15] It is then straightforward to show that fewer firms violate the regulation (i.e., θ^* increases) when trust is higher (B_j is lower), the regulation is less stringent (the upper bound L is higher), and formal enforcement rules are stricter (μ and ϕ higher).[16]

The two potential channels discussed so far share the prediction that higher levels of trust lead to more compliance, which I bring to the data in the following sections. It is challenging to distinguish these two potential channels empirically. Later I attempt to provide suggestive evidence for the presence of internalized corporate culture by looking at multinational firms' compliance behavior when they operate abroad.

Banerjee and Shogren, 2010; Qin and Shogren, 2015).

[12]The set-up is adopted from Acemoglu and Jackson (2017) where they study the role of social norms in the enforcement of laws.

[13]Firm i' type $\theta_i \in [0,1]$ is distributed according to a cumulative distribution function F. For simplicity, F is assumed to be strictly increasing and continuous on [0,1] with $F(0) = 0$ and $F(1) = 1$.

[14]Note that deviation in both directions is equally costly. For deviation from the prevailing action in the opposite direction (complying when others violate), Fehr and Gächter (2000) provide experimental evidence that there is a strong aversion against being the "sucker" who cooperates when others do not.

[15]The existence of a threshold type follows from the monotonicity of the first order conditions. I provide a formal proof of this statement in Appendix B.

[16]Similarly, I formally show $\frac{\partial \theta^*}{\partial B_j} < 0$ in Appendix B.

4 Institutional background

In this section I provide a brief background on the European Union Emissions Trading Scheme (EU ETS) and its compliance cycle. Launched in 2005, the EU ETS is the world's largest carbon trading market operating in 31 countries (all 28 EU countries plus Iceland, Liechtenstein and Norway). It limits emissions from heavy energy-using installations (including power stations and industrial plants) and airlines operating between these countries covering around 45% of the EU's greenhouse gas emissions. Its geographic coverage, as large as all of Europe, offers a unique setting to investigate the extent to which compliance behavior with respect to the same regulation may differ across countries due to the differences in trust and civicness of the population.

The EU ETS is currently in its third phase that runs from 2013 to 2020, having gone through the first two phases. Phase 1 ran from 2005 to 2007 and was considered a pilot phase. The second phase ran from 2008 and 2012, the same period as the first commitment period under the Kyoto Protocol. In the first two phases, most allowances were allocated for free (i.e., grandfathered) to regulated installations based on historical emissions and the amount of allowances was decided via National Allocation Plans (NAPs) in each participating country. In phase 3, however, around 50% of total allowances are auctioned (with full auctioning for the power sector), with the share set to rise over the course of the trading period. Also, allocation is determined through common rules agreed at the EU level to improve transparency and harmonization of the permit allocation process across countries.

Integral to the scheme's successful implementation is the Monitoring, Reporting and Verification (MRV) system, known as the ETS compliance cycle. As a primary actor in all related procedures, operators of industrial installations and aircraft operators (henceforth called installations) are required to monitor and report their annual emissions to the Competent Authority (CA), one or more institutions within each country designated to ensure smooth running of the compliance cycle of the EU ETS.[17]

Specifically, installations report their emissions of the previous year verified by third-party accredited verifiers by 31 March of each year. Installations are then required to surrender a quantity of allowances equal to the volume of their verified greenhouse gas emissions of the previous year by 30 April of that year. An installation is considered out of compliance if the number of allowances surrendered by 30 April is lower than its verified emissions.[18]

[17] 15 out of 31 participating countries have one centralised CA that deals with all aspects of the ETS including permit allocation and compliance, whereas the rest has multiple CAs.

[18] In addition to EU allowances (EUAs), firms can use international credits such as Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) from the Clean Development Mechanism (CDM) and Joint Implementation (JI) from phase 2 with qualitative and quantitative restrictions.

Noncompliant installations are subject to the EU level penalty for the amount of emissions for which the installation failed to surrender allowances (40 euro per tCO_2 in phase 1 and 100 euro per tCO_2 in phase 2 and 3) and the shortfall in compliance is then added to the compliance target of the following year (i.e. paying a fine does not exempt noncompliant installations from their obligations to surrender sufficient allowances).

I focus on noncompliance in the form of not surrendering enough permits, for which all regulated installations face the same penalty and which I observe in the data. However, there are other forms of noncompliance such as failing to report changes in the installation's capacity or monitoring plans. With regard to these, each national government is required to lay down penalties that are "effective, proportionate, and dissuasive" (Article 16(1) of the Directive). The presence of these country-specific enforcement rules for other forms of noncompliance may have impacts on overall compliance behavior. This feature introduces difficulties in identifying the role of trust in regulatory compliance across countries (i.e. it would be problematic if high-trust countries also have more stringent enforcement rules and more frequent inspections). In later sections, I propose identification strategies that overcome this obstacle.

5 Data description

5.1 Compliance in the EU ETS

Data on compliance in the EU ETS is provided by the European Union Transaction Log (EUTL), a system harmonized at the EU level that publishes information on compliance status, permit allocation, verified emissions, and surrendered allowances at the installation level. Existing papers that have studied compliance behavior of firms have focused on a single industry or several industries in a single country.[19] While providing valuable insights into various motivations behind compliance decisions, these studies are unable to shed light on the systematic differences in compliance behavior caused by cultural traits such as trust, which largely varies at the country level. I address this lacuna by taking advantage of this unique international dataset that contains installations operating in multiple industries and multiple countries.[20]

[19]For single industry studies, see, for example, Gray and Deily (1996) for the US steel industry, Shimshack and Ward (2005, 2008) for the US pulp industry. Multi-industry studies include Dasgupta et al. (2000) for Mexico, Decker and Pope (2005) and Evans (2016) for the US, Nyborg and Telle (2006) for Norway, and more recently Duflo et al. (2014) for India.

[20]I drop Cyprus, Iceland, Liechtenstein, Malta, and Luxembourg since there are too few installations (less then 50) operating in these countries, thus may not represent the culture of the environment in which they

I use information on compliance status from 2005 to 2015 that includes all three phases so far. There are five possible compliance codes installations can be given: (1) A, when the number of allowances and permits surrendered by the deadline (30 April) is greater than or equal to verified emissions, (2) B, when the number of allowances and permits surrendered by the deadline is lower than verified emissions, (3) C, when verified emissions were not entered until the deadline, (4) D, when competent authority corrected verified emissions after the deadline and decided that the installation is not in compliance, and (5) E, when competent authority corrected verified emissions after the deadline and decided that the installation is in compliance. The distribution is reported in Table 2. Based on this categorization, I construct a binary noncompliance variable that takes 1 if an installation is given either B or D and 0 if an installation is given either A or E. In my preferred specification, I treat compliance status of code C as missing in order to be conservative.[21] Alternative specifications such as considering A and B only or treating C differently yield similar results.

The cross-country compliance rates depicted in Figure 5 reveals startling variation across countries. It is noteworthy that the distribution (Figure A3) is highly right-skewed with a majority of countries close to full compliance and several countries with very high noncompliance. Some countries such as Bulgaria, Italy, and Slovakia, have close to or over 10 percent noncompliant installation-year observations. However, the mean noncompliance rate is very low – 3.2 percent – and half the countries countries show less then 1 percent noncompliant observations during the sample period.

Figure 6 shows noncompliance rates by year. The occurrence of noncompliance was very high in 2005 (59% of all noncompliance occurring in the first year) and the rate was substantially lower in 2006 onwards. In case the cross-country pattern observed in 2005 is an outlier I exclude 2005 and calculate noncompliance rates across countries. A similar cross-country pattern continues to exist, albeit with lower magnitudes, as shown in Figure A4 with Bulgaria, Italy and France appearing high in the ranking. Even without 2005, noncompliance tends to be less frequent in phase 2 and phase 3. One possible reason is that the EU level fine for the amount of emissions for which the installation failed to surrender allowances increased by 2.5 times starting from phase 2 (40 euro per tCO_2 in phase 1 to 100

operate. Due to the small number of regulated installations, in some cases, technical aspects of monitoring, reporting and verification procedures were delayed (for instance, Malta), which could affect the compatibility of the data. I also drop Croatia that joined the ETS in 2013.

[21] Although failing to report verified emissions is strictly speaking noncompliance, two observations call for a more cautious approach. First, among observations with compliance status C, around 80 percent have incomplete information on permit allocation, either missing or zero even in the first two phases when most permits are given for free based on their historical emissions. Second, these installations tend to have missing verified emissions for multiple periods followed by missing compliance status in the following periods. Taken together, it is possible that these installations were no longer regulated (or active) and therefore did not have reporting obligations.

euro per tCO_2 in phase 2 and 3).

[Figure 5,6]

5.2 Measuring trust

As briefly explained in Section 2, the ESS measures generalized trust – the expectation that a random member of the society is trustworthy – by asking the classical question, "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?".[22] Respondents' answers are given on a scale of 0 to 10, where 0 implies "You can't be too careful" and 10 means "Most people can be trusted". The variable that I use in the econometric regression is the average of this answer within the country where the installation is located. For identification purposes, I later also explore the importance of trust prevalent in the location of the firm's headquarters (that owns the installation) when the firm's headquarters are located in a different country and therefore likely to be exposed to a different set of values and corporate culture.

This trust question appears in several other surveys including the World Value Survey (WVS) with the same wording and has been the most widely used tool to measure trust across countries in the literature.[23] A number of papers have confirmed that it is indeed correlated with trusting behavior. Fehr et al. (2003) show that survey questions of this type do capture trust by running a series of experiments, and Fehr (2009) further demonstrates that the survey measure of trust is strongly correlated with the behavioral measure of trust derived from trust games. On the contrary, Glaeser et al. (2000) provide experimental evidence that the survey question captures the trustworthiness of respondents rather than trust; but, this conflicting finding has been reconciled by Sapienza et al. (2013) who show that subjects in a homogeneous sample (such as Harvard undergraduates as in Glaeser et al. (2000)) tend to extrapolate the trustworthiness of others based on their own trustworthiness. However, in a large anonymous sample (such as random individuals in Germany as in Fehr et al. (2003)) in

[22]The ESS also measures trust that respondents have in parliament, legal system, the police, politicians and political parties. These measures can also explain compliance patterns and are highly correlated with the measure of generalized trust (the smallest pairwise correlation coefficient being 0.84 between trust in parliament and generalized trust). However, they are likely to reflect the quality of the corresponding institutions, whose effect on compliance I try to remove in order to focus on the effect of trust as culture. Thus I believe it is appropriate to focus on this measure of generalized trust in my analysis.

[23]Another popular approach is to measure trust in a trust game in experiments. See Johnson and Mislin (2011) for a meta-analysis of an extensive number of trust games in the literature. However, a clear limitation of this approach to measure trust is that it is difficult to derive a measure that is compatible across countries. There are multi-country experiments (e.g. Akai and Netzer (2012)), but still the sample tends to be not large enough to allow a rigorous cross-country econometric analysis.

which respondents are not extrapolating expected trustworthiness of others based own their own trustworthiness, the survey question does seem to capture trust. Thus, I believe the trust measure from the ESS is appropriate for the purpose of my analysis that investigates the role of trust in compliance decisions by firms.

[Figure 7]

Figure 7 plots the average level of trust by country. Two points are noteworthy. First, as shown in previous studies, there exists substantial variation in trust across countries. The average level of trust ranges from a minimum of 3.8 observed in Portugal to a maximum of 6.9 in Denmark. Second, it is readily observable that there are differences across regions of Europe; for instance, Nordic countries (Denmark, Norway, Finland, and Sweden) display highest levels of trust in the sample. On the other hand, Mediterranean countries such as Greece, Italy, and Portugal appear to have lower levels of trust. Continental European countries tend to be in the middle of the trust ranking.[24]

5.3 Firm-level controls

Data on firm characteristics comes from Bureau Van Dijk's Orbis Database. The account holders' information in the EU ETS (i.e., regulated installations) was matched to the corporations in the Orbis Database in Calel and Dechezleprêtre (2016). Only less than 3 percent of installations are left unmatched. I obtain key financial variables that may affect compliance decisions (i.e., firms may be too financially constrained to buy enough permits) including the number of employees, operating revenue and total assets for the sample period as well as firms' ownership structure in 2015 and the number of installations run by each firm. These controls will also account for firm-level heterogeneity more generally. Table A1 in Appendix A reports the descriptive statistics of these variables for firms in each country.

6 Trust and compliance

The discussions in the conceptual framework in Section 3 predict that greater trust leads to higher compliance, or fewer firms violating the regulation. In this section, I subject this prediction to rigorous econometric investigation.

[24]It is beyond the scope of this paper to explain the sources of variation in trust across countries. There is a related literature devoted to this question. For historical determinants of differences in cultural norms of behavior, see Tabellini (2008b); Durante (2010); Nunn and Wantchekon (2011). Guiso et al. (2009) explore several long-term determinants of *bilateral* trust between two countries. For studies that emphasize short-run determinants of trust, see Glaeser et al. (2000), and Alesina and La Ferrara (2002), and Jo (2017).

6.1 Using inherited trust as instruments

The negative correlation between trust and noncompliance documented in Section 2 is consistent with the theoretical prediction. However, it is possible that trust picks up the effect of country-specific regulatory environment or institutional capacity that might be correlated with trust, given the documented influence of trust in shaping institutions and regulations (Algan and Cahuc, 2009; Aghion et al., 2010, 2011). Relatedly, Cohen (1998) and Brehm and Hamilton (1996) have argued that the presence and characteristics of other environmental regulations may affect compliance behavior of firms through higher degrees of familiarity and knowledge with compliance procedures. I included a measure that controls for rule of law and the perceived quality of regulation in Section 2.2, but it may not be perfect.

It is also plausible that the correlation could also be explained by some unobservable factors that affect regulatory compliance of firms and the level of trust within the country simultaneously.[25] For instance, Carattini and Jo (2018) document that high-trust countries have reduced their per capita CO_2 emissions more substantially than low-trust countries between 1950 and 2010. Then, one might argue that it might be easier for installations in high-trust countries to comply with the EU ETS since they already operate in an environment more conducive to reducing emissions. Thus, what I need is a measure that can predict the average level of trust in a country, but uncorrelated with country-specific formal institutions and other unobservable features that may affect compliance behavior of firms.

One such measure is the *inherited* component of trust observed in second-generation immigrants. This epidemiological approach has gained recognition in the literature (Fernandez, 2007) and been adopted by several papers that attempt to isolate the causal effects of trust on economic outcomes (Algan and Cahuc, 2010; Butler et al., 2016; Carattini and Jo, 2018). The insight is based on the evidence that trust is highly persistent across generations through the transmission of values within families (Rice and Feldman, 1997; Putnam, 2000; Guiso et al., 2009). Then, inherited trust observed in second-generation immigrants is expected to be correlated with the level of trust in their countries of origin where their parents came from, and yet unlikely to directly affect compliance behavior of firms operating in their source country since they are born and reside in their adopted countries.

[Figure 8]

I apply this idea to my analysis by using, for example, the average level of trust among second-generation British immigrants born and raised in any of the other ESS countries

[25] I believe the threat of reverse causality is minimal given the extensive evidence on the importance of historical determinants of trust (Guiso et al., 2009; Durante, 2010; Tabellini, 2010; Nunn and Wantchekon, 2011).

to predict the level of trust in Britain. The exclusion restriction is then trust of second-generation British immigrants born and living in Spain, for instance, should not directly affect compliance decisions of regulated firms operating in Britain between 2005 and 2015. The number of second-generation immigrants from each country from which I estimate this measure of inherited trust is reported in Table A2 in Appendix A. Figure 8 clearly depicts a strong positive correlation between the inherited trust of immigrants and the level of trust observed in their source county, which ensures a strong first stage.

I estimate regression equations of the following form:

$$Noncompliance_{ijct} = \alpha + \beta Trust_c + \phi C_{ct} + \rho F_{ijct} + \delta Year_t + \xi Industry_j + \epsilon_{ijct} \qquad (2)$$

where $Noncompliance_{ijct}$ is a binary variable that takes 1 if firm i in industry j in country c is out of compliance in year t. $Trust_c$ is the average trust of country c where installations are located. It is reasonable to suppose that the variable does not vary over time during the 11-year period I study, given the persistent nature of trust across generations.[26] Most empirical analyses in the trust literature follow this approach by taking the average of trust in surveys conducted since the 80s (e.g. Tabellini, 2010; Bloom et al., 2012b).[27] Therefore, I run a pooled regression despite the panel nature of the dependent variable. To avoid understating the standard errors due to repeated observations, the errors are clustered at the country level over all years. C_{ct} and F_{ijct} represent country-level controls and firm-level controls. I further include year dummies and industry dummies.

[Table 3]

Table 3 reports IV probit estimates. Column (1) first shows the IV estimates from the regression that does not include any controls to begin with. The coefficient on trust is negative and statistically significant (with P-value 0.018). The instrument is strong with F-statistics over 40. Column (2) includes year dummies and industry dummies, which will capture industry-specific characteristics that may affect compliance such as available abatement technology or market situations. In column (3), I include country-level controls such as

[26] To formally test if there is time variation over the study period I check whether there is overlap in the 90% confidence intervals of the trust variable for the start and end year using 2000 and 2014 wave, respectively. Only two out of 25 countries in my sample have non-overlapping confidence intervals over this period.

[27] Few studies exploit time variation in trust with a notable exception being Algan and Cahuc (2010). They suggest a methodology to recover long intertemporal variation in trust by comparing immigrants who moved to America from different countries at different points in time and generate a trust measure for 25 countries with time variation over 60 years, which arguably covers multiple generations. Their trust variable measures trust in two points far apart in time, 1935 and 2000, to allow sufficient time for the evolution of trust. Algan and Cahuc (2009) also exploit time variation in trust over 20 years in one of the specifications, using only the end points of their data (1980 and 2000) to get enough variation.

log GDP per capita, log population, educational attainment and two governance indicators that measure country-wide rule of law and perceived regulatory quality (summary statistics of these variables are reported in Appendix C). In column (4), I further include firm-level variables such as the number of installations each firm owns (to control for economies of scale in compliance) and operating revenue, total assets and number of employees to control for the possibility that firms were too financially constrained to buy permits. Due to the large number of missing values in these firm-level financial variables, the sample size falls substantially, and yet the negative relationship between trust and noncompliance remains robust.[28] Column (5) shows the reduced form relationship between inherited trust and noncompliance. The 2SLS estimate from a linear probability model is qualitatively similar with a coefficient (standard error) of -0.049 (0.028).

The magnitude of the association between trust and compliance is substantial. The estimate from column (4) that includes the full set of controls implies a 1 standard deviation increase in trust (roughly from trust in Italy to trust in Netherlands) is associated with a 2.4 percentage point decrease in the probability of noncompliance.

Some papers have exploited within-country regional variation in trust for identification purposes (Guiso et al., 2004; Tabellini, 2010; Bloom et al., 2012b). I also try a trust measure at the region level in column (6) and find consistent results. The most prominent benefit of exploiting regional variation in trust is that it allows including country fixed effects and the studies mentioned above successfully combine country fixed effects with region-level instruments to estimate the causal effects of trust. However, the difficulty of adopting this approach in my context is that country fixed effects will make it impossible to use my instrument, which is at the country level (the *region* of origin of immigrants is not asked in the ESS).[29] In the next section, I suggest an alternative design that allows both using the instrument and country fixed effects.

6.2 Exploiting differences in the location of headquarters

About 80 percent of installations (10,692 in total) for which I have ownership data are owned by multinational firms (MNEs) and 4,310 of them are owned by foreign MNEs whose central

[28]To make sure the presence of missing values does not alter the distribution of compliance, I check if the compliance rate differs with and without observations with missing firm-level controls and find that the distribution of the dependent variable (noncompliance) is not statistically different across the two groups (with P-value of the test statistics 0.64).

[29]Another concern is that there might not be enough regional variation in trust once country dummies are included, given that my sample includes 25 European countries, many of which are culturally homogeneous. Previous studies that exploited regional variation in trust focused on large countries known for substantial within-country variation in trust including Italy (Guiso et al., 2004; Tabellini, 2010) or on the entire world Bloom et al. (2012b).

headquarters are located in a different country from the country where the installations operate. This subsample offers a chance to further probe the causality of the relationship that I attempted to estimate so far by allowing country of operation fixed effects. Country fixed effects remove any bias associated with unobservable national characteristics that may be spuriously correlated with trust and compliance. I then compare compliance behavior of installations that are exposed to the exact same external environment (e.g. legal enforcement, stringency of other related regulations, etc.) but have different levels of trust coming from the country of origin.

The importance of country of origin characteristics in MNEs' management and organizational structure has long been recognized in the relevant literature. A study most relevant to my analysis is Bloom et al. (2012b) where they provide evidence that the level of trust prevalent in the country where the multinational is headquartered has a strong positive effect on the degree of decentralization in the affiliate's foreign location (for instance, a Swedish affiliate operating in the US is typically more decentralized than a French affiliate in the US). Furthermore, Bloom et al. (2012a) show that US multinationals operating in Europe displayed higher productivity in the use of information technologies (IT) than non-US multinationals in Europe during the period when the US experienced a rapid productivity growth in sectors that intensively use IT. Burstein et al. (2009) and Bloom and Van Reenen (2007) also document the transmission of knowledge and management practices across countries in MNEs. Given this ample evidence on the influence of source-country characteristics over MNEs' operation abroad, it seems legitimate to investigate whether there might be different patterns in compliance behavior across multinationals based in different countries.

It is possible, however, that some firms might have experienced changes in ownership through mergers and acquisitions (M&As) just before or while being subject to the EU ETS. In particular, if firms are recently bought out by foreign enterprises that may have substantially different source-country characteristics, the level of trust prevalent in the country where the new headquarters are located might not precisely predict the compliance behavior of their installations.[30] To reduce the potential measurement error arising from this scenario, I identify firms that were bought out by foreign companies (i.e., target firms in foreign M&A deals) since 2000, five years prior to the start of the ETS, using rich M&A data from Bureau Van Dijk's Zephyr Database. There are only a small number of such firms in my sample (264 out of 8,156 firms). I drop 573 installations owned by these firms from the regression.

The results of this analysis are reported in Table 4. For this exercise, I construct another

[30]The case of firms in my sample buying other firms, as opposed to being bought out, is not likely to introduce measurement error in the trust variable because it does not bring about changes in the relationship between pre-existing subsidiaries and their global owners that I exploit here.

trust measure from the World Value Survey (WVS) since there are a number of non-European countries in which MNEs in my sample are headquartered and thus not included in the ESS.[31] As before, I pool together individual responses from all six waves conducted so far (1984, 1993, 1999, 2004, 2009, and 2014), and compute the average level of trust in the country where the global headquarters of the installation is located.[32] I later also check for the independent role of trust in the installation's location.

[Table 4]

Column (1) shows the relationship between compliance and the level of trust in the country where the central headquarters are located without any controls. Standard errors are clustered at the country level. The coefficient is negative and significant at 1 percent level, which suggests that trust prevalent in source countries is positively correlated with the affiliates' compliance decisions. The influence of trust in the country of headquarters remains strong even when I control for individual firm-level characteristics in column (2). Next, I include country of operation fixed effects as well as year and industry fixed effects. The magnitude of the coefficient falls sharply with an extensive set of fixed effects, but the coefficient in column (3) is still negative and significant. This implies that installations owned by firms based in high-trust countries are less likely to violate the regulation than those owned by firms in low-trust countries, even when they operate in the same country. In column (4), I add the level of trust in the location where the installation operates (at the region level, since the country-level measure will be omitted due to country fixed effects). The coefficient on trust in the region of installation is insignificant, while the role of trust in the country of headquarters remains negative and statistically significant with a similar magnitude as in column (3).

It is still possible that an endogeneity bias is affecting the coefficient of trust even with country fixed effects. For instance, Bloom et al. (2012b) show that MNEs with headquarters in high-trust countries are larger in firm size and more productive than those with headquarters in low-trust countries. If compliance behavior is correlated with these firm characteristics related to trust that I cannot directly control for (although I control for the number of employees), the estimate might be biased. Thus, I apply the same instrument developed in the section above to further probe the role of trust in compliance behavior. The measure of inherited trust observed in second-generation immigrants is still valid in

[31] There are 44 source countries in my sample and the median (mean) number of firms headquartered in each source country is 28 (103).

[32] The only difference in the trust question in these two surveys is the scale used for the answer. While the ESS uses the scale of 10, the WVS provides a binary choice between 0 and 1 where 0 implies "You can't be too careful" and 10 means "Most people can be trusted".

this context, since it predicts the level of trust in their source countries but unlikely to be correlated with the organization and performance (such as size and productivity) of MNEs headquartered in those countries. Column (5) reports the IV estimates. The coefficient is negative and of larger magnitude when instrumented and still statistically significant. Column (6) shows the presence of a negative and significant relationship between noncompliance and the measure of inherited trust in the reduced form. In column (7), I further include time-varying country-level controls in addition to the country of operation fixed effects. The negative relationship between trust and noncompliance remains robust. Column (8) includes *region* fixed effects, comparing compliance decisions of MNE's based in different countries operating within the same region. Even in this demanding specification, the influence of trust in the MNE's source country continues to exist. Repeating this specification in a linear probability model yields similar results (unreported).[33]

Not only is the estimated effect of trust on compliance statistically significant, it is also economically meaningful. The estimate in column (5) implies that a change in ownership from a multinational firm based in Philippines (the lowest-trust country in my sample) to another MNE headquartered in Norway (the highest-trust country) would be associated with a 1.5 percentage point decrease in the probability of noncompliance. How large is this effect relative to that of formal enforcement on compliance? To provide a sense of magnitude, I compare this effect with other existing estimates for the effectiveness of formal enforcement actions reported in previous papers. Estimates for the effect of traditional regulatory measures (e.g. inspections and fines) range between 42 and 52 percent treatment effects (Gray and Shimshack, 2011).[34] Also, Evans (2016) documents that an information-based enforcement tool such as the "watch list" in the Clean Air Act is associated with a 21 percentage point decrease in the probability of noncompliance, indicating a 29 percent treatment effect given the average noncompliance rate 72 percent. Compared with these previous estimates, the effect of trust still seems large: given the average compliance rate of 3.2 percent in my sample, the predicted fall in the probability of noncompliance by 1.5 percentage point caused by the change in ownership from a Filipino firm to a Norwegian firm implies a 47 percent treatment effect.

[33]It yields a coefficient (standard error) on the trust measure of -0.023 (0.010).

[34]Deily and Gray (2007) studied the deterrent effects of regulatory measures on compliance in the Clean Air Act using compliance data on large steel mills in the Unites States. They found that being subject to an enforcement activity in the prior two years decreased the probability of noncompliance by 32 percentage point. Given the overall noncompliance rate 62 percent, the estimate suggets a 52 percent treatment effect. In a similar context, using compliance data on pulp and paper mills Gray and Shadbegian (2005) found that a typical regulatory action decreased the probability of violation by 10 percentage point, implying a 42 percent treatment effect (with the average violation rate 24 percent in the sample).

6.3 Robustness checks

In this section I report the results from a number of robustness checks. Table A3 reports robustness checks for the cross-country analysis using all firms (as in Section 6.1) where I try to (1) drop late joiners in the EU ETS, (2) use alternative specifications for noncompliance, (3) use alternative measures of trust, (4) use an alternative specification for the measure of inherited trust, and (5) check if installations' compliance behavior is different also at the intensive margin, i.e., if the amount by which installations are noncompliant can also be explained by the level of trust. Here I focus on the main results from the specification using MNEs that includes country of operation fixed effects. First, I add region-level economic controls (log GDP per capita, log population and the percentage of population with tertiary education) in addition to country of operation fixed effects (column (1) in Table 5). Also, I exclude Bulgaria and Romania that joined the EU ETS later, in case there might have been technical difficulties arising from immature infrastructure. Bulgaria and Romania started to participate in the ETS in 2007 when they joined the European Union in the same year.[35] Excluding these late joiners does not affect the relationship between trust and compliance (column (2)).

[Table 5]

Next, I try alternative specifications for the binary noncompliance variable. In my preferred specification, I dropped installations with compliance status C that did not report their verified emissions (the step before they surrender corresponding amount of permits) in order to be conservative because there is suggestive evidence that these installations are no longer regulated or active (see footnote 21). Alternatively, I treat these installations as noncompliant when they can be reasonably presumed to be active by two standards: first, when they have non-missing information on permit allocation in the current period and second, when they have non-missing compliance status other than C in the following period. The regression in column (3) uses this alternative measure of noncompliance. The magnitude of the coefficient on the trust measure falls but it remains significant at 10 percent level. I also try to drop installations whose verified emissions were corrected later by the competent authority (i.e. those with code D and E) and find similar results (column (4)).

In column (5) and (6) I try alternative measures of trust to get a sense of potential measurement error in the trust variable. First, I construct a measure that takes into account year-specific shocks since I pool multiple waves conducted in different years to calculate the average level of trust in each country. Following Bertrand et al. (2004) and Guiso et al.

[35] Croatia also joined the ETS in 2013 and is already dropped from my sample along with five small countries with less then 50 installations.

(2009), I regress trust on year dummies, form residuals, and then compute the means of these residuals by country. Column (5) shows that the coefficient on this alternative measure of trust is still negative and significant at 1 percent level. Next, I try a potentially more demanding approach that further takes into account individual respondents' characteristics such as gender, age, education and income as well as year dummies. To proceed, I follow Algan and Cahuc (2010) by regressing trust on a set of individual characteristics, year fixed effects and country fixed effects. The coefficients on the country fixed effects then measure the average level of trust relative to the omitted reference country (Germany, in this case). The results from the individual-level regression are reported in Table A5 in Appendix A. The fact that coefficients on the country dummies are significant (with standard errors clustered at the country level) even after controlling for a set of individual characteristics and year dummies confirm the substantial cross-country variation in trust documented in the literature. Column (6) reports the IV probit estimate from the specification using this alternative trust measure and shows the results consistent with previous findings. The effect of trust on compliance remains robust across different measures of trust.

Finally, I try an alternative specification of the instrument that imposes a minimum of 25-year lag between the launch of the EU ETS and the year of immigration of the second-generation immigrants' parents as in Algan and Cahuc (2010) . This is to further ensure that the exogeneity assumption is satisfied, since I only use second-generation immigrants born before 1980 and therefore whose parents must have left their source countries before 1980, at least 25 years (one generation) prior to the start of the ETS in 2005. Then it is even less likely that the level of trust transmitted by those who left the country at least 25 years ago still affects compliance behavior of firms in that country. Column (7) shows that the result with this instrument is very similar and the modified instrument still has a strong predictive power (F-stat is 18.6 and Figure A5 graphically shows the positive correlation). Column (8) shows the presence of a negative and significant relationship between noncompliance and the alternative instrument in the reduced-form regression.

6.4 Extension: bilateral trust

Several papers have looked at the influence of *bilateral* trust between two countries in economic activities (Guiso et al., 2009; Bloom et al., 2012b). The measure of bilateral trust used in the literature comes from the following question in a series of surveys conducted for the European Commission: "I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust, or no trust at all." This question allows me to explore

the role of trust between the host and the source country in MNEs' compliance decisions controlling for country of operation and country of origin fixed effects at the same time and thus solely exploit the pairwise variation in trust. In other words, it will reveal, for instance, if a French affiliate is more likely to comply with the regulation in Belgium (that the French tend to trust) than in the United Kingdom (that the French tend to distrust).

[Table 6]

Column (1) in Table 6 shows that bilateral trust does not play a significant role in multinationals' compliance behavior when I include a full set of country of location and origin dummies (therefore this specification only includes foreign MNEs). The result is similar when I add firm-level controls in column (2). In case the bilateral trust variable is affected by endogeneity (for instance, better compliance behavior in the country of operation might engender trust towards the source country or there might be omitted bilateral factors affecting trust and compliance behavior at the same time), I use a measure of religious similarity between two countries developed in Guiso et al. (2009) to instrument for bilateral trust.[36] This measure is positively correlated with bilateral trust due to long-standing cultural affinities, but unlikely to affect regulatory compliance exhibited by firms. It yields a strong first stage (with F statistics of 22) as in previous studies, but the bilateral trust variable is still insignificant as shown in column (3). I add an additional instrument in column (4) that measures somatic distances, based on the average frequency of specific traits (hair color, height, etc.) present in two populations developed in Guiso et al. (2009) since people tend to trust other people who look like them more. The first stage F statistics continues to be strong (around 15). However, the coefficient on bilateral trust remains qualitatively similar with no meaningful impact.[37]

The result seems to suggest that firms do not comply selectively depending on the location of their operation: French subsidiaries are no more likely to be in compliance with the regulation in Belgium than in the United Kingdom. The finding is perhaps intuitive when we consider that the outcomes which bilateral trust has been shown to affect – for instance, trade flows between two countries in Guiso et al. (2009) and delegation of decision-making power from the CEO to the plant manager in Bloom et al. (2012b) – are indeed bilateral or relational. On the other hand, the nature of compliance decision resonates more closely with the concept of *generalized* trust that I focused on in this paper in a similar spirit that the use

[36]This variable measures the probability that two randomely chosen individuals in two countries will share the same religion and is calculated by taking the product of the share of people in country i and in country j who have religion k and then sum across all religions k (where k includes Catholic, Protestant, Jewish, Muslim, Hindu, Orthodox, other affiliation, and no religion) based on the World Value Survey.

[37]When I only include the measure of somatic distances as an instrument (the first stage F-statistics is 9.7), the result is qualitatively similar (unreported).

of checks rather than cash in Guiso et al. (2004) and more demand for business regulation against corrupt businessmen in Aghion et al. (2010) are related to generalized trust. Further, the finding here is consistent with Fisman and Miguel (2007) that provide evidence on the strong effect of source-country culture, rather than culture in the country of residence, on law-breaking behavior at the individual level.

7 Conclusion

In this article I have provided evidence on the positive role of trust in compliance as a potential factor that can explain the heterogeneity in the stringency of climate change regulations across countries. Trust or trustworthiness may positively affect compliance decisions through strong internalized norms or strong social punishment for non-cooperative behavior in high-trust societies.

The EU ETS and the data on compliance under this international regulation has provided a unique opportunity to investigate if countries differ in their compliance patterns with respect to the same international regulation due to the differences in trust and civicness. Using this data, I find strong empirical evidence that trust in the country where the installation is located has a positive influence on its compliance decision. Interestingly, the pattern continues to exist when I look within countries and compare compliance behavior of multinational subsidiaries whose central headquarters are located in different countries: installations owned by firms based in high-trust countries were more likely to be in compliance than those owned by firms located in low-trust countries, even when they operate in the same country thus exposed to the same formal enforcement environment. These results underpin the findings from the existing literature that emphasizes the influence of source country characteristics in MNEs' operation abroad.

One notable implication of my findings is that local norms, such as trust, could play a significant role in global cooperation problems such as climate change. In this article, I have shown that trust could affect the design of climate change legislation through its positive influence on compliance: higher compliance in high-trust countries may induce their governments to implement more stringent regulations that address global externalities than some of their neighbors, particularly when there is a binding international goal to be reached as in the case of the European Union. The argument is consistent with the previous studies that suggest trust can affect institutional outcomes through how law-abiding people are.

Another interesting implication is related to the idea of using corporations as a lab in which to study the role of culture. Although the role of culture in economic activities

has long been recognized, economists' attempts to develop a deeper insight into specific workings of culture have not been straightforward because (1) it is difficult to know where culture comes from, (2) it is sticky with rare drastic changes, and (3) even when these cultural changes occur they take place over a long period with many other things happening at the same time. Guiso et al. (2015a) note this problem and suggest corporations as an alternative environment to study the role of culture. This is indeed promising since with corporate culture, we know (1) when, how, and based on what values corporations are founded, (2) corporate culture is subject to more frequent changes (e.g., through hiring, firing and M&As), and (3) performance is more easily measured (Guiso et al., 2015a). There is an increasing interest in this line of reasoning that sheds light on specific mechanisms behind the documented effect of culture at the macro-level. For instance, Bloom et al. (2012b) provides evidence on the influence of trust in firms' decision to decentralize, which allows more efficient resource allocation within and across firms that leads to higher firm productivity and economic growth. This serves as microevidence for the long-held belief that trust facilitates economic growth through lower transactions costs (Arrow, 1972). Similarly, this current article provides a plausible mechanism for the relationship between trust and climate change regulation by providing microevidence on the role of trust in compliance at the firm level. I concur with Guiso et al. (2015a) that these approaches substantially enhance our understanding of how cultural norms affect economic behavior and relate to formal institutions.

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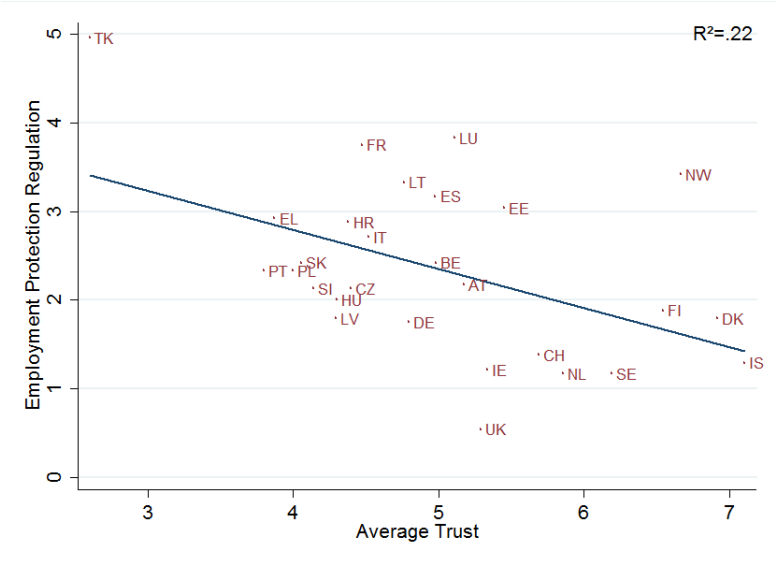
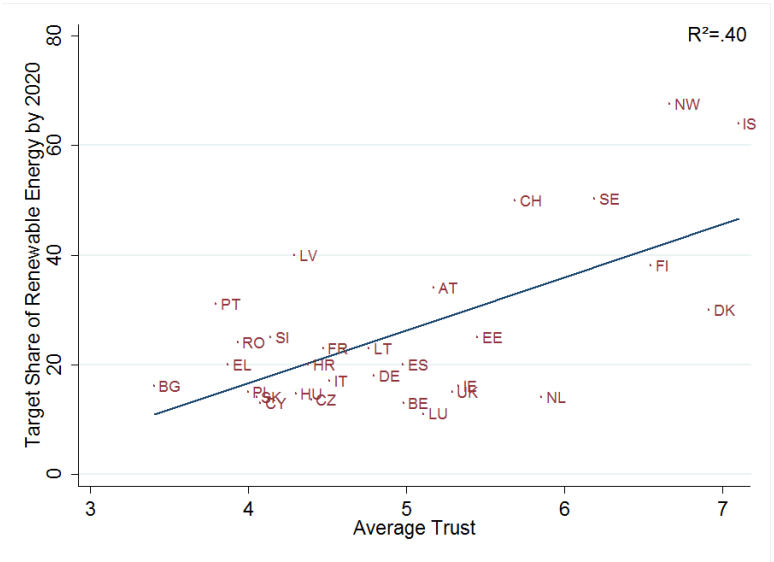
Figures and Tables

Figure 1: Correlation between Trust and Employment Protection Regulation



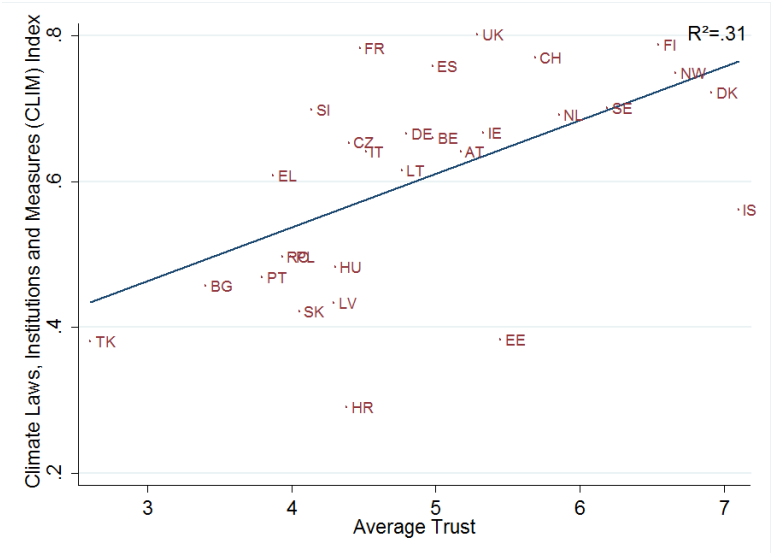
Note: the graph plots the relationship between trust and the stringency of labor market regulation. Data on the stringency of employment regulation comes from the OECD. The trust measure is constructed based on the European Social Survey (2000-2014).

Figure 2: Correlation between Trust and Renewable Energy Regulation



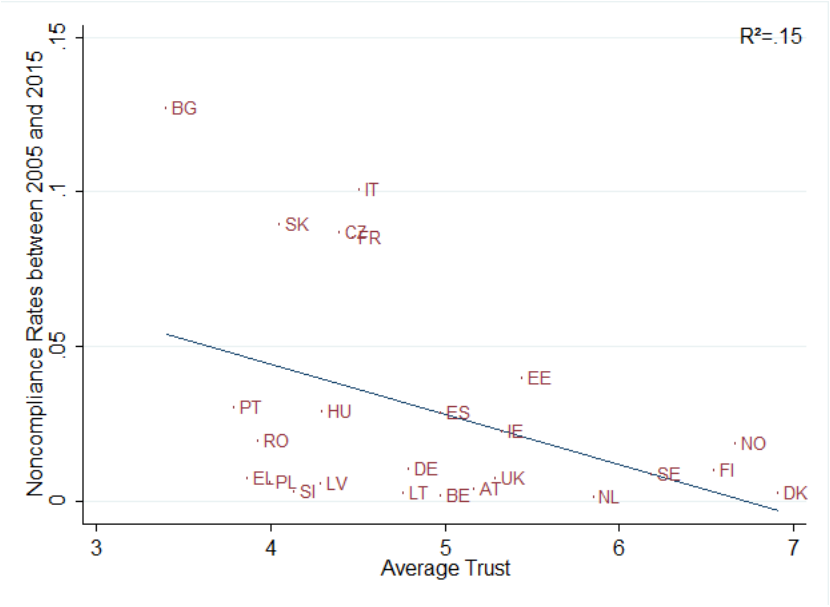
Note: the graph plots the positive correlation between trust and the stringency of climate change regulations across countries measured by the target share of renewable energy in total energy consumption by 2020. The trust measure is constructed based on the European Social Survey (2000-2014).

Figure 3: Correlation between Trust and the Climate Laws, Institutions and Measures (CLIM) Index



Note: the graph plots the relationship between the level of average trust and the the Climate Laws, Institutions and Measures (CLIM) Index. The CLIM Index comes from EBRD (2011). The level of average trust measure is constructed based on the the European Social Survey (2000-2014).

Figure 4: Correlation between Trust and Noncompliance Rate in the EU ETS



Note: the plot shows a correlation between the level of average trust and compliance rates in the ETS across countries. The level of average trust measure is constructed based on the European Social Survey (2002-2014).

Table 1: Probit Estimation: Trust and Noncompliance in the EU ETS between 2005 and 2015

	Dependent variable: Indicator for noncompliance					
	(1)	(2)	(3)	(4)	(5)	(6)
Trust measured in country of operation	-0.358*** (0.111)	-0.444*** (0.150)	-0.482** (0.217)	-0.372* (0.222)	-0.490* (0.270)	-1.381** (0.680)
Observations	119,701	119,163	119,163	119,163	73,498	73,498
Firm-level controls (4)	No	No	No	No	Yes	Yes
Country-level controls (5)	No	No	Yes	Yes	Yes	Yes
Year dummies (10)	No	Yes	Yes	Yes	Yes	Yes
Industry dummies (35)	No	Yes	Yes	Yes	Yes	Yes
Clustering	Country	Country	Country	Country	Country	Country
Number of clusters	25	25	25	25	25	25

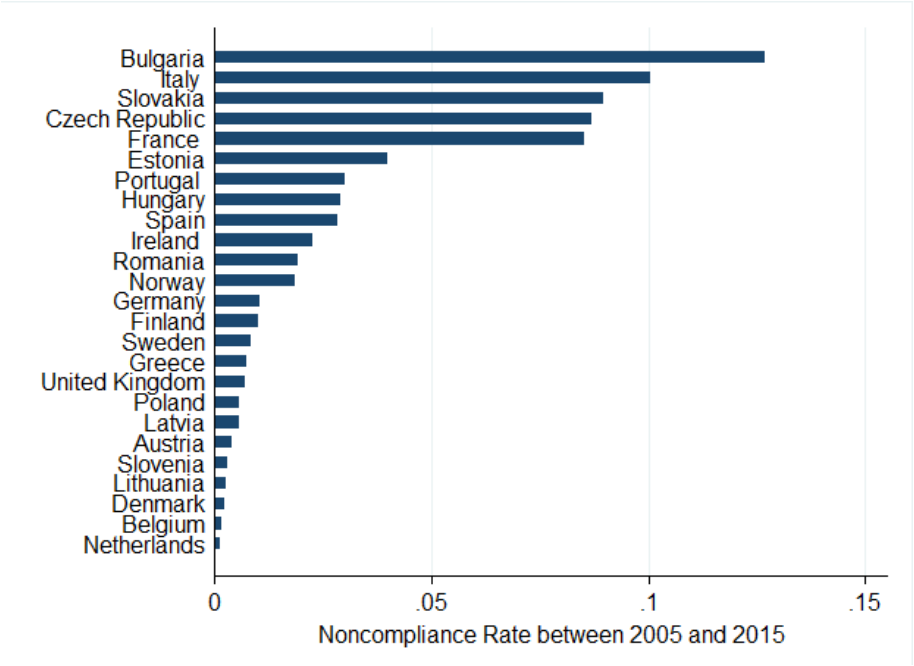
Notes: The dependent variable in all columns is the binary noncompliance measure that takes 1 if the installation is out of compliance and 0 otherwise. All estimation is by Probit except for column (6) where I try a logit model. Standard errors are clustered at the country of installations' location. "Industry dummies" are based on the main activity type information provided in the European Transaction Log. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 2: Distribution of Compliance Code, installation by year observations

Code	Frequency	Percent
A	122,647	93.93
B	4,010	3.07
C	3,273	2.51
D	86	0.07
E	563	0.43
Total	130,579	100.0

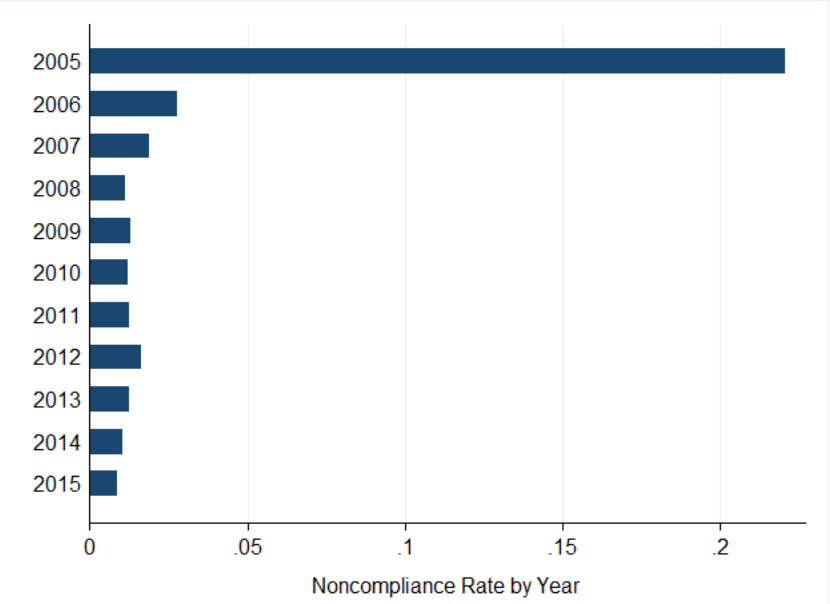
Source: European Union Transaction Log (EUTL).

Figure 5: Average Noncompliance Rate between 2005 and 2015



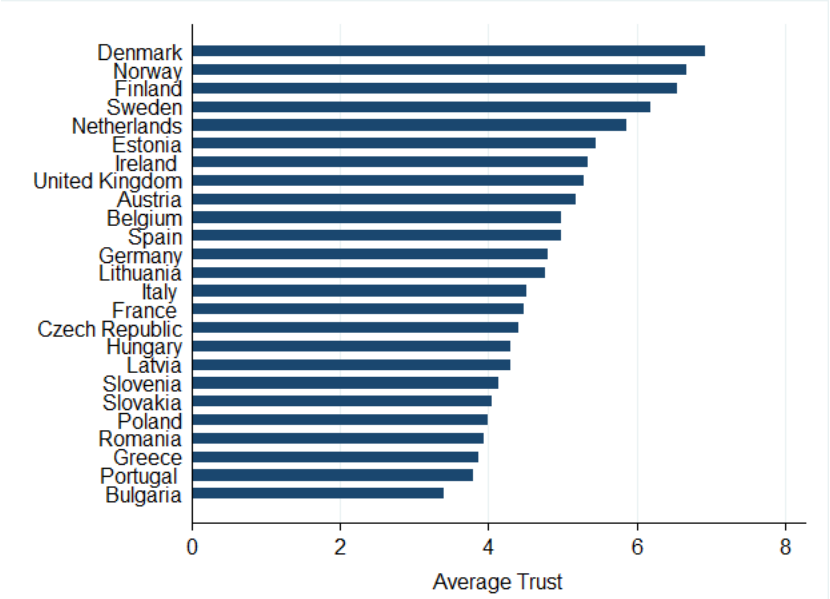
Note: the plot shows variation in noncompliance rates across countries. The data on compliance in the ETS is provided by the European Union Transaction Log (EUTL) at the installations level and I collapse the data over time across countries to calculate average compliance rates.

Figure 6: Noncompliance Rate by Year



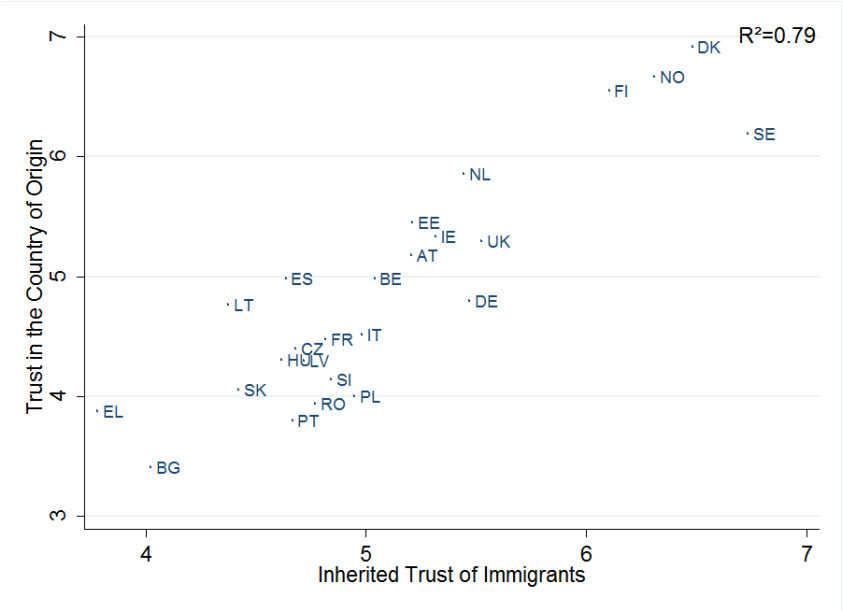
Note: the plot shows variation in noncompliance rates across years. The data on compliance in the ETS is provided by the European Union Transaction Log (EUTL) at the installations level and I collapse the data over countries to calculate average yearly compliance rates.

Figure 7: Average Trust



Note: the plot shows variation the level of average trust across countries. The level of average trust measure is constructed based on the following survey question "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" in the European Social Survey (2002-2014).

Figure 8: Correlation between Trust in Source Country and Inherited Trust



Note: the plot shows a correlation between inhered trust of second-generation immigrants and the level of trust in their countries of origin. These measures are constructed based on the following survey question "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" in the European Social Survey (2002-2014).

Table 3: IV Probit Estimation: Trust and Noncompliance in the EU ETS between 2005 and 2015

	Dependent variable: Indicator for noncompliance					
	(1)	(2)	(3)	(4)	(5)	(6)
Estimation method	IV Probit	IV Probit	IV Probit	IV Probit	Probit	IV Probit
Trust measured	-0.459***	-0.575***	-0.750*	-0.865*		-0.892***
in country of operation	(0.118)	(0.153)	(0.427)	(0.461)		(0.258)
Inherited Trust					-0.494*	
					(0.292)	
Observations	119,701	119,163	119,163	73,498	73,498	71,356
Firm-level controls (4)	No	No	No	Yes	Yes	Yes
Country-level controls (5)	No	No	Yes	Yes	Yes	Yes
Year dummies (10)	No	Yes	Yes	Yes	Yes	Yes
Industry dummies (35)	No	Yes	Yes	Yes	Yes	Yes
Clustering	Country	Country	Country	Country	Country	Region
Number of clusters	25	25	25	25	25	165
First stage F stat	40.4	45.0	32.1	60.2		57.7

Notes: The dependent variable in all columns is the binary noncompliance measure that takes 1 if the installation is out of compliance and 0 otherwise. Standard errors are clustered at the level shown in each column. "Industry dummies" are based on the main activity type information provided in the European Transaction Log. Column (1) shows an IV probit estimate without any controls. Column (2) includes year and industry dummies. Column (3) includes a set of country level controls (GDP per capita, education, population and two governance indicators). Column (4) further includes several firm-level controls (number of installations each firm owns, total assets, operating revenue, and number of employees). Column (5) shows the reduced form relationship between noncompliance and the instrument. Column (6) uses a measure of trust that varies at the region level. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 4: Trust and Noncompliance in the EU ETS between 2005 and 2015:
Exploiting the Differences in the Location of Headquarters

	Dependent variable: Indicator for noncompliance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	Probit	Probit	Probit	Probit	IV Probit	Probit	IV Probit	Probit
Trust measured	-1.596***	-1.616***	-0.390*	-0.417**	-0.591***		-0.559**	-0.425*
in country of central headquarter	(0.380)	(0.343)	(0.204)	(0.207)	(0.222)		(0.224)	(0.234)
Trust measured				0.217				
in region of operation				(0.167)				
Inherited Trust						-0.111***		
						(0.042)		
Observations	69,912	51,070	49,174	47,692	49,160	49,160	49,160	41,976
Firm-level controls (4)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-level controls (5)	No	No	No	No	No	No	Yes	No
Year dummies (10)	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies (35)	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Country of operation dummies (24)	No	No	Yes	Yes	Yes	Yes	Yes	No
Region of operation dummies (103)	No	No	No	No	No	No	No	Yes
Clustering	Country	Country	Country	Country	Country	Country	Country	Region
Number of clusters	25	20	20	20	20	20	20	93

Notes: The dependent variable in all columns is the binary noncompliance measure that takes 1 if the installation is out of compliance and 0 otherwise. The sample in this table includes multinational firms only. Standard errors are clustered at the level shown in each column. "Industry dummies" are based on the main activity type information provided in the European Transaction Log. Column (1) does not include any controls and column (2) adds firm-level controls (number of installations each firm owns, total assets, operating revenue, and number of employees). Column (3) includes year, industry and country of operation fixed effects. Column (4) separately checks the influence of trust in the region where the installation is located. Column (5) instruments the trust variable with a measure of inherited trust and column (6) shows the reduced form relationship between noncompliance and the instrument. Column (7) further includes time-varying country-level controls and column (8) includes region fixed effects. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 5: Trust and Noncompliance in the EU ETS between 2005 and 2015: Robustness Checks

	Dependent variable: Indicator for noncompliance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit	Probit
Trust measured	-0.598***	-0.609**	-0.398*	-0.602***	-0.615***	-0.599**	-1.064*	
in country of central headquarter	(0.223)	(0.249)	(0.219)	(0.222)	(0.230)	(0.241)	(0.562)	
Inherited Trust								-0.113***
								(0.044)
Observations	46,257	47,570	49,204	48,921	49,160	49,160	49,160	49,160
Firm-level controls (4)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-level controls (3)	Yes	No	No	No	No	No	No	No
Country of operation dummies (24)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies (10)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies (35)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Country	Country	Country	Country	Country	Country	Country	Country
Number of clusters	20	18	20	20	20	20	20	20
First stage F stat	172.7	191.9	179.8	187.1	194.0	218.7	21.2	

Notes: The dependent variable in each column is a binary noncompliance measure that takes 1 if the installation is out of compliance and 0 otherwise. Standard errors are clustered at the level shown in each column. "Industry dummies" are based on the main activity type information provided in the European Transaction Log. Column (1) includes region-level controls and column (2) drops ETS late joiners in my sample (Bulgaria and Romania). In column (3) and (4) I use alternative specifications for the binary compliance variable. In column (5) and (6) I try alternative measures of trust to check for potential measurement error (detailed explanations in the main text). In column (7) I try an alternative instrument and column (8) shows the reduced-form relationship between noncompliance and the alternative instrument. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 6: Bilateral Trust and Noncompliance in the EU ETS between 2005 and 2015

	Dependent variable: Indicator for noncompliance			
	(1)	(2)	(3)	(4)
Estimation method	Probit	Probit	IV Probit	IV Probit
Bilateral trust	-0.007	-0.059	1.717	0.623
	(0.254)	(0.260)	(1.536)	(0.804)
Observations	12,292	9,199	7,696	7,696
Firm-level controls (4)	No	Yes	Yes	Yes
Country of operation FE (24)	Yes	Yes	Yes	Yes
Country of HQ FE (43)	Yes	Yes	Yes	Yes
Year dummies (10)	Yes	Yes	Yes	Yes
Industry dummies (35)	Yes	Yes	Yes	Yes
Clustering	Country pair	Country pair	Country pair	Country pair
Number of clusters	125	111	77	77
First stage F stat			22.0	15.5

Notes: The dependent variable in all columns is the binary noncompliance measure that takes 1 if the installation is out of compliance and 0 otherwise. The sample in this table includes foreign MNEs only. Standard errors are clustered at the country of headquarter by country of operation (country pair) level. "Industry dummies" are based on the main activity type information provided in the European Transaction Log. I use religious similarity as an instrument in column (3) and somatic distances as well as religious similarity in column (4). * significant at 10%, ** significant at 5%, *** significant at 1%.

Appendix A

A1 Wealth as a competing factor?

In studying the relationship between trust and the stringency of climate change regulation, it is important to take into account the relative wealth of countries for two reasons; (1) the argument that rich, developed countries have emitted greater emissions over a longer period and therefore they are primarily responsible for climate change impacts, has led to more active mitigation efforts by richer economies (Adger, 2006); (2) trust tends to be positively correlated with wealth across countries (e.g. Algan and Cahuc, 2010). Then, it is possible that the positive correlation we observe between trust and the stringency of climate change legislation may simply reflect that richer nations contribute more actively to climate change mitigation.

However, column (2) in Table A6 shows that the correlation between trust and the stringency of climate change policy measured by the target share of renewable energy in total consumption by 2020 remains strong even when I control for log GDP per capita as well as educational attainment (since it has been pointed out that countries with more educated citizenry are more likely to have stringent climate change polices).

As a simple placebo test, I use another measure of climate change regulation stringency that is comparable across EU countries: the national emission targets for 2020 set by the Effort Sharing Decision in the EU to reduce emissions from sectors not included in the EU ETS. Unlike the measure used above (which is based on National Renewable Energy Action Plan), these targets have been *assigned* on the basis of member states' relative wealth, therefore not voluntary. Given the positive relationship between trust and national wealth, this measure may also display a positive correlation with trust. However, the correlation should disappear once income is controlled for, because the involuntary nature of this policy rules out the argument put forward in this paper that trust could matter (independently or in addition to the country's wealth) via lower enforcement costs when countries are voluntarily choosing their own policies to contribute to joint objectives (EU level binding targets in this case).

[Table A7]

Column (3) and (4) confirm this intuition. The positive correlation between trust and the measure of involuntary climate policy in column (3) is absent when income and education are included in column (4). It is also interesting to note that log per capita GDP barely predicts the voluntary measure of climate policy in column (2) (increasing R-squared by only

0.02), whereas it accounts for a substantial share of variation in the involuntary measure of climate policy as anticipated (increasing R-squared by 0.49).

A2 Domestic demand for environmental regulation

Previous studies that investigate the heterogeneity in the stringency of regulations (mostly economic regulations) across countries have emphasized the link that runs as follows: (1) trust and the public demand for regulations, (2) the public demand for and the actual stringency of regulations, and consequently (3) trust and the stringency of regulations. Does this link hold in the context of environmental legislation as well? Here I refer to environmental regulations at large, not exclusively climate change legislation due to data availability.

I obtain data on the demand for environmental regulations from the International Social Survey Programme (ISSP), which is the same survey used by (Aghion et al., 2010) to show the negative correlation between trust and demand for labor market regulation. I use the 2010 wave that includes questions both on trust and attitudes towards environmental regulation. The question that captures the degree of the demand for environmental regulations reads as follows: "Government should pass laws to make businesses protect the environment, even if it interferes with businesses's rights to make their own decisions".[38] I construct a binary variable from this question that takes 1 if respondents agreed with the given statement and 0 otherwise, and calculate the country average of this measure. For the stringency of environmental regulations, I use the Environmental Policy Stringency (EPS) Index in Figure A2 that measures the stringency of regulatory instruments primarily related to climate and air pollution.

[Figure A8, A9]

Figure A8 reveals no discernible association between trust and the public demand for environmental regulations. Moreover, the correlation between the demand for and the actual stringency of environmental regulations is also weak as depicted in Figure A9, which stands in contrast to the previous studies that explain the stringency of a variety of regulations as a function of the public demand.[39] Thus, the link (1) and (2) do not seem to hold when it

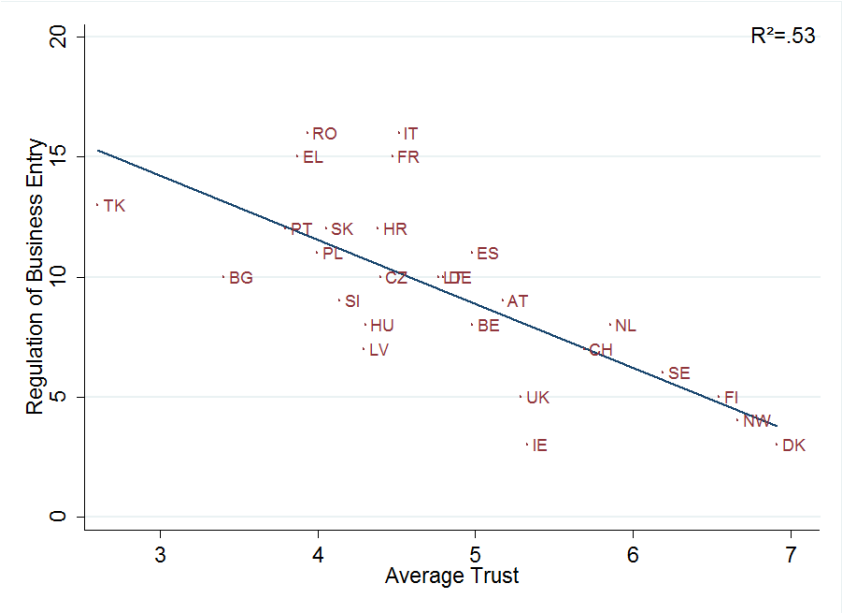
[38]There is another related question that reads, "Government should pass laws to make ordinary people protect the environment, even if it interferes with people's rights to make their own decisions". I do not use this question for the public demand for environmental regulations because the measures for the stringency of environmental regulations mostly cover policy instruments that apply to industrial sectors (Botta and Koźluk, 2014), rather than ordinary individuals. However, results in this section are similar when I use this question as an alternative.

[39]One likely explanation is based on the environment being a secondary policy issue. There is a consensus that the public or the voters' preferences have large effects on "frontline" policies (mostly economic) such as

comes to environmental regulations. However, we have seen the strong positive correlation between trust and this measure of environmental legislation stringency in Figure A2, which is to say the link (3) holds despite the absence of the first two links. Taken together, I believe this casual inspection suggests that the influence of domestic demand is muted in this context and provides further support for the importance of supply side dynamics such as enforcement costs and the degree of public acceptability in the provision of environmental protection legislation across countries.

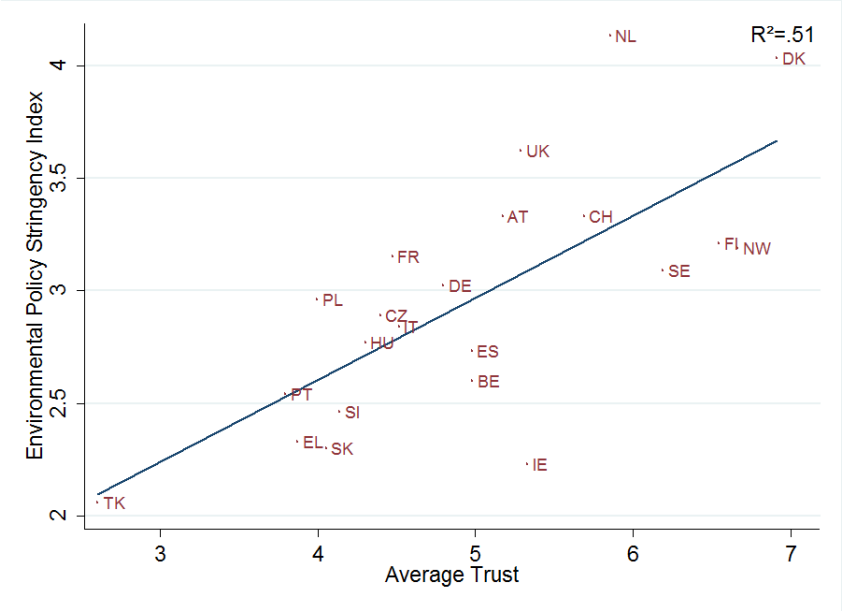
government spending or wealth redistribution, there is widespread recognition that secondary policy issues, that concern only relatively small groups in society, such as environmental policy and gun control do not sensitively reflect preferences held by voters (List and Sturm, 2006).

Figure A1: Correlation between Trust and Regulation of Business Entry



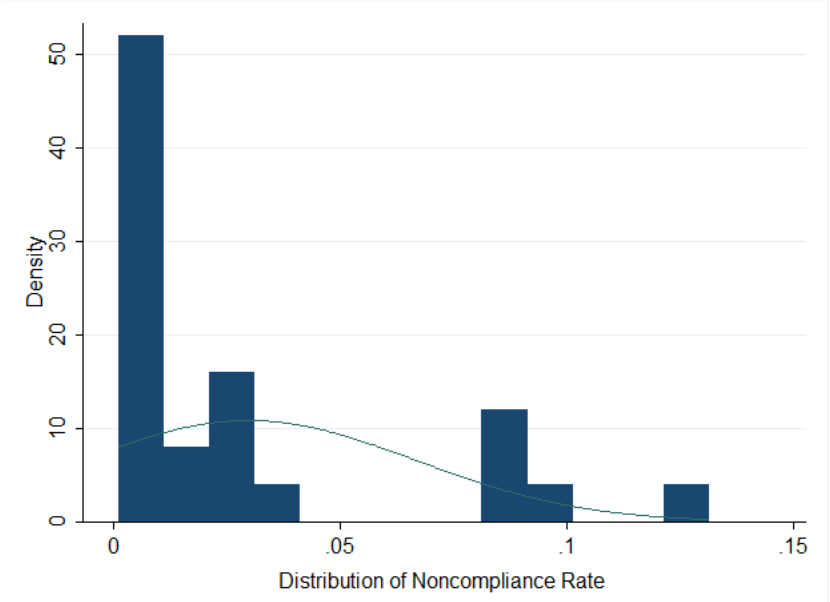
Note: the graph plots the relationship between the level of average trust and the stringency of market regulation measured by the number of steps that an entrepreneur has to complete to open a business across countries. This data on regulations on market entry is provided by Djankov et al. (2002) for the year 1999. The level of average trust measure is constructed based on the the European Social Survey (2000-2014).

Figure A2: Correlation between Trust and the Environmental Policy Stringency (EPS) Index



Note: the graph plots the relationship between the level of average trust and the OECD Environmental Policy Stringency (EPS) Index. The level of average trust measure is constructed based on the European Social Survey (2002-2014).

Figure A3: Distribution of Noncompliance Rates



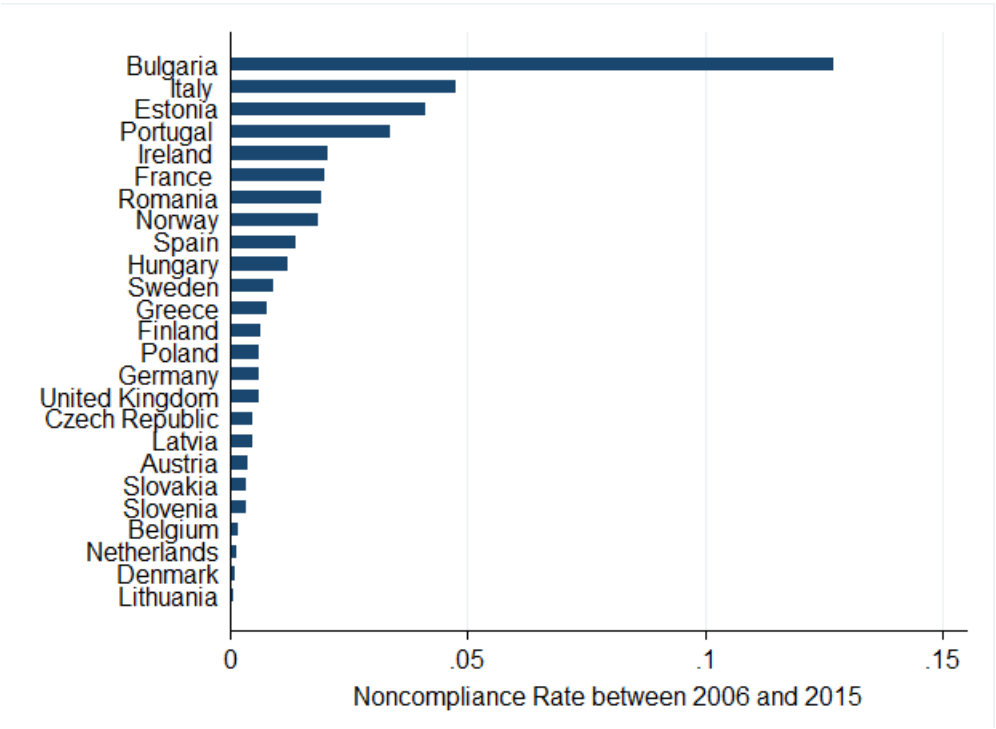
Note: the plot shows the distribution of noncompliance rates across countries. The data on compliance in the ETS is provided by the European Union Transaction Log (EUTL) at the installations level and I collapse the data over time across countries to calculate average compliance rates.

Table A1: Descriptive Statistics: Firm-level Variables

Country	Number of firms	Number of employees	Number of installations per firm	Total assets Thousand USD	Operating revenue Thousand USD
Austria	146	712	1.72	626,484	487,542
Belgium	248	945	1.54	3,320,201	814,570
Bulgaria	112	413	1.35	96,637	107,210
Czech Republic	278	850	1.58	279,192	223,508
Denmark	269	815	1.60	383,084	424,302
Estonia	37	184	1.54	144,959	60,214
Finland	183	802	3.68	514,466	412,311
France	669	5,281	1.85	3,173,589	1,624,696
Germany	1,194	2,730	1.92	1,719,551	1,614,392
Greece	104	584	1.46	508,478	409,479
Hungary	136	881	2.07	407,152	370,139
Ireland	113	4,386	1.39	5,439,998	4,342,960
Italy	747	1,037	1.68	971,609	707,199
Latvia	75	304	1.49	109,923	59,061
Lithuania	78	265	1.49	105,722	127,252
Netherlands	327	527	1.43	382,333	588,377
Norway	87	599	1.56	1,916,191	1,552,504
Poland	584	776	1.70	216,743	216,529
Portugal	242	188	1.19	163,830	137,704
Romania	209	845	1.34	171,379	153,741
Slovakia	152	726	1.35	216,850	203,772
Slovenia	91	666	1.10	189,347	142,437
Spain	957	529	1.34	448,584	364,320
Sweden	279	980	3.09	855,421	493,645
United Kingdom	839	6,750	1.65	8,159,246	3,469,543
Average	335	1,348	1.68	1,267,680	791,675

Notes: The table reports summary statistics of the financial variables of 8,156 firms used in the regressions by country. The data comes from Bureau Van Dijk's Orbis Database.

Figure A4: Noncompliance Rate between 2006 and 2015 (Excluding 2005)



Note: the plot shows variation in noncompliance rates across countries, excluding 2005. The data on compliance in the ETS is provided by the European Union Transaction Log (EUTL) at the installations level and I collapse the data over all years (excluding 2005) to calculate average compliance rates.

Table A2: Descriptive Statistics: Number of Second-generation Immigrants from Each Source Country

Country of origin	Number of second-generation immigrants
Austria	333
Belgium	153
Czech Republic	382
Denmark	143
Estonia	38
Finland	315
France	520
Germany	1299
Greece	169
Hungary	347
Ireland	233
Italy	971
Latvia	78
Lithuania	80
Netherlands	187
Norway	128
Poland	835
Portugal	186
Romania	388
Slovakia	373
Slovenia	44
Spain	251
Sweden	149
United Kingdom	510

Notes: The table reports the number of second-generation immigrants from each country that I use to estimate inherited trust. The data comes from the European Social Survey.

Table A3: Trust and Noncompliance in the EU ETS between 2005 and 2015:
Robustness Checks for Country-level Analysis

	Dependent variable: Indicator for noncompliance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit	Poisson
Trust measured	-0.814**	-0.923**	-0.835*	-0.869*	-0.871*	-0.837*	-0.699	-1.505*
in the country of operation	(0.351)	(0.454)	(0.451)	(0.483)	(0.465)	(0.453)	(0.430)	(0.878)
Observations	71,158	73,498	73,563	73,146	73,498	73,498	73,498	77,558
Firm-level controls (4)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-level controls (3)	Yes	No	No	No	No	No	No	No
Country-level controls (5)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies (10)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies (35)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Country	Country	Country	Country	Country	Country	Country	Country
Number of clusters	25	23	25	25	25	25	25	25
First stage F stat	35.3	55.7	60.2	61.0	61.8	70.4	37.5	

Notes: The dependent variable in each column is a binary noncompliance measure that takes 1 if the installation is out of compliance and 0 otherwise. Standard errors are clustered at the level shown in each column. "Industry dummies" are based on the main activity type information provided in the European Transaction Log. Column (1) adds region-level controls and column (2) drops ETS late jointers (Bulgaria and Romania) in my sample. Column (3) and (4) try an alternative measure of trust that I constructed as follows: I first regress trust on year dummies, form residuals, and then compute the means of these residuals by country. This measure takes into account year-specific shocks since I pool multiple waves conducted in different years to calculate the average level of trust in each country. In column (5) and (6), I construct another alternative measure for trust using the point estimates on country dummies from an individual-level regression (similarly as in column (5) and (6) in Table 4). The point estimates and associated standard errors are reported in Table A4. In column (7), I try an alternative specification for the instrument. Column (8) tries an alternative measure for noncompliance that measures the amount by which installations are noncompliant. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A4: Alternative Measure of Trust: Coefficients on the Country Dummies from the European Social Survey

Dependent variable: Trust		
Country Indicator	Coefficient	SD
Austria	0.856***	(0.016)
Belgium	0.216***	(0.01)
Czech Republic	0.134***	(0.014)
Germany	Reference category	
Denmark	2.288***	(0.003)
Estonia	1.191***	(0.012)
Spain	0.453***	(0.018)
Finland	1.781***	(0.006)
France	-0.293***	(0.011)
United Kingdom	0.598***	(0.005)
Greece	-0.772***	(0.03)
Hungary	-0.185***	(0.014)
Ireland	0.744***	(0.006)
Italy	-0.087***	(0.032)
Lithuania	0.558***	(0.026)
Latvia	-0.095***	(0.045)
Netherlands	1.049***	(0.005)
Norway	1.823***	(0.006)
Poland	-0.507	(0.019)
Portugal	-0.314***	(0.058)
Romania	-0.129	(0.053)
Sweden	1.545***	(0.009)
Slovenia	-0.318***	(0.02)
Slovak Republic	-0.175	(0.018)
Observations: 283,181		
R-squared: 0.16		

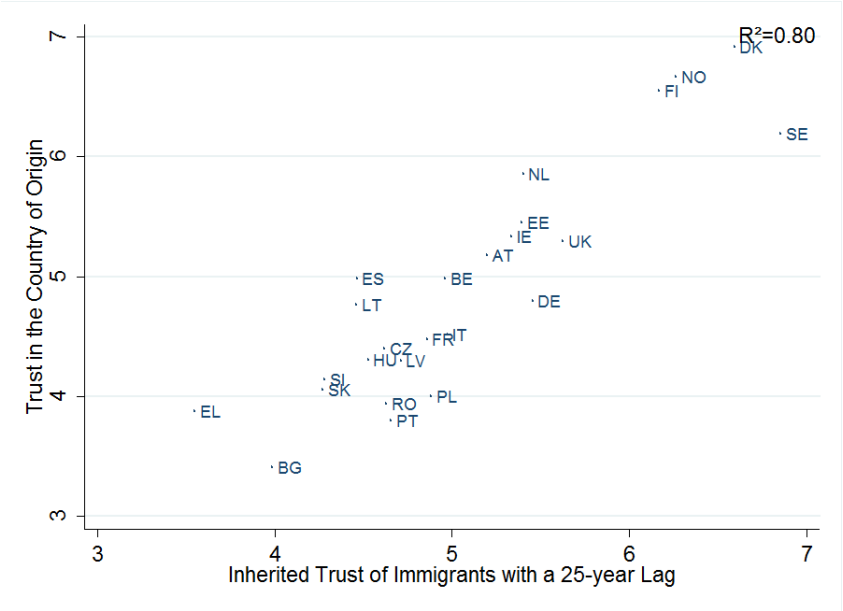
Notes: I report the point estimates on country dummies used as an alternative measure of trust across countries in column (5) and (6) in Table A3. The coefficients measure the level of trust in each country relative to Germany, which is the omitted reference category. Apart from the country dummies, the regression also included gender, age, education and income as well as year dummies (not reported). Standard errors are clustered at the country level. * significant at 10%, ** significant at 5%, *** significant at 1%.
Source: European Social Survey 2002 - 2014.

Table A5: Alternative Measure of Trust: Coefficients on the Country Dummies from the World Value Survey

Dependent variable: Trust					
Country Indicator	Coefficient	SD	Country Indicator	Coefficient	SD
Australia	0.093***	(0.003)	Japan	0.014*	(0.008)
Brazil	-0.299***	(0.009)	South Korea	-0.100***	(0.006)
Bulgaria	-0.112***	(0.005)	Latvia	-0.138***	(0.010)
Canada	0.000	(0.01)	Mexico	-0.160***	(0.006)
Switzerland	0.055***	(0.005)	Malaysia	-0.283***	(0.005)
Chile	-0.201***	(0.007)	Netherlands	0.240***	(0.006)
China	0.204***	(0.005)	Norway	0.332***	(0.005)
Cyprus	-0.265***	(0.006)	Philippines	-0.335***	(0.013)
Czech Republic	-0.084***	(0.01)	Poland	-0.164***	(0.002)
Germany	Reference category		Romania	-0.220***	(0.002)
Estonia	-0.054***	(0.006)	Russian Federation	-0.112***	(0.002)
Spain	-0.123***	(0.006)	Saudi Arabia	0.114***	(0.023)
Finland	0.176***	(0.006)	Sweden	0.255***	(0.006)
France	-0.164***	(0.01)	Singapore	-0.107***	(0.012)
Hong Kong	0.081***	(0.005)	Slovenia	-0.179***	(0.004)
Hungary	-0.071***	(0.01)	Slovakia	-0.100***	(0.011)
Indonesia	0.069***	(0.008)	Turkey	-0.260***	(0.01)
Israel	-0.182***	(0.024)	Ukraine	-0.085***	(0.003)
India	-0.08***	(0.007)	United Kingdom	-0.067***	(0.006)
Italy	-0.037***	(0.01)	United States	-0.020***	(0.006)
Jordan	-0.136***	(0.007)	South Africa	-0.187***	(0.009)
Observations: 263,695					
R-squared: 0.109					

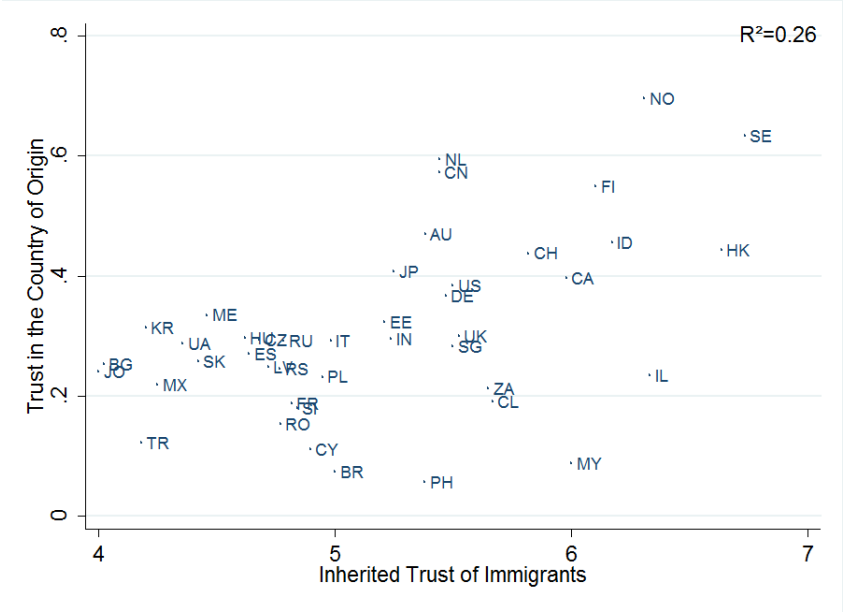
Notes: I report the point estimates on country dummies used as an alternative measure of trust across countries in column (6) in Table 5. The coefficients measure the level of trust in each country relative to Germany, which is the omitted reference category. Apart from the country dummies, the regression also included gender, age, education and income as well as year dummies (not reported). Standard errors are clustered at the country level. * significant at 10%, ** significant at 5%, *** significant at 1%.
Source: World Value Survey 1981 - 2013.

Figure A5: Correlation between Trust in Source Country and Inherited Trust with a 25-year Lag



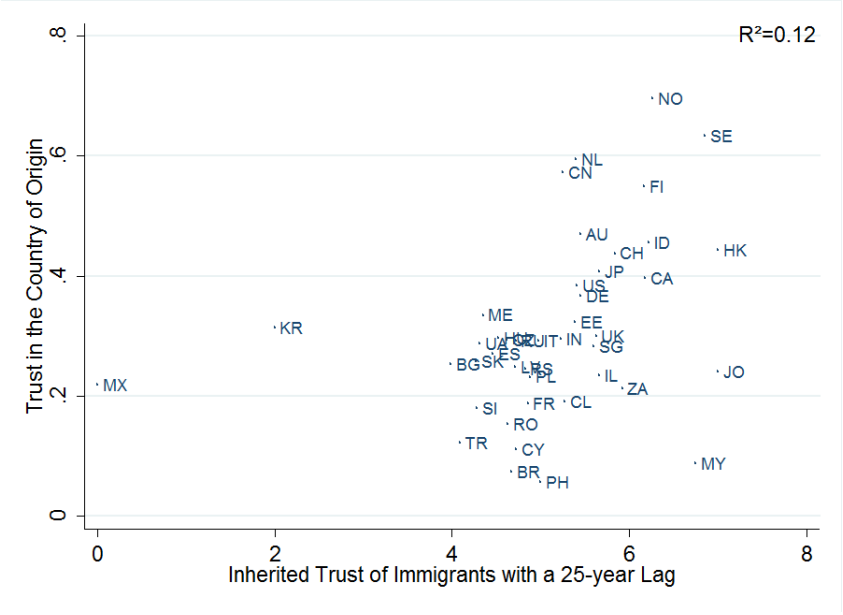
Note: the plot shows a correlation between inhered trust of second-generation immigrants and the level of trust in their countries of origin. These measures are constructed based on the following survey question "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" in the European Social Survey (2002-2014).

Figure A6: Global: Correlation between Trust in Source Country and Inherited Trust



Note: the plot shows a correlation between inhered trust of second-generation immigrants and the level of trust in their countries of origin. The average trust measure across countries in the global sample is based on the World Value Survey (1984-2014). The inherited trust measure is constructed based on the European Social Survey (2002-2014).

Figure A7: Global: Correlation between Trust in Source Country and Inherited Trust with a 25-year Lag



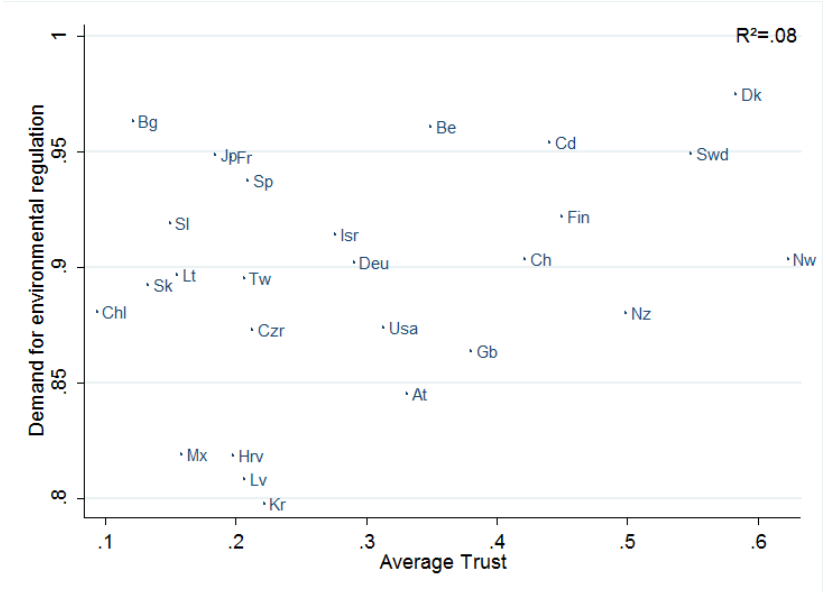
Note: the plot shows a correlation between inhered trust of second-generation immigrants and the level of trust in their countries of origin. The average trust measure across countries in the global sample is based on the World Value Survey (1984-2014). The inherited trust measure is constructed based on the European Social Survey (2002-2014).

Table A6: Correlation between trust and measures of climate policy

	Voluntary policy		Involuntary policy	
	(1)	(2)	(3)	(4)
Average trust	9.650***	12.139***	11.043***	1.895
	(2.233)	(3.158)	(2.453)	(1.106)
Log per capita GDP		-5.011		18.147***
		(4.495)		(1.445)
Share of population		-0.159		-0.151**
with tertiary education		(0.209)		(0.065)
Observations	30	30	27	27
R-squared	0.40	0.43	0.44	0.94

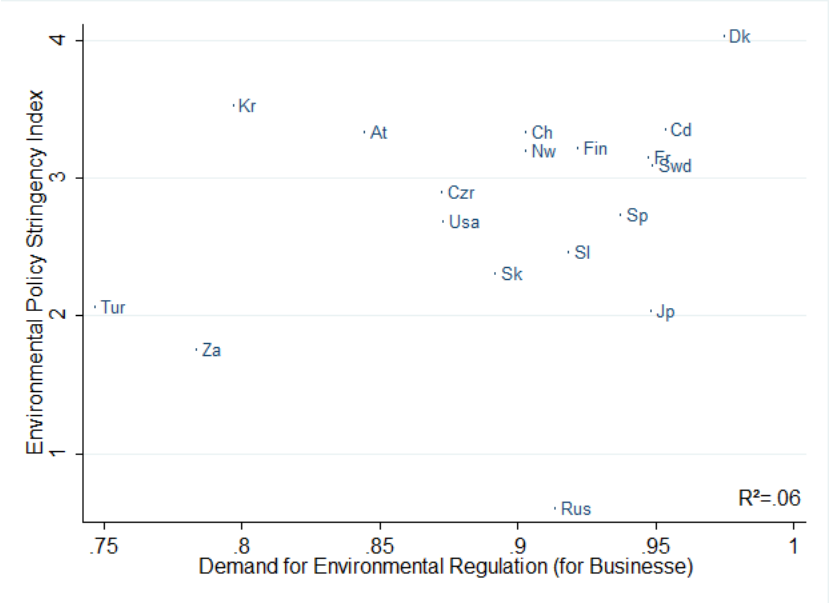
Notes: The table reports macro-level correlations between trust and different measures of climate policy stringency. The dependent variable in column (1) and (2) is a measure of voluntary climate policy measured by target shares of renewable energy in total consumption by 2020. The dependent variable in column (3) and (4) is a measure of involuntary (assigned) climate policy represented by emission targets for 2020 set by the Effort Sharing Decision at the EU level. Data on per capita GDP and education comes from the Eurostat.

Figure A8: Correlation between Trust and Demand for Environmental Regulations



Note: the graph plots the relationship between trust and public demand for environmental regulations. Data on both measures comes from the International Social Survey Programme (2010).

Figure A9: Correlation between Demand and the Stringency of Environmental Regulations



Note: the graph plots the relationship between the public demand for and the stringency of environmental regulations measured by the OECD Environmental Policy Stringency Index.. The data on the public demand comes from the International Social Survey Programme (2010).

Appendix B Proofs

The presence of the threshold type The existence of a cutoff type θ^*, above which all types violate and below which all types comply with the regulation, directly follows from the monotonicity of firms' actions. Firm i chooses an action b_i to maximize its expected payoff written as:

$$\mathbb{E}u_i(b_i, \theta_i) = -a(b_i - \theta_i)^2 - (1-a)(b_i - B_j)^2 - \gamma \sum_{i \in N} b_i \qquad \text{if } b_i \leq L \tag{3}$$

$$\begin{aligned}\mathbb{E}u_i(b_i, \theta_i) = &-\mu[a(L - \theta_i)^2 + (1-a)(L - B_j)^2 + \phi] \\ &- (1-\mu)[a(b_i - \theta_i)^2 + (1-a)(b_i - B_j)^2] - \gamma \sum_{i \in N} b_i \qquad \text{if } b_i > L\end{aligned} \tag{4}$$

where (3) represents the expected payoff of abiding by the law and (4) represents the expected payoff of violating the law.

The first order conditions are:

$$b_i = \min[a\theta_i + (1-a)B_j - \frac{\gamma}{2}, L] \qquad \text{if } b_i \leq L \tag{5}$$

$$b_i = a\theta_i + (1-a)B_j - \frac{\gamma}{2} \qquad \text{if } b_i > L \tag{6}$$

Note that both (5) and (6) are nondecreasing in θ_i and (6) is always greater than (5). Thus, the only possible violation of the monotonicity property is where the payoff-maximizing action at θ_i is smaller than (or equal to) L, while at $\theta_i' < \theta_i$ the payoff-maximizing action is greater than L. To rule out this scenario, it suffices to show that for any b_{low} and b_{high} such that $b_{\text{low}} \leq L$ and $b_{\text{high}} > L$, $\mathbb{E}u_i(b_{\text{high}}, \theta_i) - \mathbb{E}u_i(b_{\text{low}}, \theta_i)$ is increasing in θ_i.

From (2) and (3), it follows that

$$\begin{aligned}\mathbb{E}u_i(b_{\text{high}}, \theta_i) - \mathbb{E}u_i(b_{\text{low}}, \theta_i) = &-\mu[a(L - \theta_i)^2 + (1-a)(L - B_j)^2 + \phi] \\ &- (1-\mu)[a(b_{\text{high}} - \theta_i)^2 + (1-a)(b_{\text{high}} - B_j)^2] + a(b_{\text{low}} - \theta_i)^2 + (1-a)(b_{\text{low}} - B_j)^2\end{aligned} \tag{7}$$

Differentiating with respect to θ_i yields:

$$2a\mu(L - b_{\text{high}}) + 2a(b_{\text{high}} - b_{\text{low}}) \tag{8}$$

It is straightforward to see that the above expression is positive given the definition of b_{low} and b_{high} that are smaller (or equal to) and greater than L, respectively for any $a \in [0, 1]$ and $\mu \in [0, 1]$. From this monotonicity property, the existence of the threshold θ^* follows. QED

θ^* as a decreasing function of B_j I characterize the expression for a threshold θ^* by balancing the costs and benefits of violating the regulation for the threshold firm at θ^*.

Suppose that firm θ^* decides to violate the regulation. Then the expected payoff will be:

$$\begin{aligned} &- \mu[a(L-\theta^*)^2 + (1-a)(L-B_j)^2 + \phi] \\ &- (1-\mu)[a(a\theta^* + (1-a)B_j - \frac{\gamma}{2} - \theta^*)^2 + (1-a)(a\theta^* + (1-a)B_j - \frac{\gamma}{2} - B_j)^2] \end{aligned} \tag{9}$$

Suppose instead that firm θ^* decides to abide by the regulation.

$$- a(L-\theta^*)^2 - (1-a)(L-B_j)^2 \tag{10}$$

The threshold θ^* is given by setting (11) equal to (12). Differentiating both sides of the resulting equation with respect to B yields:

$$a(L-\theta)\frac{\partial \theta^*}{\partial B_j} + (1-a)(L-B_j) = -a(1-a)(\theta^* - B_j)(\frac{\partial \theta^*}{\partial B_j} - 1) \tag{11}$$

Solving for $\frac{\partial \theta^*}{\partial B_j}$ and simplifying the expression yields $1 - \frac{1}{a}$, which is negative for any $a \in [0, 1)$. QED

Appendix C Data

C1 Trust

European Social Survey I build trust measures using the European Social Survey (ESS), a collection of cross-country surveys on the individual beliefs, values and social norms as well as basic demographic information of respondents such as age, education, religion and occupation, etc. I pool data from the seven waves collected so far (from 2002 to 2014), which includes all European countries in my sample.

The survey elicits trust of respondents by asking the standard question, "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Answers are given on a scale of 0 to 10, where 0 implies "You can't be too careful" and 10 means "Most people can be trusted". The frequency of individual responses used to build the trust measure by country and wave is reported in Table C1.

World Value Survey In Section 5.2, I exploit the difference in the country where the regulated installations' global headquarters are located, which include a number of non-European countries. For this specification, I rely on the World Value Survey for the data on trust since its geographic coverage is world-wide, while the ESS covers Europe only. The WVS allows me to exploit the geographical variation in trust across 44 countries shown in Table A5.

The WVS measures trust by asking the exact same question that appears in the ESS, which makes the two measures based on the two surveys reasonably comparable. The only difference is that the answer to the trust question in the WVS is binary, while the ESS uses a scale of 0 to 10.

Similarly as with the ESS, I pool together seven successive waves administered so far (1984-2014) and compute the country level trust by taking the simple average over all observations available for each country available across all waves. The frequency of individual responses used to build the trust measure by country and wave is reported in Table C2.

European Commission Bilateral Trust The data on bilateral trust between a pair of countries directly comes from Panel A in Table 1 of Guiso et al. (2009). The data is collected in a series of Eurobarometer surveys commissioned by the European Commission. They ask the following question, "I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust, or no trust at all." This was asked to all European Union Member States about each other and a number of other countries (including the United

States, China, and Japan). I use the average level of trust country A has for country B to predict the probability of noncompliance of an installation operating in country B but owned by a multinational firm headquartered in country A.

C2 Compliance in the ETS

The data on compliance behavior in the EU ETS is provided by the European Union Transaction Log (EUTL), a system harmonized at the EU level that publishes information on permit allocation, verified emissions and surrendered allowances at the installation level. I drop countries with less than 50 installations (Cyprus, Iceland, Liechtenstein, Malta, and Luxembourg). The number of installations in each country is reported in Table C3.

In addition to this detailed information, the EUTL also automatically calculates the compliance status of each installation. There are five possible codes installations can be given: (1) A, which implies "the number of allowances and ERUs/CERs surrendered by 30 April is greater than or equal to verified emissions.", (2) B, which implies "the number of allowances and ERUs/CERs surrendered by 30 April is lower than verified emissions.", (3) C, which implies "verified emissions were not entered until 30 April.", (4) D, which implies "verified emissions were corrected by competent authority after 30 April of year X. The competent authority of the Member State decided that the installation is not in compliance for year X-1.", and (5) E, which implies "verified emissions were corrected by competent authority after 30 April of year X. The competent authority of the Member State decided that the installation is in compliance for year X-1." CERs refer to Certified Emission Reductions and ERUs refer to Emission Reduction Units (ERUs) from the Clean Development Mechanism (CDM) and Joint Implementation (JI) that can be used as permits in the ETS.

C3 Country-level controls

Governance indicators I use two governance indicators developed by the World Bank to control for law enforcement or institutional capacity between 2005 and 2015. One is a measure of country-wide 'rule of law' defined as "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence". The values range between -0.171 and 2.12 in my sample. The second measure is the perceived regulatory quality defined as "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development". The values range between 0.213 and 1.921 in my sample. The data can

be accessed at: http://data.worldbank.org/data-catalog/worldwide-governance-indicators.

Economic controls For country-level economic controls, I use GDP per capita in Euro, the percentage of population with tertiary education and total population between 2005 and 2015. The data comes from the Eurostat. Descriptive statistics for all country-level controls is reported in Table C5.

C4 Region-level controls

I follow the NUTS classification (Nomenclature of territorial units for statistics) to define regions in Europe. For most countries, areas at NUTS 2 level are considered as regions, while I use NUTS 1 level for some countries (France, Germany, Greece, Poland, Romania, Spain, and Belgium) in order keep the number of regions within countries relatively comparable across countries (for instance, if I apply NUTS 2 for Germany there will be 39 regions in Germany when on average there are 6.5 regions in each country). The three Baltic countries (Estonia, Latvia, and Lithuania) are only broken down to NUTS 3 level (with NUTS 2 level being the entire territory) and most regional statistics by the Eurostat is only available at NUTS 2 level. Thus region-level controls for these countries are unavailable. The economic data at region level comes from the Eurostat. Descriptive statistics for all region-level controls as well as the number of regions in each country are reported in Table C6.

Table C1: European Social Survey: Number of Respondents

Country	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	Total
Austria	2,257	2,256	2,405	2,255	2,259	0	1,795	13,227
Belgium	1,899	1,778	1,798	1,760	1,704	1,869	1,769	12,577
Bulgaria	0	0	1,400	2,230	2,434	2,260		8,324
Czech Republic	1,360	3,026	0	2,018	2,386	2,009	2,148	12,947
Denmark	1,506	1,487	1,505	1,610	1,576	1,650	1,502	10,836
Estonia	0	1,989	1,517	1,661	1,793	2,380	2,051	11,391
Finland	2,000	2,022	1,896	2,195	1,878	2,197	2,087	14,275
France	1,503	1,806	1,986	2,073	1,728	1,968	1,917	12,981
Germany	2,919	2,870	2,916	2,751	3,031	2,958	3,045	20,490
Greece	2,566	2,406	0	2,072	2,715	0	0	9,759
Hungary	1,685	1,498	1,518	1,544	1,561	2,014	1,698	11,518
Ireland	2,046	2,286	1,800	1,764	2,576	2,628	2,390	15,490
Italy	1,207	1,529	0	0	0	960	0	3,696
Latvia	0	0	1,960	1,980	0	0	0	3,940
Lithuania	0	0	0	2,002	1,677	2,109	2,250	8,038
Netherlands	2,364	1,881	1,889	1,778	1,829	1,845	1,919	13,505
Norway	2,036	1,760	1,750	1,549	1,548	1,624	1,436	11,703
Poland	2,110	1,716	1,721	1,619	1,751	1,898	1,615	12,430
Portugal	1,511	2,052	2,222	2,367	2,150	2,151	1,265	13,718
Romania	0	0	2,139	2,146	0	0	0	4,285
Slovakia	0	1,512	1,766	1,810	1,856	1,847	0	8,791
Slovenia	1,519	1,442	1,476	1,286	1,403	1,257	1,224	9,607
Spain	1,729	1,663	1,876	2,576	1,885	1,889	1,925	13,543
Sweden	1,999	1,948	1,927	1,830	1,497	1,847	1,791	12,839
United Kingdom	2,052	1,897	2,394	2,352	2,422	2,286	2,264	15,667

Source: European Social Survey (ESS, 2002-2014).

Table C2: World Value Survey: Number of Respondents

Country	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Total
Australia	1,228	0	2,048	0	1,421	1,477	6,174
Brazil	0	1,782	0	0	1,500	1,486	4,768
Bulgaria	0	0	1,072	0	1,001	0	2,073
Canada	0	0	0	1,931	2,164	0	4,095
Chile	0	1,500	1,000	1,200	1,000	1,000	5,700
China	0	1,000	1,500	1,000	1,991	2,300	7,791
Cyprus	0	0	0	0	1,050	1,000	2,050
Czech Republic	0	924	1,147	0	0	0	2,071
Estonia	0	0	1,021	0	0	1,533	2,554
Finland	1,003	0	987	0	1,014	0	3,004
France	0	0	0	0	1,001	0	1,001
Germany	0	0	2,026	0	2,064	2,046	6,136
Hong Kong	0	0	0	0	1,252	1,000	2,252
Hungary	1,464	0	650	0	1,007	0	3,121
India	0	2,500	2,040	2,002	2,001	5,659	14,202
Indonesia	0	0	0	1,000	2,015	0	3,015
Israel	0	0	0	1,199	0	0	1,199
Italy	0	0	0	0	1,012	0	1,012
Japan	1,204	1,011	1,054	1,362	1,096	2,443	8,170
Jordan	0	0	0	1,223	1,200	1,200	3,623
Korea, Republic of	970	1,251	1,249	1,200	1,200	1,200	7,070
Latvia	0	0	1,200	0	0	0	1,200
Malaysia	0	0	0	0	1,201	1,300	2,501
Mexico	1,837	1,531	2,364	1,535	1,560	2,000	10,827
Netherlands	0	0	0	0	1,050	1,902	2,952
New Zealand	0	0	1,201	0	954	841	2,996
Norway	0	0	1,127	0	1,025	0	2,152
Pakistan	0	0	733	0	0	0	733
Philippines	0	0	1,200	1,200	0	1,200	3,600
Poland	0	938	1,153	0	1,000	966	4,057
Romania	0	0	1,239	0	1,776	1,503	4,518
Russian Federation	0	1,961	2,040	0	2,033	2,500	8,534
Saudi Arabia	0	0	0	1,502	0	0	1,502
Singapore	0	0	0	1,512	0	1,972	3,484
Slovakia	0	466	1,095	0	0	0	1,561
Slovenia	0	0	1,007	0	1,037	1,069	3,113
South Africa	1,596	2,736	2,935	3,000	2,988	3,531	16,786
Spain	0	1,510	1,211	1,209	1,200	1,189	6,319
Sweden	954	0	1,009	1,015	1,003	1,206	5,187
Switzerland	0	1,400	1,212	0	1,241	0	3,853
Turkey	0	1,030	1,907	3,401	1,346	1,605	9,289
Ukraine	0	0	2,811	0	1,000	1,500	5,311
United Kingdom	0	0	1,093	0	1,041		2,134
United States	2,325	0	1,542	1,200	1,249	2,232	8,548

Source: World Value Survey (WVS, 1984-2014).

Table C3: Number of Installations in the ETS by Country

Country	Number of installations
Austria	275
Belgium	481
Bulgaria	172
Czech Republic	464
Denmark	455
Estonia	65
Finland	679
France	1,520
Germany	2,532
Greece	207
Hungary	287
Ireland	215
Italy	1,482
Latvia	118
Lithuania	124
Netherlands	622
Norway	173
Poland	1,020
Portugal	358
Romania	284
Slovakia	221
Slovenia	104
Spain	1,362
Sweden	875
United Kingdom	1,373
Total	15,468

Source: European Union Transaction Log (EUTL).

Table C4: Descriptive Statistics: Country-level Variables

Country	Rule of law	Regulatory quality	GDP per capita (Euro)	Tertiary education (level 3-8, %)	Population
Austria	1.870	1.528	35,645	76.9	8,368,325
Belgium	1.360	1.291	33,591	67.5	10,861,533
Bulgaria	- 0.120	0.600	5,045	73.9	7,429,690
Czech Republic	0.962	1.134	14,300	85.5	10,406,087
Denmark	1.956	1.821	44,009	70.4	5,530,786
Estonia	1.153	1.440	12,273	81.9	1,333,244
Finland	1.974	1.769	35,573	76.7	5,352,147
France	1.442	1.202	30,909	68.7	64,631,834
Germany	1.696	1.571	32,673	79.0	81,483,174
Greece	0.593	0.667	18,855	62.5	11,025,804
Hungary	0.721	1.023	10,018	75.3	9,990,034
Ireland	1.729	1.707	41,555	69.4	4,469,781
Italy	0.377	0.840	26,773	53.9	59,184,429
Latvia	0.748	1.020	9,882	79.8	2,117,490
Lithuania	0.756	1.074	9,918	82.9	3,120,577
Netherlands	1.822	1.751	37,791	69.1	16,578,149
Norway	1.950	1.495	66,745	74.8	4,868,568
Poland	0.620	0.914	9,218	81.8	38,085,752
Portugal	1.055	0.926	16,445	34.6	10,512,146
Romania	0.014	0.545	6,336	69.5	20,479,399
Slovakia	0.503	1.015	11,927	83.4	5,392,052
Slovenia	0.962	0.738	17,418	79.5	2,035,400
Spain	1.077	1.068	22,845	52.1	45,787,350
Sweden	1.930	1.713	40,409	75.8	9,345,354
United Kingdom	1.715	1.744	32,909	75.6	62,513,575
Average	1.116	1.195	24,355	72.142	19,430,388

Source: Eurostat and the World Bank.

Table C5: Descriptive Statistics: Region-level Variables

country	Number of regions	GDP per capita (Euro)	Education (level 5-8)	Population
Austria	9	34,627	19.8	929,814
Belgium	3	40,058	36.8	3,620,511
Bulgaria	6	4,508	22.2	1,238,282
Czech Republic	8	14,389	17.0	1,300,761
Denmark	5	40,265	31.9	909,087
Finland	5	36,493	36.1	1,070,429
France	9	27,850	27.4	7,130,197
Germany	16	30,904	26.4	5,004,642
Greece	4	18,182	23.1	2,756,451
Hungary	7	8,792	18.2	1,427,148
Ireland	2	35,955	35.1	2,234,890
Italy	5	26,024	14.6	11,836,886
Netherlands	12	35,096	30.5	1,381,512
Norway	7	55,450	35.6	695,510
Poland	6	8,726	21.4	6,347,625
Portugal	7	16,155	15.0	1,501,735
Romania	4	6,599	14.2	5,242,526
Slovakia	4	14,482	19.7	1,348,013
Slovenia	2	17,673	28.6	187,453
Spain	7	22,657	31.0	6,541,050
Sweden	8	38,269	32.3	1,168,169
United Kingdom	12	30,950	34.1	4,671,064
Average	6.5	24,964	25.6	3,073,368

Source: Eurostat.