Centre for Climate Change Economics and Policy

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March 2018

Centre for Climate Change Economics and Policy Working Paper No. 330
ISSN 2515-5709 (Online)

Grantham Research Institute on Climate Change and the Environment Working Paper No. 294
ISSN 2515-5717 (Online)

Grantham Research Institute on Climate Change and the Environment

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Trust and CO_2 Emissions: Cooperation on a Global Scale*

Stefano Carattini Ara Jo

March 22, 2018

Abstract

In this paper we argue that the within-country cooperative culture sustained by trust positively affects international cooperative behavior. We focus on the role of social norms shared by trustworthy individuals and theoretically show how such norms can create incentives for trustworthy agents to cooperate with foreigners even when they are unsure of the trustworthiness of their foreign partners via reputation effects. We then provide empirical evidence in the context of climate change that an increase in trust leads to more global cooperation measured by larger reductions in CO_2 emissions. We establish causality by obtaining a time-varying measure of inherited trust from the trust that descendants of US immigrants have inherited from their ancestors. The measure allows us to have country fixed effects and thus to study how the evolution of trust is correlated with the change in CO_2 emissions over time. Inherited trust turns out to be a significant factor that explains the changes in CO_2 emissions across 26 countries worldwide including most European countries. The results are robust even when we study different time periods and control for a large set of time-varying factors that may affect trust and emissions at the same time. Our findings provide a plausible explanation for the existence of national, regional and local level mitigation efforts in the absence of a global agreement for climate change, which is difficult to reconcile with the conventional theory of collective action.

JEL Classification: Q54, N50, Z10.

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1 Introduction

As globalization accelerates, we are faced with an increasing number of global cooperation problems. Climate change is one example of such global collective action dilemmas on an unprecedented scale. The conventional collective action theory predicts that there should be no voluntary action since unilateral mitigation efforts impose costs while the benefits of climate change mitigation are dissipated across the globe. Yet, the reality is not as bleak. We do observe that a number of countries, regions and even individuals have taken independent action to reduce carbon emissions despite the absence of external enforcement. What is even more interesting is that there exists heterogeneity in the level of contribution across these voluntary actors —some are more active than others in their contribution to this global public good problem.[1] In this paper, we attempt to provide a plausible explanation for this puzzling phenomenon based on the microeconomic foundation on the relationship between trust, social norms and cooperation.

There seems to be a broad consensus that trust facilitates cooperative behavior in the presence of incomplete contracts and imperfect information (see, for example, Algan and Cahuc (2013)). However, what remains unanswered is to what extent, if at all, intragroup trust affects intergroup cooperation, or more generally, the scope of cooperation that could be sustained by such individual values and incentives. Tabellini (2008) studies this question and observes that people who are trustworthy cooperate on a wider range of situations (e.g. via markets, institutions, etc.) than the untrustworthy who tend to cooperate only with a small set of people nearby (e.g. family members). In a different setting with reputation but no individual values such as trustworthiness, Dixit (2004) finds that incentives to maintain a good reputation are stronger with players located nearby, because they are more likely to be future partners and information about cheating can easily reach them. In both settings, the probability of cooperation goes to zero as the distance between players goes to infinity, thus difficult to explain why some people are willing to cooperate with foreigners who are located far away. This also suggests that cooperation sustained only by individual incentives eventually gives way to institutions, as economies grow large and more globalized (Dixit, 2004). Thus, we provide a simple model that incorporates the role of social norms, an informal institution, in facilitating cooperation between trustworthy individuals and how it

[1]For instance, the European Union tends to be more active than the rest of the world in their efforts to tackle climate change with a target of 40 percent reduction in greenhouse gas emissions by 2030 compared with 1990 levels. We also see variation within Europe. Norway has made a pledge to achieve carbon neutrality by 2030, which is more ambitious than the Europe-wide goal of 80 to 95 reduction in emissions by 2050 while Sweden intends to reach the same target earlier by 2045. There is also growing empirical evidence for pro-environmental consumption behavior at the individual level (e.g. Welsch and Kühling (2009) among many others).

affects global cooperation via reputation effects. The model yields theoretical support for our hypothesis —individuals who live in a country where people trust and cooperate with each other, are more likely to cooperate with foreigners.

We then provide empirical evidence for the relationship between trust and global cooperation measured by the reduction in CO_2 emissions. Identifying the causal effect of trust faces a number of challenges. First, it is difficult to control for unobservable time-invariant national characteristics that could codetermine the level of trust and the level of emissions such as geography, legal origins and history due to the lack of long time-series data on trust across countries. A number of papers have dealt with this obstacle using time-invariant instruments such as religions (La Porta et al., 1997), ethnic fractionalization (Knack and Keefer, 1997) or historical literacy rates (Tabellini, 2010). One remaining concern related to this approach of using time-invariant instruments is that we are unsure whether the instruments picks up the effect of trust or some deeper influence of other time-invariant features related to trust on the level of emissions. A measure of trust with intertemporal variation could be one remedy. However, the difficulty is that cross-country data on trust only go back to the late 1980s, which does not provide meaningful time variation given the documented persistence of trust across generations (Rice and Feldman, 1997; Putnam, 2000; Guiso et al., 2009).

Second, even if we are able to include country fixed effects in our estimation, there remains another challenge in the identification, namely, time-varying omitted variable bias. There could be factors that affect trust and emissions simultaneously such as contemporaneous changes in the economic, political, cultural, and social environment of the country.

We rely on the methodology developed in Algan and Cahuc (2010) to deal with these identification issues. They provide a novel way to uncover the causal effect of trust (on economic development in their case) by focusing on the inherited component of trust and on its time variation over long time periods. Based on the evidence that trust is highly persistent across generations (Rice and Feldman, 1997; Putnam, 2000; Guiso et al., 2009), they estimate trust held by previous generations by looking at the level of trust that US immigrants have inherited from their ancestors who came to America from different countries and at different points in time. Time variation in inherited trust thus comes from the ancestors' time of arrival in America, assuming that they brought with themselves the prevailing social norms and attitudes from their home countries at the time of their departure and passed them on to their descendants. To explain, they estimate the differences in trust between France and Germany, for example, by comparing Americans with ancestors who came to the US from France and Germany in similar periods, say, between 1950 and 1980. Running the same exercise for descendants whose ancestors came earlier, say, between 1920 and 1950,

provides time variation in the inherited trust between the two source countries. A time-varying measure of inherited trust obtained by such logic serves as a proxy for trust held by people back in the source countries at the time periods that we look at. It allows us to include country fixed effects and control for unobservable time-invariant features that affect CO_2 emissions and trust at the same time such as geography (that is correlated with energy consumption patterns, fossil fuel endowments and potential damage from changing climate, etc) and history. The estimation of inherited trust is based on the General Social Survey that provides information on the contemporaneous trust of US descendants of immigrants, where their ancestors came from and the generation of the immigrants. The methodology provides credible information on the level of trust held by previous generations and thus allows tracing the evolution of trust for 26 countries around the world, including most European countries, Japan, India, Mexico and Africa.

This methodology can also help us reduce the concern stemming from time-varying factors by imposing a lag of minimum 25 years (one generation) between the time when trust was transmitted (that is, ancestors time of arrival in America) and the contemporaneous level of CO_2 emissions in the source country. It is then less likely that the level of emissions and the level of trust held by people who left the source country at least 25 years ago were driven by some unobservable factors simultaneously. We control for a number of changes in the economic, political, cultural and social environment to further reduce the bias that may arise from other time-varying factors.

Our findings suggest that increase in inherited trust is a significant factor that explains the reduction of CO_2 emissions over the period between 1950 and 2010, even when we include country fixed effects and control for the changes in economic growth, industrial composition, and trade patterns. The results are robust when we look at different periods such as 1970 and 2010 and include additional controls such as changes in political institutions, religious or social attitudes, education, urbanization, and population density. We also run a placebo test on the period between 1920 and 1980, which is an era when there was no awareness of man-made climate change, thus no reason for the relationship between trust and CO_2 emissions to exist. As expected, we do not see the link between trust and CO_2 emissions between 1920 and 1980, while trust still had a positive impact on economic growth over the same period.

Our paper relates to two distinct strands of literature. First, it has grown out of the literature that concerns social norms and cooperation. In contrast to the conventional collective action theory, Ostrom (1990) documents a wide range of empirical evidence that local social norms —a set of shared beliefs on how one ought to behave in a given situation —enable individuals to cooperate to sustainably manage local natural resources in the absence of

external enforcement. In fact, she observes that such self-governed resource management regimes often outperform formal enforcement regimes. One of the central characteristics of the cases of successful cooperation is trust between involved parties, or the capability of group members to gain a reputation for being trustworthy (Ostrom, 2000; Milinski et al., 2002; Poteete et al., 2010).[2] Taking this insight one step further, we show that the intra-group cooperative culture sustained by trust and trustworthiness may also affect intergroup cooperation through reputation effects.[3] We provide theoretical and empirical support for this hypothesis.

Also related is the well-established literature on the effect of trust, or social capital at large, on various economic outcomes. Most notably, a number of papers have documented the strong and positive influence of trust on economic development. Knack and Keefer (1997) and La Porta et al. (1997) provide early empirical evidence on the relationship between social capital and economic performance in a cross-country investigation. Zak and Knack (2001) provide theoretical support and further empirical evidence from a larger cross-sectional sample of countries. Recently, Tabellini (2010) and Algan and Cahuc (2010) corroborate the effects of trust on economic development controlling for country fixed effects. Trust has also been shown to affect financial development (Guiso et al., 2004), trade patterns (Guiso et al., 2009), and the design of institutions and regulations (Algan and Cahuc, 2009; Aghion et al., 2010, 2011). Closely related to the current article is Jo (2017) where the author provides support for our findings by showing that high-trust countries tend to have more stringent climate change legislation through lower enforcement costs.[4]

The paper is organized as follows. Section 2 provides theoretical support for our hy-

[2]Ostrom (2010) argues that this relationship between social norms and local cooperation could have implications for global collective action dilemma by generating multi-level externalities that go beyong the local level. Communities with solar power networks, better waste disposal facilities and efforts to reduce pollution levels in metropolitan areas are the examples put forward that help reduce local pollution levels as well as potentially decrease global greenhouse gas emissions. However, this argument has yet to be tested empirically. A recent paper by Brunel and Johnson (2017) provide empirical evidence against her argument.

[3]Carattini et al. (2015) also study the relationship between within-country trust and greenhouse gas emissions, but the paper fails to provide a compelling theoretical explanation for the observed relationship between the two variables. Also, the analysis provides correlational evidence only, relying on short-run variations in the average trust measure across countries between 1990 and 2007.

[4]We draw insights for our theoretical framework from the repeated game with random matching literature. A group of papers investigate community enforcement mechanisms in this setting, where players change their opponents in each period and cheating against one opponent triggers sanctions by other members of the society (Okuno-Fujiwara and Postlewaite, 1995; Kandori, 1992; Ellison, 1994; Dal Bó, 2007; Takahashi, 2010). In particular, we focus on the setting of local information processing, first introduced by Okuno-Fujiwara and Postlewaite (1995) and also studied in Kandori (1992) and Dal Bó (2007), that provides players with information on the trustworthiness of the randomly matched opponent. Such information transmission structure serves as an interesting tool to investigate the incentives of the players to cooperate with foreigners whose trustworthiness is not provided by the local information processing system unlike that of local opponents.

pothesis. We discuss the data in Section 3. Section 4 presents the estimation strategy and Section 5 discusses our findings and present the results from a placebo test and robustness checks. Section 6 concludes.

2 Conceptual Framework

In this section we present a simple model to theoretically motivate our hypothesis. We begin by discussing the relevant literature that provides insights for understanding the relationship between trust and cooperation. We then modify the standard model to incorporate the possibility of global cooperation to answer the following question —when people live in a society where people trust and cooperate with each other, are they also more likely to cooperate globally?

2.1 Trust, Social Norms and Cooperation

In his relation-based governance model, Dixit (2004) shows that cooperation is easier to sustain if the size of the group is small and individuals are close to each other. Given that information transmission is localized, incentives to maintain a reputation are stronger for individuals nearby since information about cheating is more likely to reach them than those who are located far away. Tabellini (2008) also studies the range of situations in which individuals cooperate and reaches similar conclusions but in a different context. He observes that in reality, individuals draw utility from the act of cooperating itself (i.e., have "warm glow" preferences) and this non-pecuniary utility from cooperation is stronger among close individuals. In other words, there is no reputation, but norms of good conduct apply with greater force among close individuals.

Both models yield useful insight as to why we observe cooperation in various situations. However, the probability of cooperation being sustained goes to zero as the distance between individuals goes to infinity in both cases, thus difficult to explain why individuals cooperate *globally*. This also indicates that cooperation sustained only by individual incentives eventually gives way to institutions as economies grow large and more globalized (Dixit, 2004). Thus, in this paper we focus on the role of social norms, a form of informal institution, in inducing global cooperation as one potential mechanism.

The specification of desirable behavior together with sanction rules in a community constitutes a *social norm*. The role of such social norms in guiding human behavior in conflict situations has been studied in the repeated game literature with random matching (Okuno-Fujiwara and Postlewaite, 1995; Kandori, 1992; Ellison, 1994; Dal Bó, 2007; Takahashi, 2010).

Among other factors, the literature is concerned about the minimal information transmission with which the cooperative social norm can be sustained and has shown that a large community can sustain cooperation through community enforcement under various levels of information availability.[5] We are particularly interested in the setting where players have access to some local information (as opposed to no or perfect information), although they do not observe what happens in the entire community; that is, players can observe the characteristics of their opponent to whom they are randomly matched in each stage game via their 'status', which we label as trustworthy or untrustworthy, and players make actions based on the status of their own and their opponent's.[6] We present a simple baseline model of such information structure used in the literature to illustrate the interaction between trustworthiness, norms and cooperation and more importantly, to motivate our extension of the model in the following section.

The structure of the repeated game with random matching is as follows. A society consists of a continuum of players on [0,1]. In each period t=1,2,..., a player is randomly matched to another player to play a two-player stage game. This procedure is repeated infinitely and each player's total payoff is the expected sum of her stage payoffs discounted by $\delta \in (0,1)$, which is common to all players. We assume that the probability distribution over potential opponents in each period is uniform and independent of the past history. The stage game that each pair of players plays at time t is shown in Table 1. The payoff g is taken to be positive with l non-negative so that each player has Defect as a dominant strategy in the stage game.

Apart from their own history, players have access to a local information processing system that gives them information on the status or type of their opponents. The system has the following structure: (1) a status $z_i(t) \in Z_i$ is assigned to player i at time t; (2) when player i and j meet at time t and take actions $(a_i(t), a_j(t))$, the update of their status follows a transition mapping $(z_i(t+1), z_j(t+1)) = \tau_{ij}\ (z_i(t), z_j(t), a_i(t), a_j(t))$; (3) at time t, player i can only observe $(z_i(t), z_j(t))$. The processing of information is treated as exogenous and assumed to function honestly.

Now, let us consider a simple social norm that prescribes the behavior of each player, σ, as a function of her status and the status of the matched player when there are two status levels, trustworthy (T) and untrustworthy (U), i.e., $z_i = \{T, U\}$. The associated status

[5]There can be three broad levels of information availability; perfect information where every player's past actions are publicly observable, limited information where players have some information of their randomly matched opponents' past actions, and no information where players only observe their own past history.

[6]Okuno-Fujiwara and Postlewaite (1995), Kandori (1992) and Dal Bo (2007) use more neutral words, 'good' instead of 'trustworthy' to describe the type of players who are expected to follow the social norm and thus cooperate and 'bad' instead of 'untrustworthy' to describe the type of players who are not expected to cooperate or have deviated from the norm.

	Cooperate	Defect
Cooperate	1,1	-l,1+g
Defect	1+g,-l	0,0

Table 1: The Stage Game

transition mapping is also defined below.

$$\sigma_i(z_i, z_j) = \begin{cases} Cooperate & \text{if } (z_i, z_j) = (T, T) \\ Defect & \text{otherwise} \end{cases}$$

$$\tau_i(z_i, z_j, a_i) = \begin{cases} Trustworthy & \text{if } (z_i, z_j, a_i) = (T, T, C) \text{ or } (T, U, D) \\ Untrustworthy & \text{otherwise} \end{cases}$$

$$P_i(T) = 1 - r \text{ and } P_i(U) = r$$

We suppose there is a fixed share of trustworthy players in the population, $1-r$, labelled so in the sense that they are expected to cooperate for a mutually beneficial outcome in a conflict situation such as the prisoner's dilemma by conforming to the social norm.[7] An immediate implication of the setting of an infinite population is that each player is of zero measure and hence no unilateral deviation from the social norm by a single player will alter the distribution, i.e., the status distribution is stationary. The setting of an infinite population and the resulting stationarity of status distribution is reasonable since the endogenous formation or dynamic change of status distribution, i.e., why there is higher trust or are more trustworthy individuals in some countries than in others, is beyond the scope of our analysis. We are mainly interested in the extent to which community enforcement is possible in the presence of local information processing system and its sustainability as a function of the trustworthiness of the population.

To explain the system above, the social standard behavior $\sigma_i(z_i, z_j)$ prescribes that a player cooperates if both she and her opponent are trustworthy and defects if either is untrustworthy. A player's status is revised according to τ_i. A player with trustworthy status remains so as long as she follows the social standard behavior but changes to untrustworthy

[7]There is strong experimental evidence that suggests there are different types of individuals. There are 'conditional cooperators' who are willing to cooperate so long as other people also cooperate, while there are 'free riders' who never cooperate no matter what (Fischbacher et al., 2001; Fehr and Gächter, 2000; Fehr and Schmidt, 1999; Ostrom, 2000). This structure of the model closely matches this evidence.

if she deviates. Note that each player's decision making and the update of the status is done without the knowledge of the entire society. They are based only on the local information which consists of the player's status and her action and the status of the matched player.

It can be shown that with such social norm that facilitates cooperation between trustworthy individuals, any strictly individually rational payoff (cooperative outcome in this case) can be supported by a sequential equilibrium when the discount factor is sufficiently high.[8]

PROPOSITION 1 (i) The social norm, $\sigma_i(z_i, z_j)$, can be sustained as a sequential equilibrium if players are sufficiently patient or $\delta \in (\delta^*, 1)$ for some δ^*. (ii) Trustworthy players have greater incentives to conform to the norm if r is low.

Proof. The model we consider here is Example 1 of Okuno-Fujiwara and Postlewaite (1995) with a generic payoff matrix. Thus we closely follow their approach in proving the results. It is a player's best response to follow the norm if the immediate gain from deviation is less than the resulting loss in the future due to the change in one's status. The resulting loss is evaluated along the equilibrium path, or evaluated by the value function $v^\infty(z_i, {\sigma_i}^*)$. The immediate gain is g, while the present discounted payoff along the equilibrium path is $\frac{1-r}{1-\delta}$ and zero for trustworthy and untrustworthy players, respectively. Then the norm is sustained if:

$$\delta^* = \frac{g}{g+1-r} \leq \delta \tag{1}$$

For part b of the proposition, it is straightforward that δ^* is an increasing function of r. Q.E.D.

Intuitively, trustworthy players follow the norm if players are patient enough and sufficiently value future cooperation opportunities. In particular, the main implication of the equilibrium is that trustworthy players face greater incentives to follow the norm when there are a large number of trustworthy individuals in the community. The expected loss in future payoffs from deviation, of becoming untrustworthy and losing future cooperation opportunities, $\frac{1-r}{1-\delta}$, is higher or simply cheating is more costly as the share of trustworthy individuals in the community rises.

[8]The payoff to a player i is said to be *individually rational* if it is at least as large as the level she can guarantee for herself, i.e., $\underline{u}_i = \min_{a_j \in A} \max_{a_i \in A} g_i(a_i, a_j)$.

2.2 Trust and Cooperation in the Global Context

Now, suppose there is a global collective action dilemma that requires attention and collective effort of all societies (or countries) that constitute the global community. We model the situation by introducing to the population a number of foreigners whose status is 'unknown', which constitutes b percent of the population and b is assumed to be equal across countries. The local information processing structure is not able to provide information on the trustworthiness of foreigners (one can think of the barriers imposed by the difference in language, culture, appearance, etc. that could hinder the functioning of the local information system). The existing social norm then does not advise players on what to do upon being matched to a foreigner simply because their status is unknown (recall that the norm prescribes appropriate actions only based on the player's status and the status of the matched opponent). The question here is then, is the social norm still sustainable in the presence of foreigners? Do trustworthy individuals have incentives to cooperate with foreigners? We show that trustworthy individuals do cooperate with foreigners even when their trustworthiness is unknown and the incentives to do so increase in the fraction of trustworthy individuals in the local population.

PROPOSITION 2 (i) The norm $\sigma_i'(z_i, z_j)$ can be sustained as a sequential equilibrium in the presence of foreigners if players are sufficiently patient or $\delta \in (\delta^*, 1)$ for some δ^*. (ii) Trustworthy players have greater incentives to cooperate with foreigners when r is low.

Proof. Consider the norm $\sigma_i'(z_i, z_j)$ and the following modified status transition with the presence of foreigners.

$$\sigma_i'(z_i, z_j) = \begin{cases} Cooperate & \text{if } (z_i, z_j) = (T,T),(T,X) \\ Defect & \text{otherwise} \end{cases}$$

$$\tau_i(z_i, z_j, a_i, a_j) = \begin{cases} Trustworthy & \text{if } (z_i, z_j, a_i, a_j) = (T,T,C,\cdot),(T,U,D,\cdot), \\ & \qquad\qquad (T,X,C,\cdot) \text{ or } (T,X,D,D) \\ Untrustworthy & \text{otherwise} \end{cases}$$

where a_j is the opponent's action and X is the unknown status of foreigners. Players still play the same prisoner's dilemma game described in Table 1. The best response strategy can be expressed in terms of unimprovability as in Okuno-Fujiwara and Postlewaite (1995). That is, it is a player's best response to follow the norm if the immediate gain from defecting

against a foreigner is less than the resulting loss in the future due to the change in one's status. The probability of the foreigner's cooperation, $\theta \in (0,1)$, is assumed to be random for the sake of simplicity, i.e., $E(\theta) = \frac{1}{2}$. The resulting loss is evaluated along the equilibrium path, or evaluated by the value function $v^{\infty}(z_i, \sigma_i{}^*)$. It is straightforward to check that the expected immediate gain from defecting against a foreigner is $\frac{1}{2(g+l)}$. The present discounted payoff for a player of each status along the equilibrium path is as follows.

$$v_i{}^{\infty}(T) = \frac{1}{1-\delta}[(1-b)(1-r) + b(\frac{1}{2} - \frac{1}{2}l)] \tag{2}$$

$$v_i{}^{\infty}(U) = \frac{b(1+g)}{2(1-\delta)} \tag{3}$$

The unimprovability requirement $1/2(g+l) \leq \delta[v_i{}^{\infty}(T) - v_i{}^{\infty}(U)]$, reduces to the following condition.

$$\delta^* = \frac{g+l}{(1-b)[2(1-r)+(g+l)]} \leq \delta \tag{4}$$

Thus, for δ sufficiently large, the loss caused by the change in status is greater than the expected gain from a one-shot deviation against a foreigner, and therefore trustworthy players have incentives to cooperate with foreigners even when their status is unknown. For the second part of the proposition, it is clear that δ^* is an increasing function of r. A large fraction of trustworthy players in the population makes defection against foreigner costly and thus serves to lower the threshold discount factor beyond which the norm is sustained. Q.E.D.

The modified transition function is identical to the one in the previous section, so long as players are matched to local players whose trustworthiness is observable. For matchings with foreigners, if a trustworthy player cooperates she remains trustworthy irrespective of the foreigner's action, a_j. On the other hand, if she defects there are two possible outcomes. In the case where the foreigner defects as well, she remains trustworthy. We interpret this as the player's cautiousness being justified. If, however, the foreigner cooperates she becomes untrustworthy, which will cost her future cooperation opportunities that could have been ensured by remaining trustworthy (i.e. local trustworthy partners who follow the social norm do not cooperate with untrustworthy players).[9]

[9]We have assumed the same payoff structure for cooperation with foreigners (the same g and l). One might argue that the benefit from global cooperation might be smaller than local cooperation. Assuming $g' < g$, where g' is the benefit from global cooperation, in fact makes the incentive to cooperate with foreigners even stronger since $v_i{}^{\infty}(U)$ is smaller when g' is lower. Similarly, assuming $l' < l$, where l' is a loss from being cheated by a foreign partner, makes $v_i{}^{\infty}(T)$ larger. Intuitively, trustworthy players take the risk of being cheated by foreigners when they cooperate with them and thus a lower price of such risk-taking induces trustworthy players to be more inclined to cooperate with foreigners.

The equilibrium provides a simple theory of how local cooperative norms between trustworthy players create incentives to cooperate with foreigners through the role of reputation. The most important implication is that individuals face greater incentives to cooperate with foreigners when they live in a society with a large number of trustworthy individuals. There is a greater benefit of having the reputation for being trustworthy when most people are trustworthy. The result relies on the status transition function that specifies, defection against cooperative foreigners is treated similarly as defection against local trustworthy players —trustworthy players become untrustworthy in both cases.

This specification is consistent with a growing body of experimental evidence that shows global cooperation can be sustained by local interaction and local punishment for global defection. For example, Milinski et al. (2006) run an experiment where players are first asked to contribute to a "climate fund" that will benefit the entire world and then play a 2-player prisoner's dilemma game (PD henceforth). The authors find that players were much more willing to contribute to the climate fund when the information on each player's contribution was going to be shared in the next round PD than each contribution remained anonymous, which highlights the role of reputation that flows across local and global settings.[10]

A recent work by Hauser et al. (2016) provides further evidence on the interaction between local and global cooperation through reputation. In alternating rounds of public goods games (PGG henceforth) and PDs, they find that in a pairwise PD game with two neighbours, players were more likely cooperate with neighbours who had contributed at least as much as themselves in the preceding PGG as well as with neighbours who had cooperated with them in the previous PD. That is, participants reciprocated not only their neighbour's previous pairwise cooperation, but also their contributions in the PGG, which the authors call local-to-global reciprocity.[11] They also provide direct evidence that local punishment effectively induces global cooperation by showing that when both neighbours defected in the PD, the

[10]In a more generic setting that replaces the contribution to the climate fund with standard multi-player public good games, Milinski et al. (2002) find that a higher level of cooperation is sustained in public good games (played among six players including the pair that will play the PD in the next round) when they are alternated with 2-player PDs than when all PGGs (Public Good Games) are played first and followed by a series of PDs. This reflects that not contributing in the PGG harms the reputation of a player in the following PD, which induces players to contribute in the PGGs. They provide evidence for this mechanism of reputation in two ways. Firstly, players are more likely to defect in a 2-player PD if their opponent did not contribute in the preceding PGG (that involved four other players apart from the pair themselves). In other words, players tend to withhold from cooperating with those who did not behave in a trustworthy manner in the preceding PGG. Secondly, they show that cooperation in the PGGs is sustained only when there is the risk of future rounds of PDs. In groups that were told that there would be no PDs, thus no channel of reputation effects, cooperation declined rapidly.

[11]Here the group sizes in PGGs are much bigger than usual with 39 players on average and 17 and 60 being minimum and maximum, respectively, compared to, for instance, 6 in Milinski et al. (2002). In a second experiment, they replicate their findings with a group of 1000 players for the PGGs and provide further evidence on the scalability of local-to-global reciprocity.

player significantly increases contribution in the following PGG.[12]

Most closely related to our model is a recent work by Jordan et al. (2016) where they provide evidence that reputation concerns drive uncalculating cooperation. They introduce a novel two-stage incentivised economic game where in the first stage player A decides whether to pay a cost to benefit a recipient in a way either calculating or uncalculating and in the second stage player B (who is not involved in the first stage game) and player A play a trust game, with player B as the truster and player A as the trustee.[13] As in standard trust games, the amount sent by B to A reflects B's trust of A and the amount returned from A to B reflects A's trustworthiness. First, they find that player A is more likely to be uncalculating when the decision making process in the first stage is observable to player B than when the process is hidden, indicating that people tend to use uncalculating cooperation for reputational benefits. Also, their findings show that uncalculating cooperation is indeed perceived as a signal for trustworthiness as player B tends to send more money when she observed that player A was uncalculating in the first stage. Finally, uncalculating cooperation as a signal for trustworthiness seems to be valid since player A who was uncalculating in the first stage did behave in a more trustworthy matter (returned more money to player B) in the second stage. In our model, trustworthy players who follow the social norm cooperate with foreigners without knowing their trustworthiness and bear the risk of being cheated (thus cooperate uncalculatingly) in order to keep their reputation for being trustworthy. This specification seems to be directly supported by this experimental evidence.

The parameters g and l in the prisoner's dilemma game reflect the quality of *formal* institutions that we consider exogenous.[14] Better external enforcement implies a smaller benefit of cheating and a smaller loss from being cheated. It is instructive to discuss the implications of these parameters on the equilibrium. The immediate gain from deviating from the social norm falls in both cases, with and without foreigners, as g falls. However,

[12]We also observe similar punishment mechanisms in formal law enforcement. The exercise of extraterritorial jurisdiction, defined as the legal ability of a government to exercise authority beyond its normal boundaries, is an example similar in spirit in that global defection (or defection against a foreigner) is punished locally. For some types of crime, a crime committed abroad is prosecuted in the country of origin of the offender even if the crime may not be illegal in the country where the offence took place (Colangelo, 2014). Fraud, bribery, sexual offences against children, murder and manslaughter are the examples for which the court can exercise extraterritorial jurisdiction.

[13]The authors employ two approaches to operationalise uncalculating versus calculating decision-making. One is to provide a looking choice whereby player A can choose to look at the cost of helping the recipient before helping. Another approach is to measure the time player A spends before making the helping decision when the cost is revealed based on experimental evidence that quick cooperative choices are perceived to be more prosocial.

[14]Tabellini (2008) studies how formal institutions and the share of trustworthy individuals (who cooperate on a wider range of situations than the untrustworthy) dynamically evolve through value transmissions from parents to children.

the gain from defecting against a foreigner, $\frac{1}{2}(g+l)$, depends on l as well as g, whereas it only depends on g without foreigners. This follows from imperfect information. As players do not observe the trustworthiness of their foreign opponents, they bear the risk of cooperating with a cheating foreigner in the equilibrium. A smaller l reduces the cost of being cheated, which increases the incentives to conform to the norm of cooperation instead of deviating from it.

The equilibrium we discussed here illustrates how trust or trustworthiness of the population sustains the norm of cooperation within the country, and how such norms create incentives to cooperate with foreigners. In the following sections, we provide empirical evidence for this theoretical prediction by estimating the role of trust on the reduction in CO_2 emissions.

3 Data Description

We rely on standard sources for historic emissions and macroeconomic data. CO_2 emissions data are from the Carbon Dioxide Information Analysis Center (CDIAC) and measured in thousand metric tons of carbon dioxide. We focus on the period 1950 - 2010 for which the emissions estimates are derived from energy statistics published by the United Nations. Data on population and economic growth measured by income per capita in 1990 US dollars come from the Maddison database (Bolt and van Zanden, 2014) which covers the period 1820 - 2010.[15]

To trace the evolution of trust in different countries we use the information on the trust of US immigrants and the country of origin of their ancestors provided by the General Social Survey (GSS) since 1978. Individual trust is measured by the following question commonly used in other surveys and in the relevant literature: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" Respondents answer the question by choosing one of the following options, "Most people can be trusted", "Can't be too careful," and "Depends." We construct a binary trust variable that takes 1 if the respondent answered that most people can be trusted and takes 0 otherwise. The fraction of respondents who answered "Depends" is small, around 4 percent, and thus the categorization has little influence on the results of our analysis. We report the results from various alternative specifications of the trust measure in the Appendix A2.

The country of origin of the respondents' ancestors is given by the following question: "From what countries or part of the world did your ancestors come?" Individuals can name

[15]Here we only discuss two major macro-level variables but subsequently we employ more. Data Appendix contains a detailed description of all macro-level variables used in the analysis.

up to three countries in order of preference and when more than one country is named, respondents are asked to specify one country to which they feel closest. We use this information to construct the country of origin variable following Algan and Cahuc (2010). Our baseline sample includes 26 countries including most European countries: Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, United Kingdom, former Yugoslavia, and African origins as a single category. We only include countries of origin with 10 or more observations in our estimations (Table A1).

We use the information on the birth year of the respondents and which immigrant generation they belong to in order to estimate their ancestors' time of arrival in America (the way we do this will be explained in detail in the following section). Respondents are asked if they were born and how many of their parents and grandparents were born in the United States. Based on this information we distinguish four generations of US immigrants: first-generation Americans, second-generation Americans with at least one parent born abroad, third-generation Americans with both parents born in the United States and at least two grandparents born abroad, and fourth-generation Americans with both parents and more than two grandparents born in the United States.

Current trust in the source countries, which is to be used to compare with the estimated inherited trust from US immigrants, comes from the European Social Survey (ESS) for European countries and the World Value Survey (WVS) for non-European countries. The trust question in both surveys is exactly the same as the one used in the GSS, which makes the variable comparable across these databases.[16] Whenever possible, we use the 2010 wave of both surveys to provide a comparison with trust transmitted in 2010 estimated from the GSS. We rely on the 2005 wave of the WVS for Canada.

[16] Although the wording of the question is identical, the scale given for answer differs across these surveys. GSS offers three options, "Most people can be trusted", "Can't be too careful", and "Depends", while the ESS offers a scale from 0 to 10 (with 10 the highest level of trust) and the WVS offers only two options, "Most people can be trusted", "Can't be too careful." The construction of a binary trust variable from the GSS allows a straightforward comparison with the answer from the trust question in WVS and the categorisation has little impact on the comparability of the two variables because as stated in the main text the fraction of respondents who choose "Depends" is minimal. For the ESS, we also construct a binary variable from the answer that takes 1 if the respondent chose a number larger than 5 and 0 otherwise.

4 Empirical Analysis

4.1 Estimating the Role of Trust in Reducing CO_2 Emissions

Our aim is to estimate the effect of trust on global cooperation which we measure by the reduction of CO_2 emissions. To this end we run the following regression:

$$Emissions_{ct} = \alpha_0 + \alpha_1 T_{ct} + \alpha_2 X_{ct} + F_c + F_t + \epsilon_{ct} \tag{5}$$

where $Emissions_{ct}$ is per capita CO_2 emissions in country c and time t. T_{ct} measures the average trust of individuals who live in country c and time t, conditional on a set of individual characteristics such as age, gender, education, income, employment status and religious affiliations. X_{ct} includes a vector of time-varying country characteristics that influence the level of emissions such as the size and structural composition of their economies and openness to trade. F_c denotes country fixed effects that control for unobservable time-invariant national features such as geography that is likely to be correlated with emissions through energy consumption patterns, fossil fuel endowments and potential damage from changing climate, and also initial economic development or historical institutional qualities that may have had influence on trust and characteristics of the economy. Finally, F_t denotes period fixed effects common to all countries.

The task of uncovering the causal effect of trust is not straightforward. First, given the substantial evidence that trust tends to be highly persistent across generations (Rice and Feldman, 1997; Putnam, 2000; Guiso et al., 2006; Nunn and Wantchekon, 2011), we need a measure for trust with intertemporal variation over several generations. However, the cross-country measure for trust available from the World Value Survey only goes back to the late 1980s, which does not allow sufficient time for the evolution of trust attitudes in individuals. Second, the correlation between the change in trust and the change in CO_2 emissions in a model with country fixed effects can be interpreted as causal only if these two variables are not simultaneously affected by common time-varying factors. For example, one can imagine there might have been political or social events in a country that affected generalized trust or trustworthiness of the population and industrial activities that led to changes in CO_2 emissions at the same time.

To overcome these difficulties, we follow the methodology developed in Algan and Cahuc (2010). The authors suggest a novel way to estimate the causal effect of trust on economic growth by focusing on the inherited component of trust and its time variation over long time periods. The key insight here is that trust tends to be persistent across generations and therefore parents' trust is a strong predictor of their children's trust. Based on this

observation they trace the evolution of inherited trust from the trust that US immigrants have inherited from their ancestors who immigrated to America from different countries at different points in time. Time variation in inherited trust thus comes from the ancestors' time of arrival in America, assuming they brought with themselves the prevailing social norms and attitudes from their home countries at the time of their departure. Inherited trust is measured by the country of origin fixed effects in individual regressions of the current trust of the descendants of US immigrants. The coefficients on the country of origin fixed effects, which we denote as $\hat{T_{ct}}$, serve as a proxy variable for trust by replacing T_{ct} in equation (1). The coefficient on the inherited trust variable α_1 then reflects the correlation between inherited trust and contemporaneous CO_2 emissions.

The concern for time-varying omitted variable bias is reduced by the 25-year lag that we impose between the time at which trust was transmitted by immigrant ancestors (which is their time of arrival in the US) and contemporaneous CO_2 emissions in the home country. The lag structure effectively replaces $\hat{T_{ct}}$ with $\hat{T_{ct-25}}$. It is then less likely that the correlation between changes in inherited trust and changes in emissions is driven by changes in some unobservable factors that affected the two variables simultaneously, after controlling for a number of channels through which trust in the past may affect the contemporaneous level of emissions. The way we implement this strategy is explained at length in the section below.

We consider the periods 1950-1952 and 2008-2010 (1950 and 2010 henceforth) in our baseline estimation. As Figure A1 shows, the trend in CO_2 emissions has been relatively stable for most countries from 1950 onwards after a structural break due to World War 2 in most OECD countries. It is important to go sufficiently far back in time to allow a long gap for inherited trust to evolve; however, we are also aware that up to around 1980s there was no awareness of man-made climate change and therefore there is no conceptual link between trust and cooperation in climate change mitigation efforts.[17] We make a trade-off between going as far back as to 1950 and including an era when there was no prior to expect the relationship between trust and CO_2 emissions to exist. Later, we take advantage of the setting by running a placebo test on the period (1920-1980) in which we do not expect to observe the link between trust and emissions. As robustness checks, we also consider an

[17]The first World Climate Conference was held in Geneva in 1979, convened by the World Meteorological Organization (WMO) with the main focus of the meeting being global warming and how it could affect human activity. According to our search on the media database Factiva, newspaper articles were regularly written on the warming effects of carbon dioxide emissions and the use of fossil fuel starting from the 80's. Since then the topic has become a major political issue in many developed countries with varying degrees of intensity since then. In 1988, the WMO and the United Nations Environment Programme (UNEP) created the Intergovernmental Panel on Climate Change (IPCC), whose initial task was to prepare a comprehensive review and recommendations with respect to the state of knowledge of the science of climate change; social and economic impact of climate change; possible response strategies. Thus we believe it is safe to assume that the period between 1920 and 1980 was void of the public's awareness for climate change.

alternative period (1970-2010) and find similar results as in the main analysis.

4.2 Inherited Trust of US Immigrants and Contemporary Trust in the Source Country

4.2.1 Inherited Trust

In this section we estimate the evolution of trust transmitted from the home country through US immigrants from the General Social Survey (GSS) following Algan and Cahuc (2010). We impose a lag of 25 years between the inherited trust and the contemporaneous level of CO_2 emissions. It implies that we study trust attitudes transmitted at least T−25 before to explain the level of emissions at T. We expect this lag structure to mitigate the concern of time-varying omitted variable bias since it is then less likely that some common factors simultaneously affected both emissions at T and trust transmitted at least 25 years before T.

We use the following mechanism to estimate inherited trust in 1950 and 2010. The information on the birth year of the respondents (who are descendants of US immigrants) and their immigrant generation is used to group them into two cohorts, 1950 cohort and 2010 cohort. The two cohorts differ in the timing of their ancestors' arrival in America from the source countries (before 1925 and between 1925 and 1985, respectively) and therefore the prevailing social norms and attitudes they are presumed to have inherited. The 25-year lag pushes back the latest time of arrival in the country by 25 years from the periods in which we are interested.

Table 2 describes the cohort decomposition by immigrant generation. One generation is assumed to be 25 years. Inherited trust in 1950 is then that of second-generation Americans born before 1925 (i.e. those whose parents arrived in America before 1925), of third-generation Americans born before 1950 (i.e. those whose parents were born in the US before 1925 and therefore whose immigrant grandparents arrived in America before 1925), and of fourth-generation Americans born before 1975 (i.e. following the same logic, whose great grandparents arrived in America before 1925). Similarly, inherited trust in 2010 is that of second-generation Americans born between 1925 and 1985, of third-generation Americans born after 1950, and of fourth-generation Americans born after 1975. Table A1 reports the number of observations for these two cohorts by their country of origin. Table A2 presents summary statistics.

We run a single regression on both cohorts with interaction terms between cohort dummies and country of origin dummies, controlling for age, gender, education, employment status, religion, and income category in order to provide evidence for time variation in in-

Table 2: Cohort decomposition - example with a 25-year lag

Generation	Cohort 1950	Cohort 2010
2nd	born before 1925	Born 1925-1985
3rd	born before 1950	born after 1950
4th	born before 1975	born after 1975

herited trust. In another specification, we also try to include parents' education to address the possibility that trust is transmitted through parents' human capital rather than cultural transmission and find similar results. Table 3 reports the OLS estimates of inherited trust for 1950 and 2010 measured by the coefficients on the country of origin fixed effects. Trust inherited in 1950 by Swedish Americans is used as the reference group. We include year dummies to control for common temporal shocks. Standard errors are clustered at the country of origin level.

Column 1 presents the estimates for inherited trust in 1950 relative to trust inherited by Swedish Americans in 1950. The results suggest that having ancestors coming from a country that is not Sweden has a statistically significant effect on one's inherited trust. The level of trust inherited in 1950 from most Western and Central European countries or the United Kingdom tends to be higher than that inherited from Sweden. The probability to trust other people is 9.2 percentage points higher for Austrian Americans and 1.2 percentage points higher for British Americans. On the other hand, inherited trust in 1950 is lower for most Eastern European and Mediterranean countries. The probability to trust others is 2.3 and 4.8 percentage points lower for Czech Americans and for Italian Americans, respectively. Inherited trust in 1950 is also lower for countries in other regions such as India, Japan, and Africa.

Column 2 reports inherited trust in 2010 relative to trust inherited by Swedish Americans in 1950. The estimates suggest substantial time variation in inherited trust for most source countries. The pattern in the evolution of inherited trust we find here is remarkably similar to what Algan and Cahuc (2010) document in their paper although we consider a slightly different time period (their baseline period is 1935-2000). It provides further evidence for the persistent nature of trust and its slow evolutionary process. Swedish Americans have inherited higher trust in 2010 than in 1950. Similarly, trust inherited from other Nordic countries has also increased. In contrast, inherited trust deteriorated over time for most Continental European countries as well as Mediterranean countries such as Italy and Greece. We report the effect of other individual characteristics on trust in Table 4. Trust is positively correlated with age, education and income as documented by previous studies (Alesina and La Ferrara 2002; Glaeser, Laibson and Sacerdote 2002).

4.2.2 Correlation between Inherited Trust and Contemporary Trust in the Source Country

Having estimated inherited trust from the descendants of US immigrants, we now document the relationship between the estimated inherited trust and the current level of trust in the source countries. We would expect to find a strong correlation between inherited trust and current trust back in the source country, if the channel of cultural transmission within families is at work.

As in Algan and Cahuc (2010), we estimate the same regression that we ran above but replace the country of origin fixed effects by the current level of average trust in the source countries in 2010 provided by the World Value Survey and the European Social Survey. One might be concerned about potential compatibility issues of using two different surveys to construct a variable (although the wording of the trust question in the two surveys is identical). Thus we try to restrict the sample to respondents whose ancestors came from European countries and use the ESS only to calculate the current level of trust. The results are reported in Table A3 and qualitatively consistent with what we find and discuss in this section.

Column 1 and 2 in Table 5 show the results for descendants of US immigrants who have inherited trust from their ancestors in 2010 and 1950, respectively. Column 1 indicates that for the period 2010, the level of average trust in the source country is a statistically significant predictor of the inherited trust of Americans who are born and raised in the US but have ancestors who came from the same country. This provides strong evidence for the role of cultural transmissions within families. We also find a similar relationship for the period 1950 (Column 2), but with larger standard errors. It indicates that the contemporaneous trust in the source country does not predict trust inherited much earlier (before 1925) as precisely as it predicted trust inherited more recently. This is consistent with the time variation in inherited trust we observed in the above section.

Another possible interpretation for the weaker correlation between inherited trust in 1950 and the contemporaneous trust in the source country in 2010 might be that the change in inherited trust over the period of 1950-2010 is driven by the selection of immigrants. People who migrated to America before World War 2 might have been systematically different from those who migrated after the war and transmitted a different set of social norms and values to their children. We attempt to investigate this possibility by checking if the inherited trust attitudes of one cohort can predict those of the other. If the observed time variation is driven by sample selection or if each cohort is simply a subsample of the population that is not representative of the population back in the source country, the attitudes of the two groups should be relatively different and not likely to be a strong predictor of each other's

inherited trust. To investigate this, we estimate the same regression used in Column 1 and 2 but replace the current level of average trust in the source countries by the average inherited trust of the other cohort. In Column 3 and 4, we find that inherited trust of one cohort is a strong predictor of the inherited trust of the other cohort, which supports the interpretation based on the evolution of values and attitudes, rather than variation from sample selection.

Yet another alternative interpretation of time variation in inherited trust is that trust attitudes of immigrants in cohort 1950 have converged to those of Americans as the time spent in the host country since the transmission of the values increases. However, we have seen in Table 3 that there are statistically significant differences in inherited trust across countries of origin for immigrants in cohort 1950, which should have not been the case had there been a convergence in attitudes. We further explore this possibility in the Appendix and confirm that there has been little convergence by focusing on the fourth-generation immigrants in cohort 2010. Contemporaneous trust in the source country is still a statistically significant predictor of inherited trust of the fourth-generation immigrants in cohort 2010 (Table A4).

Figure 1 and 2 visually show the relationship between the current trust in the source country in 2010 and the inherited trust of US immigrants for cohort 2010 and 1950, respectively. Inherited trust is measured by the coefficients on the country of origin fixed effects in the individual-level regression now run separately on each cohort. As we discussed, the correlation between trust in the source country in 2010 and trust inherited by US immigrants in 2010 is strong and positive (Figure 1). On the other hand, we find that the relationship between current trust in 2010 and inherited trust in 1950 is much weaker (Figure 2).

4.3 The Role of Inherited Trust in Reducing CO_2 Emissions

We are interested in discovering whether the culture of cooperation between trustworthy individuals within a country affects their willingness to cooperate in a global collective action dilemma, climate change. To shed light on this question, we investigate the effect of inherited trust on the reduction of CO_2 emissions.

4.3.1 Baseline Estimation

In this section we discuss the findings from our baseline estimation with country fixed effects. The dependent variable is log per capita CO_2 emissions relative to that of Sweden in 1950 and 2010. All other variables that we subsequently introduce are also measured relative to Sweden. Descriptive statistics for our dataset used in this section are shown in Table 6.[18] The explanatory variable of interest is the level of inherited trust measured by the coefficients

[18]More detailed discussions on the data follow in the Data Appendix.

associated with the country of origin fixed effects in the individual level regression based on the GSS. We run separate regressions for 1950 and 2010, using Swedish Americans in 1950 and 2010 as the reference (thus omitted) group, respectively.

Table 7 presents the cross-country correlation between the change in inherited trust and the change in the level of per capita CO_2 emissions between 1950 and 2010. In our baseline estimation, we control for three major components that can explain the level of per capita emissions: economic development and sectoral composition of the economy and trade patterns.[19] We control for the level of economic development measured by log per capita GDP, the share of manufacturing in the economy, and openness to trade in an attempt to account for the influence of trade on pollution.[20] The historical data on sectoral composition of economies around the world come from Mitchell (2013). For data on openness to trade, we rely on the Penn World Table that provides national accounts data in US dollars from 1950. The variable is calculated by dividing the sum of exports and imports by GDP.

The coefficient on inherited trust is negative and statistically significant in our baseline specification that includes all the controls we mentioned above (Column 1).[21] An alternative trust measure that controls for parents' education (to control for the possibility that inherited trust is a product of parents' human capital) yields similar results (Column 2). We provide further tests by excluding potential outliers. We have excluded Africa because the whole continent is taken as a whole and it might contaminate the result, but find the same result with significance at 5 percent level (Column 3). Excluding Nordic countries, in case these high-trust countries are driving the result, also does not affect the findings (Column 4).[22] We believe that the findings provide support for our hypothesis that the culture of cooperation between trustworthy individuals within a country positively affects

[19]Technology in pollution abatement is another key component extensively studied in the literature (Levinson, 2009). However, it is difficult to measure the level of technology across countries and we believe the GDP per capita measure will account for this component at least to some extent.

[20]The pollution haven hypothesis posits that regulatory stringency in developed countries shifts polluting industries to the developing world with lax environmental regulations. The debate on the hypothesis, regarding the complicated interaction between international trade, foreign investment and the environment, is still ongoing. Copeland and Taylor (2004) and Brunnemeir and Levinson (2004) provide careful reviews on the literature.

[21]One might be concerned about the uncertainty rising from the fact that we use estimated coefficients as a variable, although most of them are precisely estimated. We try to get a sense of this uncertainty by randomly drawing 1000 values from the distributions of the point estimates associated with fixed effects and see if the level of significance or the magnitude differs across these replications that use ranor is different from our baseline estimation. We find that the uncertainty is minimal. The empirical confidence interval of the coefficient on the inherited trust measure does not include zero and the variable is significant at 5 percent level close to 99% of the simulations.

[22]We also tried excluding Czechoslovakia, Yugoslavia, and Russia for which the trade openness variable in year 1950 takes the values of 1990 as this is the earliest available data for these countries (as we explain in the Data Appendix) and still found the same results with a p-value 0.018.

global cooperative behavior.

4.3.2 Placebo Test

As mentioned earlier, the strategy of focusing on the inherited component of trust and going far back in time to allow enough time for inherited trust to evolve comes at a cost, in our context, of including an era when there was no awareness of man-made climate change. However, we turn it to our advantage by running a placebo test on the period when there is no prior to expect the relationship between trust and CO_2 emissions to exist. Data availability and the concern to proceed with enough observations lead us to consider the period between 1920 and 1980.

The way we estimate inherited trust for 1920 and 1980 is exactly the same as the way we proceeded in Section 4.2.1. Inherited trust in 1920 is that of second-generation Americans born before 1895, of third-generation Americans born before 1920, and of fourth-generation Americans born before 1945. Similarly, inherited trust in 1980 is that of second-generation Americans born between 1895 and 1955, of third-generation Americans born between 1920 and 1980, and of fourth-generation Americans born after 1945. We only keep countries of origin with minimum 10 observations in the individual regressions on the trust question, which leaves us 19 countries. As before, inherited trust is measured by the coefficients associated with the country of origin fixed effects in the individual level regressions based on the GSS, controlling for age, gender, education, employment status, religion, and income category. We report the number of observations and descriptive statistics for each cohort and country of origin in Table A5 and A6, respectively.

We report the results from this exercise in Table 8. When we move the time window to 1920-1980, the effect of inherited trust on the level of CO_2 emissions is now positive and statistically insignificant (Column 1). On the other hand, per capita GDP remains positive and statistically significant. This is intuitive since we would still expect the scale effect to be in place, while we hypothesize that the increase in trust would not affect the change in the level of emissions during this early time period because the concern for climate change had not emerged yet. Next, we try to replicate the findings in Algan and Cahuc (2010) on the effect of inherited trust on economic growth during this time period. Unlike the relationship between trust and CO_2 emissions, the documented effect of trust on economic growth is not contingent on specific time periods and thus we would still expect to see a positive effect of inherited trust on per capita GDP. Column 2 and 3 confirm this intuition. Indeed, the inherited trust variable is associated with a precisely estimated and positive coefficient and the relationship is robust to the inclusion of the initial level of economic development and the quality of political institutions (measured by the Polity 2 variable from the Polity IV

database used in Algan and Cahuc (2010)).[23]

4.3.3 Discussion: local and global pollutants

Our baseline estimation suggests that high-trust countries reduced CO_2 emissions more substantially over the period under study than low-trust countries. As our theoretical model depicts and the placebo test supports, we interpret the results as evidence for higher willingness for global cooperation in high-trust societies. However, the potential cross-effects of pollution regulation —namely, the ancillary benefits of local pollution regulation on CO_2 emissions and the local co-benefits of climate change policies —suggest two alternative interpretations of our findings, which we discuss carefully below.

Firstly, one might argue that high-trust countries are more effective in local pollution abatement efforts (through better collective action), which could have led to concurrent reductions in CO_2 due to spillover effects or complementarity between local and global pollutants. Then the more substantial reductions in CO_2 emissions in high-trust countries we observe may merely be a byproduct of their successful local pollution regulations rather than their willingness to contribute to the global collective action dilemma. However, there is a dearth of empirical evidence for the ancillary benefits of local pollution abatement on reducing global pollutants and the few existing studies report findings against such global spillover effects of local pollution regulation. Holland (2012) studies the effects of NO_x regulation for power plants in California on CO_2 emissions and shows that all the reduction in CO_2 emissions that followed the tightening of NO_x regulation was due to the reduction in outputs (which we control for by GDP per capita), rather than a complementarity between NO_x and CO_2. Brunel and Johnson (2017) expands the scope of the analysis to all manufacturing industries in the United States and find similar results. They exploit exogenous variation made available by changes in air quality standards under the Clean Air Act and compare counties that do not meet the new standards and therefore have to face more stringent regulation (non-attainment counties) and countries that meet the standards and faced no more stringent regulation than the status quo (attainment counties). They find no evidence that local and global pollutants are complements —there was no statistically significant difference in the pattern of CO_2 emissions between non-attainment and attainment counties, while local pollutants fell substantially in non-attainment counties. Thus, we believe it is unlikely that our estimated relationship between trust and CO_2 emissions is driven by spillover effects of local pollution abatement efforts on CO_2 emissions.

Secondly, another alternative interpretation may be that high-trust countries face larger

[23]We use per capita GDP in 1870 and 1920 as the level of initial economic development for 1920 and 1980, respectively.

local co-benefits from climate change regulations. Unlike the effects of local pollution abatement on reducing global pollutants we discussed above, the effects of the opposite direction are well-documented (see Nemet et al. (2010) for a review of the literature). In this case, the larger reductions in CO_2 in those countries might reflect their attempt to realize perceived local benefits through climate policies rather than their contribution to the global collective action problem. However, it is not the case that trust and marginal benefits from local air pollution abatement are positively correlated. We observe the opposite in reality. Figure 3 shows that there is a negative correlation between the level of local air pollution and trust across countries. Given that the marginal benefit of pollution abatement increases in the level of pollution, it is clear that high-trust countries tend to be more cooperative in climate change mitigation efforts although they face smaller local benefits from climate change policies.

4.3.4 Counterfactual Analysis

The findings discussed so far indicate that inherited trust is a significant factor in explaining the change in the level of CO_2 emissions across countries. We quantify the effects of inherited trust in a counterfactual analysis where we present the change in CO_2 emissions in 2010 that countries would have had if the level of inherited trust had been the same as that of Sweden. The analysis is based on the estimates reported in Column 1 in Table 7 where we control for country fixed effects, per capita GDP, the share of manufacturing, and openness to trade. Figure 4 displays the results from this analysis. CO_2 emissions in 2010 would have been reduced by 45 percent in India, 41 percent in Africa and 29 percent in Mexico if the level of inherited trust had been the same as inherited trust from Sweden. Developing countries are often characterized by low interpersonal trust and the analysis here shows that these countries would have experienced substantial changes in their emission levels. The estimates suggest that having a higher level of trust would have led to a nonnegligible change in the level of emissions in more developed countries as well. CO_2 emissions would have been lower by 18 percent in France, 9 percent in Germany and 5 percent in the Netherlands if they had inherited the same level of trust as Sweden.

4.4 Robustness Checks

4.4.1 With a 50-year Lag

In our baseline estimation, we imposed the lag of 25 years, which is assumed to be one generation, between inherited trust and the level of emissions in order to address the concern of time-varying omitted variable bias. By doing so, we reduce the possibility that there

exist some unobserved time-varying factors correlated with both the change in the level of emissions and the change in inherited trust, which was transmitted at least 25 years before the time when the emission levels are observed. As in Algan and Cahuc (2010), we attempt to further reduce this concern by increasing the lag between inherited trust and the level of emissions to two generations, at least 50 years. This makes it even less likely that there are unobserved time-varying components that simultaneously drive the change in the level of emissions and the change in inherited trust in the source country, which is now assumed to have been transmitted at least 50 years before the periods we study. To ensure we have enough observations, we include second-, third-, and fourth-generation immigrants with at least one parent born in the United States.

We update the cohort decomposition described in Section 4.2.1 using a 50-year lag. Now, 1950 cohort and 2010 cohort consist of descendants of US immigrants whose ancestors arrived in America before 1900 and between 1900 and 1960, respectively. Inherited trust in 1950 is then that of second-generation Americans born before 1900 (i.e. those whose parents arrived in America before 1900), of third-generation Americans born before 1925 (i.e. those whose parents were born in the US before 1900 and therefore whose immigrant grandparents arrived in America before 1900), and of fourth-generation Americans born before 1950 (i.e. following the same logic, whose great grandparents arrived in America before 1900). Similarly, inherited trust in 2010 is that of second-generation Americans born between 1900 and 1960, of third-generation Americans born after 1925, and of fourth-generation Americans born after 1950. We keep countries of origin with at least 10 observations in the individual regression on the trust question, which leaves us with 23 countries. Table A9 and A10 report the number of observations and descriptive statistics, respectively, for each cohort and country of origin.

Again, inherited trust is measured by the coefficients associated with the country of origin fixed effects in the individual level regressions based on the GSS, controlling for age, gender, education, employment status, religion, and income category. We run separate regressions for 1950 and 2010 using Swedish Americans as the reference group in both periods. Figure 5 shows a strong correlation, even with the lag of two generations, between trust in the home country in 2010 and inherited trust of US immigrants for the period 2010. Table A11 shows that even with a 50-year lag, there is substantial variation across countries of origin and over time. Table A12 reports a strong correlation between inherited trust and current trust in the source countries even with a 50-year lag.

Table 9 presents the estimated effect of the change in inherited trust on the change in the level of CO_2 emissions between 1950 and 2010 with the lag of 50 years. We include the same set of controls used above with country fixed effects. The results are qualitatively very

similar to what we find in the baseline estimation.

4.4.2 Different Periods: 1970-2010

We also study different time periods to ensure that our results do not hinge on specific characteristics of the period on which we have focused so far. Since going further back in time may not be any more informative (because then we will be including more of the time when there was no awareness of climate change) we instead consider a shorter window of the period between 1970 and 2010.

We use the same cultural transmission model used so far to estimate inherited trust for 1970 and 2010. We use the lag of 50 years that we believe is more exogenous and at the same time allows more observations.[24] Inherited trust in 1970 is that of second-generation Americans born before 1920, of third-generation Americans born before 1945, and of fourth-generation Americans born before 1970. Similarly, inherited trust in 2010 is that of second-generation Americans born between 1920 and 1960, of third-generation Americans born after 1945, and of fourth-generation Americans born after 1970. [25] The number of observation and summary statistics for each cohort are reported in Table A14 and A15, respectively. We are able to keep all 26 countries in our sample. Inherited trust is measured by the coefficients associated with country of origin fixed effects in the individual level regressions based on the GSS, controlling for age, gender, education, and income category. As reported in Table A16, having ancestors coming from a different country than Sweden has a statistically significant effect on inherited trust for most countries of origin in these periods. Also, we find a strong correlation between inherited trust of US immigrants and current trust back in their source countries (Table A17).

Table 10 presents the estimated effect of the change in inherited trust on the change in the level of CO_2 emissions between 1970 and 2010 with the lag of 50 years. We again control for per capita GDP, the share of manufacturing sector, and openness to trade along with country fixed effects. The findings are qualitatively very similar to what we find in the

[24]The 50-year lag structure allows for more observations for the 2010 cohort in particular. This is because we have a large number of fourth-generation Americans and if we use the lag of 25 years almost all of them end up in cohort 1970 (born before 1995) and almost none of them in cohort 2010 (born after 1990). This is natural given the fact that the respondents are at least 18 years old at the time of interview and the newest round was conducted in 2014 (in actual fact there are only three 18-year-old respondents born after 1995 and interviewed in 2014).

[25]Although Inherited trust in 2010 had been estimated earlier, it should be modified with respect to the new starting time period because the cohort decomposition requires that there should be no overlap in the two cohorts. For instance, in period 1950-2010 with a 50-year lag, cohort 2010 included second-generation Americans born after 1900 and before 1960. If we were to use the inherited trust estimated from this cohort in our alternative period 1970-2010, we would have had overlap in estimated inherited trust caused by second-generation Americans born between 1900 and before 1920 belonging to both cohorts.

previous sections even when we look at different time periods. Inherited trust seems to be a significant factor in explaining the heterogeneity of the level of emissions across countries.

4.4.3 Additional Controls

We include additional controls to further check for omitted variable bias. Firstly, given the documented interplay between formal institutions and culture (Algan and Cahuc, 2009; Aghion et al., 2010, 2011), we control for the quality of political institutions that could be correlated with the level of trust and also affect emissions (through environmental policies, for example) using the Polity IV dataset. Secondly, it is plausible that other social attitudes that may affect willingness to cooperate globally might have coevolved with trust over the period we investigate. We deal with this possibility by explicitly controlling for religion and education. Data on the share of religious fractionalization comes from Barro (2003). We use the period 1970s and 2000s to explain the change in the level of emissions between 1950 and 2010 due to limited data availability.[26] For historical data on primary school enrolment, we rely on Lee and Lee (2016). Former Yugoslavia countries are missing in the dataset. We proceed with our baseline specification with the lag of 25 years between inherited trust and the emissions over the period 1950-2010. Finally, we try to control for urbanization rate and population density that are related to energy consumption patterns in a given country. The data on urbanization and population density comes from the World Bank.

Table 11 reports the results of the regressions that include these additional controls. In addition to our baseline controls, Column 1 adds the Polity 2 variable from the Polity IV dataset, Column 2 controls for primary school enrolment and Column 3 includes the measure of religious fractionalization. In Column 4 and 5, we add urbanization and population density measures, respectively. The effect of the change in inherited trust remains robust with the inclusion of these additional controls.

5 Conclusion

Given the long-standing literature on local social norms and cooperation, in this paper we have attempted to move one step forward by studying whether local social norms could have implications for *global* cooperation. More specifically, we were interested in the hypothesis that the within-country cooperative culture sustained by trust and trustworthiness of the population positively affects international cooperative behavior.

To motivate the link between trust and global cooperation theoretically, we incorporate

[26]The data are available only for three periods, 1900s, 1970s and 2000s.

the role of social norms, a form of informal institutions. Existing theoretical work has shown that cooperation between players located far apart becomes difficult to sustain as the distance grows. It thus serves to illuminate the role of institutions as the size of the economy grows and more globalized. We build our model based on this insight and show that local social norms shared by trustworthy individuals create incentives, via reputation effects, for the trustworthy to cooperate with foreigners even when they are unsure of their trustworthiness. The most important implication of the equilibrium is that individuals face greater incentives to cooperate with foreigners when they live in a society with a large number of trustworthy individuals.

We find empirical evidence that supports this prediction. Based on the innovative methodology developed in (Algan and Cahuc, 2010), we estimate the effect of inherited trust on the reduction in CO_2 emissions and the findings suggest that countries that have experienced a larger increase in trust have reduced CO_2 emissions per capita more substantially. To test the robustness of the results, we impose a longer lag between the outcome and the time at which trust was transmitted (to further reduce the threat of time-varying omitted variable bias), check if the results hold even in a different time period and include a wide set of additional controls. Our findings appear to be stable across this set of further specifications.

This paper provides a plausible explanation for the existence of national, regional and local level mitigation efforts in the absence of a global agreement, which has been difficult to reconcile with the conventional theory of collective action. We also believe that our findings emphasize the importance of local norms that has been largely overlooked by economists in governing the global commons.

The question of specific mechanisms behind this reduced-form macro relationship remains open. A logical next step would be to investigate potential channels that give rise to this cross-country relationship between trust and CO_2 emissions at more micro levels such as firms or individuals.

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Figures and Tables

Table 3: Inherited Trust in 1950 and 2010

	Dependent variables			
	Inherited trust in 1950		Inherited trust in 2010	
	Coefficient	SD	Coefficient	SD
Country of Origin	Reference: Swedish ancestors - 1950			
Sweden			0.036	(0.007)
Africa	-0.240	(0.005)	-0.170	(0.016)
Austria	0.092	(0.007)	-0.065	(0.007)
Belgium	0.250	(0.010)	0.044	(0.011)
Canada	0.003	(0.011)	0.074	(0.013)
Czechoslovakia	-0.023	(0.008)	-0.007	(0.008)
Denmark	0.073	(0.002)	0.150	(0.004)
Finland	0.009	(0.008)	0.016	(0.004)
France	0.006	(0.005)	-0.054	(0.009)
Germany	0.007	(0.002)	-0.007	(0.009)
Greece	0.110	(0.006)	-0.180	(0.005)
Hungary	0.080	(0.006)	-0.039	(0.005)
India	-0.190	(0.009)	-0.200	(0.015)
Ireland	-0.010	(0.005)	-0.003	(0.011)
Italy	-0.048	(0.012)	-0.091	(0.014)
Japan	-0.170	(0.008)	0.061	(0.007)
Mexico	0.007	(0.012)	-0.120	(0.014)
Netherlands	-0.059	(0.003)	0.021	(0.007)
Norway	0.097	(0.002)	0.022	(0.005)
Poland	-0.005	(0.012)	-0.063	(0.011)
Portugal	-0.073	(0.008)	0.017	(0.012)
Russian Federation	-0.020	(0.005)	-0.041	(0.005)
Spain	-0.058	(0.011)	0.020	(0.011)
Switzerland	0.036	(0.004)	0.058	(0.005)
United Kingdom	0.012	(0.001)	0.052	(0.008)
Yugoslavia	-0.041	(0.010)	0.037	(0.009)

Notes: The dependent variable is the level of trust inherited by US immigrants from the periods 1950 and 2010. Additional controls included in the model are: age, age squared, gender, education, income, employment status, and religion as well as year fixed effects. Standard errors are clustered at the country level.

Source: General Social Survey: 1978-2014

Table 4: Correlation between individual characteristics and trust

VARIABLES	Inherited trust
Age	0.009***
	(0.002)
Age squared	-0.000***
	(0.000)
Men	0.019***
	(0.006)
Education	0.037***
	(0.002)
Income	0.010***
	(0.002)
Catholic	0.013
	(0.027)
Protestant	0.001
	(0.009)
Employed	0.020
	(0.013)
Unemployed	-0.005
	(0.015)
Observations	15,730
R-squared	0.113

Notes: The dependent variable is the level of trust inherited by US immigrants from the periods 1950 and 2010 and takes 1 if the respondent answered "Most people can be trusted" and takes 0 if the answer was either "Can't be too careful" or "Depends." This table reports the coefficients on the individual-level controls included in the regression presented in Table 3. Standard errors are clustered at the country level.

Source: General Social Survey: 1978-2014

Table 5: Correlation between inherited trust of US descendants and trust in the country of origin

	Dependent variables			
	Inherited trust in 2010	Inherited trust in 1950	Inherited trust in 2010	Inherited trust in 1950
	(1)	(2)	(3)	(4)
Trust in source country	0.370***	0.432**		
	(0.099)	(0.182)		
Inherited trust in 1950			0.692***	
			(0.080)	
Inherited trust in 2010				0.753***
				(0.093)
Age	0.004***	0.003***	0.004***	0.003***
	(0.001)	(0.000)	(0.001)	(0.000)
Men	0.049*	0.014**	0.052*	0.013*
	(0.025)	(0.007)	(0.025)	(0.006)
Eduation	0.029***	0.036***	0.028***	0.035***
	(0.002)	(0.002)	(0.003)	(0.002)
Income	0.004	0.009***	0.003	0.008***
	(0.003)	(0.001)	(0.003)	(0.001)
Unemployed	-0.046	0.006	-0.040	0.007
	(0.031)	(0.023)	(0.029)	(0.023)
Employed	0.021	0.029**	0.024	0.032***
	(0.033)	(0.011)	(0.033)	(0.011)
Catholic	0.004	0.070***	0.004	0.064***
	(0.030)	(0.025)	(0.026)	(0.023)
Protestant	0.015	0.015	0.036**	0.028***
	(0.022)	(0.015)	(0.018)	(0.009)
Constant	-0.397***	-0.520***	-0.548***	-0.593***
	(0.050)	(0.069)	(0.048)	(0.026)
Observations	3,468	12,262	3,468	12,262
R-squared	0.065	0.084	0.068	0.093

Notes: The dependent variables in (1) and (3) are the level of trust inherited in 2010. The dependent variables in (2) and (4) are the level of trust inherited in 1950. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Inherited trust in 1950 is the average level of trust of immigrants in cohort 1950. Inherited trust in 2010 is the average level of trust of immigrants in cohort 2010. Standard errors are clustered at the country level.

Source: General Social Survey 1978-2014, World Values Survey and European Social Survey wave 2010.

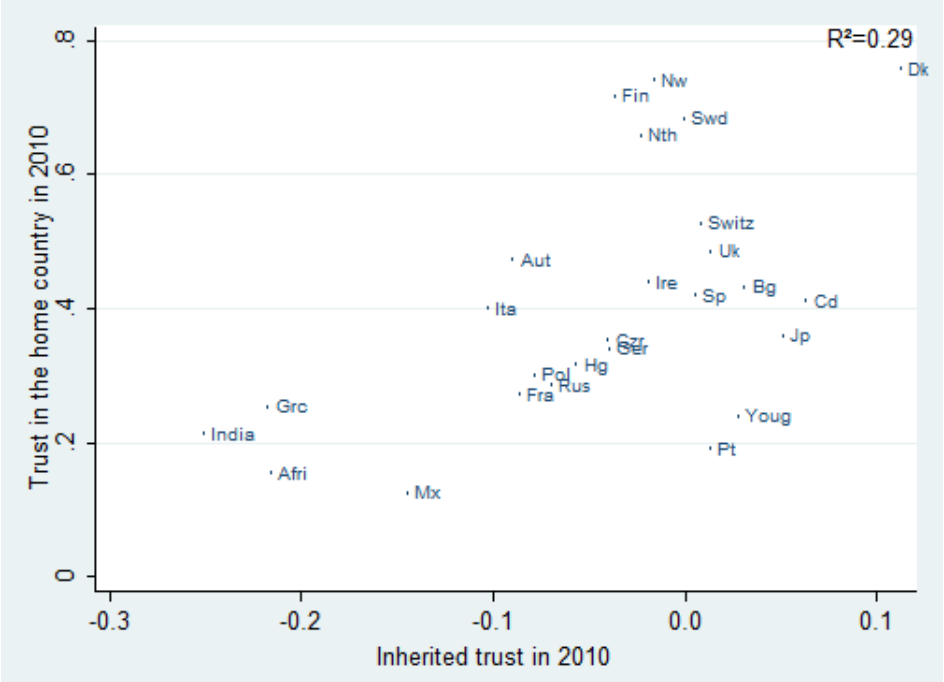

Figure 1: Correlation between inherited trust of US immigrants and trust in their source country in 2010 - cohort 2010

Figure 2: Correlation between inherited trust of US immigrants and trust in their source country in 2010 - cohort 1950

Table 6: Descriptive Statistics

VARIABLES	1950		2010	
	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)
CO_2 emissions per capita	3.56	3.05	7.67	3.17
GDP per capita	3,931	2,229	17,533	7,746
Openness to trade (%)	43.71	22.62	88.20	41.01
Share of manufacturing (%)	40.56	14.29	29.49	5.627

Notes: These are summary statistics of the original values of the variables separately for 1950 and 2010. In the regressions, the variables are transformed relative to Sweden by subtracting Sweden's values. The unit for CO_2 emissions per capita is metric ton of carbon dioxide per person. The unit for GDP per capita is 1990 International Geary-Khamis dollars.

Table 7: Inherited Trust and CO_2 Emissions Per Capita in 1950 and 2010: with a 25-year lag

	Dependent variable:			
	Log CO_2 Emissions Per Capita in 1950 and 2010			
	(1)	(2)	(3)	(4)
Inherited trust in 1950 and 2010	-2.548**	-2.529**	-2.403**	-2.629**
	(1.140)	(1.168)	(1.072)	(1.230)
Log income per capita	1.581***	1.542***	1.772***	1.535***
	(0.314)	(0.319)	(0.310)	(0.328)
Share of manufacturing	0.011	0.010	0.005	0.012
	(0.010)	(0.010)	(0.009)	(0.010)
Trade openness	-0.010**	-0.010**	-0.009**	-0.011**
	(0.004)	(0.004)	(0.004)	(0.005)
Observations	52	52	50	46
R-squared	0.892	0.891	0.889	0.895
Country fixed effects	Yes	Yes	Yes	Yes

Notes: The dependent variable is log CO_2 emissions per capita in the source countries in 1950 and 2010, relative to Sweden. Data come from the Carbon Dioxide Information Analysis Center (CDIAC). Inherited trust of US immigrants is measured relative to the inherited trust of Swedish Americans for the periods 1950 and 2010 and estimated from the GSS. Data on income per capita come from the Maddison database, share of manufacturing from B.R. Mitchell (2007), and trade openness from the Penn World Table. All controls are measured relative to Sweden.

Table 8: Placebo Test: Inherited Trust and CO_2 Emissions Per Capita in 1920 and 1980: with a 25-year lag

	Dependent variables		
	Log CO_2 Emissions per capita	Income Per Capita	
	(1)	(2)	(3)
Inherited trust in 1920 and 1980	1.950	12,097.023**	11,393.094**
	(2.649)	(5,730.379)	(5,141.116)
Log income per capita	1.443*		
	(0.751)		
Initial income per capita		3.259***	2.436***
		(0.733)	(0.729)
Polity 2			258.002**
			(106.746)
Observations	38	38	36
R-squared	0.676	0.859	0.893
Country fixed effects	Yes	Yes	Yes

Notes: The dependent variable in (1) is log CO_2 emissions per capita in the source countries in 1920 and 1980, relative to Sweden. Data come from the Carbon Dioxide Information Analysis Center (CDIAC). The dependent variables in (2) and (3) are income per capita in the source countries in 1950 and 2010, relative to Sweden. Inherited trust of US immigrants is measured relative to the inherited trust of Swedish Americans for the periods 1920 and 1980 and estimated from the GSS. Data on income per capita come from the Maddison database. The Polity 2 variable is from the Polity IV database. All controls are measured relative to Sweden.

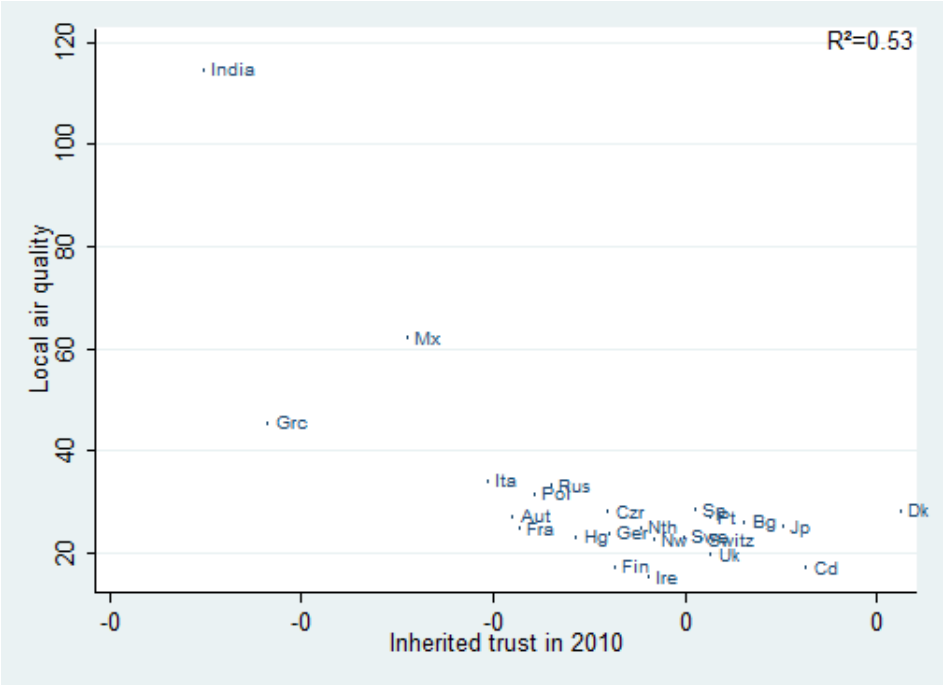

Figure 3: Correlation between inherited trust in 2010 and outdoor air pollution measured by particulate matter (pm_{10})

Sources: World Health Organization (2011) for average particulate matter (PM_{10}) from urban centers in g/m^3 and GSS 1978-2014 for inherited trust.

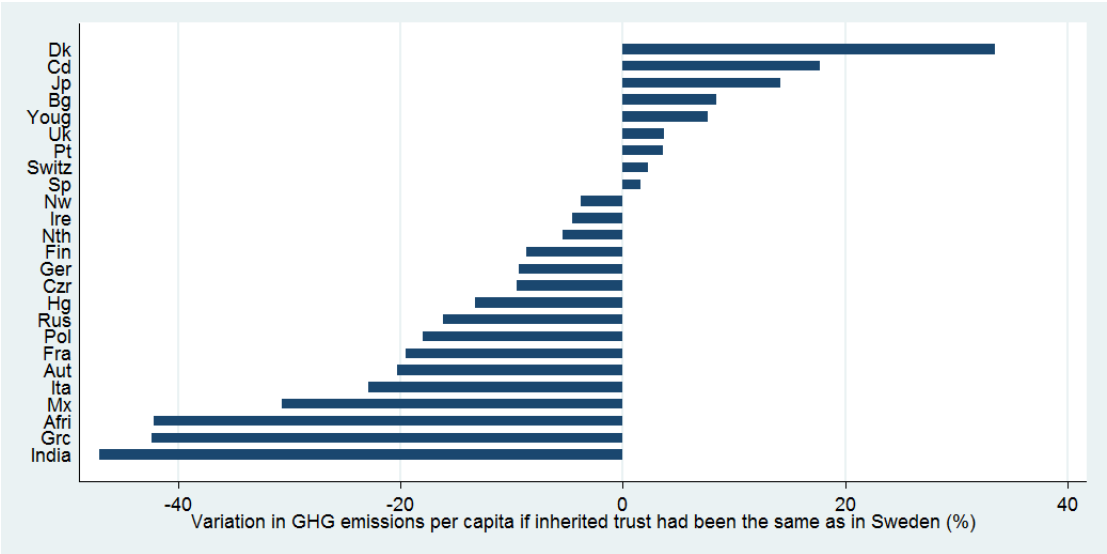

Figure 4: Predicted variation in CO_2 emission per capita in 2010 if inherited trust had been the same as inherited trust in Sweden

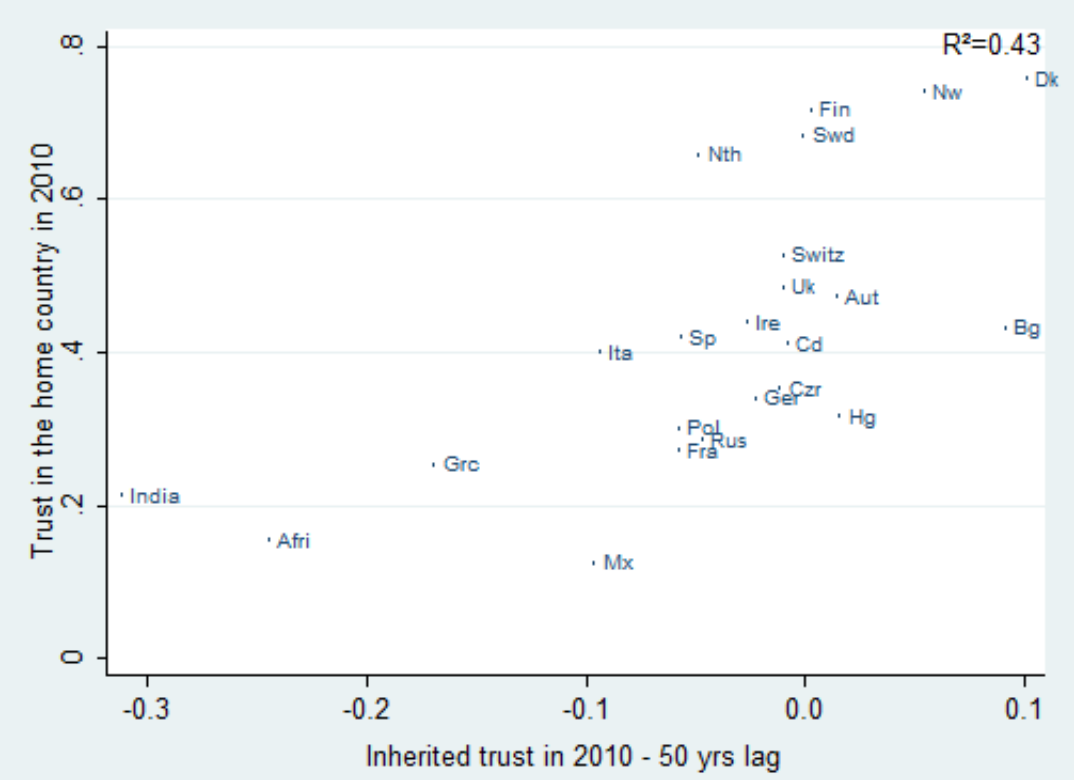

Figure 5: Correlation between inherited trust of US immigrants and trust in their source country in 2010 - cohort 2010
With a 50-year lag

Table 9: Inherited Trust and CO_2 Emissions Per Capita in 1950 and 2010: with a 50-year lag

	Dependent variable:			
	Log CO_2 Emissions Per Capita in 1950 and 2010			
	(1)	(2)	(3)	(4)
Inherited trust in 1950 and 2010	-3.115***	-2.726**	-3.016**	-2.697**
	(1.093)	(1.168)	(1.082)	(1.107)
Log income per capita	1.187**	1.298***	1.144**	1.261***
	(0.438)	(0.453)	(0.434)	(0.442)
Share of manufacturing			0.012	0.010
			(0.010)	(0.010)
Trade openness				-0.006
				(0.005)
Observations	46	46	46	46
R-squared	0.873	0.860	0.881	0.889
Country fixed effects	Yes	Yes	Yes	Yes

Notes: The dependent variable is log CO_2 emissions per capita in the source countries in 1950 and 2010, relative to Sweden. Data come from the Carbon Dioxide Information Analysis Center (CDIAC). Inherited trust of US immigrants is measured relative to the inherited trust of Swedish Americans for the periods 1950 and 2010 and estimated from the GSS. Data on income per capita come from the Maddison database, share of manufacturing from B.R. Mitchell (2007), and trade openness from the Penn World Table. All controls are measured relative to Sweden.

Table 10: Inherited Trust and CO_2 Emissions Per Capita in 1970 and 2010: with a 50-year lag

	Dependent variable:			
	Log CO_2 Emissions Per Capita in 1970 and 2010			
	(1)	(2)	(3)	(4)
Inherited trust in 1970 and 2010	-3.481**	-3.819**	-2.509*	-2.200*
	(1.545)	(1.467)	(1.417)	(1.235)
Log income per capita	1.564**	1.388**	1.765***	1.846***
	(0.649)	(0.647)	(0.581)	(0.506)
Share of manufacturing			-0.022**	-0.021***
			(0.008)	(0.007)
Trade openness				-0.012***
				(0.004)
Observations	52	52	52	52
R-squared	0.818	0.827	0.862	0.900
Country fixed effects	Yes	Yes	Yes	Yes

Notes: The dependent variable is log CO_2 emissions per capita in the source countries in 1970 and 2010, relative to Sweden. Data come from the Carbon Dioxide Information Analysis Center (CDIAC). Inherited trust of US immigrants is measured relative to the inherited trust of Swedish Americans for the periods 1970 and 2010 and estimated from the GSS. Data on income per capita come from the Maddison database, share of manufacturing from B.R. Mitchell (2007), and trade openness from the Penn World Table. All controls are measured relative to Sweden.

Table 11: Inherited Trust and CO_2 Emissions Per Capita in 1950 and 2010: with a 25-year lag

	Dependent variable: Log CO_2 Emissions Per Capita in 1950 and 2010				
	(1)	(2)	(3)	(4)	(5)
Inherited trust in 1950 and 2010	-2.192**	-1.865*	-2.293**	-2.659***	-2.704**
	(0.963)	(0.967)	(0.911)	(0.874)	(1.162)
Log income per capita	1.263***	1.487***	1.597***	1.298***	1.406***
	(0.281)	(0.258)	(0.251)	(0.250)	(0.321)
Share of manufacturing	0.023**	0.002	0.018**	0.007	0.008
	(0.009)	(0.009)	(0.008)	(0.007)	(0.009)
Trade openness	-0.008**	-0.006	-0.006*	-0.004	-0.008*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Political institution	0.045***				
	(0.014)				
Primary school enrolment		0.019***			
		(0.006)			
Religious fractionalisation			5.776***		
			(1.532)		
Urbanization rate				0.051***	
				(0.012)	
Population density					0.004*
					(0.002)
Observations	52	50	52	52	50
R-squared	0.927	0.932	0.934	0.939	0.907
Country fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is log CO_2 emissions per capita in the source countries in 1950 and 2010, relative to Sweden. Data come from the Carbon Dioxide Information Analysis Center (CDIAC). Inherited trust of US immigrants is measured relative to the inherited trust of Swedish Americans for the periods 1950 and 2010 and estimated from the GSS. Data on income per capita come from the Maddison database, share of manufacturing from B.R. Mitchell (2007), trade openness from the Penn World Table, the quality of political institutions from the Polity IV database, and urbanization and population density from the World Bank. Data on preschool enrolment and religion come from Lee and Lee (2016) and Robert Barro (2003), respectively. All controls are measured relative to Sweden.

Table 12: Inherited Trust and CO_2 Emissions Per Capita in 1950 and 2010: with a 25-year lag
Robustness checks for the trust measures

	Dependent variable:		
	Log CO_2 Emissions Per Capita in 1950 and 2010		
	(1)	(2)	(3)
Inherited trust in 1950 and 2010	-2.749**	-3.380**	-1.530**
	(1.221)	(1.247)	(0.615)
Observations	52	52	52
R-squared	0.892	0.900	0.896
Country fixed effects	Yes	Yes	Yes

Notes: The dependent variable in (1) drops those who answered "Depends". The dependent variable in (2) groups together those who answered "Most people can be trusted" or "Depends" and gives them one, while those who answered "Can't be too careful" are assigned zero. The dependent variable in (3) takes 3 for those who chose "Most people can be trusted", 2 for those who chose "Depends" and 1 for those who chose "Can't be too careful".

Appendix

A1 Alternative trust measures

The General Social Survey (GSS) provides data on immigrants' trust by the following question: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" and respondents answer the question by choosing one of the following options, "Most people can be trusted", "Can't be too careful," and "Depends." In the main text, we worked with a binary trust variable we constructed based on the answers, which takes 1 if the respondent answered that most people can be trusted and takes 0 if the answer was either of the other two options. In this section we try alternative specifications to demonstrate that our results are not driven by our specification of the trust measure. We try three different approaches. First, we drop those who answered "Depends". Second, we group together those who answered "Most people can be trusted" or "Depends" and give them one, while those who answered "Can't be too careful" are assigned zero. Third, we try an ordinal measure that takes 3 for those who chose "Most people can be trusted", 2 for those who chose "Depends" and 1 for those who chose "Can't be too careful".

Table 12 reports the effects of inherited trust on the level of CO_2 emissions per capita when we use these alternative trust measures. For all specifications, the estimated effect of inherited trust is statistically significant. The magnitude of the coefficients are highly comparable with the one reported in the main section.

A2 Correlation between inherited trust and contemporaneous trust: alternative interpretations

In section 4.2.2 in the main text, we discussed the possibility of convergence in trust attitudes of US immigrants as an alternative interpretation of time variation in inherited trust we observe. Table 3 provides evidence against this interpretation by showing that there are statistically significant differences in inherited trust across countries of origin for immigrants in cohort 1950, which should have not been the case had there been a convergence in attitudes. Here we provide further evidence against this interpretation by decomposing each cohort by generations of immigrants. If there had been strong convergence, it should have been most pronounced among the fourth-generation immigrants given the time they spent in the host country.

We run the same regression that we estimate for Table 5 but on decomposed samples. Table A4 report the results. The dependent variables in (1) and (2) are the level of trust inherited by second-, third-generation immigrants in cohort 2010 and fourth-generation im-

migrants in cohort 2010, respectively. The dependent variables in (3) and (4) are the level of trust inherited by second-, third-generation immigrants in cohort 1950 and fourth-generation immigrants in cohort 1950, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010 provided by the WVS and the ESS. In Column 2, we find that the contemporaneous trust in the country of origin is a statistically significant predictor of the trust inherited in 2010 by fourth-generation immigrants.

Column 3 and 4 decomposes cohort 1950 into second-, third-generation immigrants and fourth-generation immigrants, respectively. We find a strong correlation between inherited trust and current trust in the country of origin for second- and third-generation immigrants, while the correlation becomes weak in fourth-generation immigrants. We report the results from the same decomposition exercise for the specification with a 50-year lag and with different time periods, 1970-2010. The results are qualitatively consistent, providing evidence for the evolution of trust attitudes, rather than strong convergence (Table A13, A18).

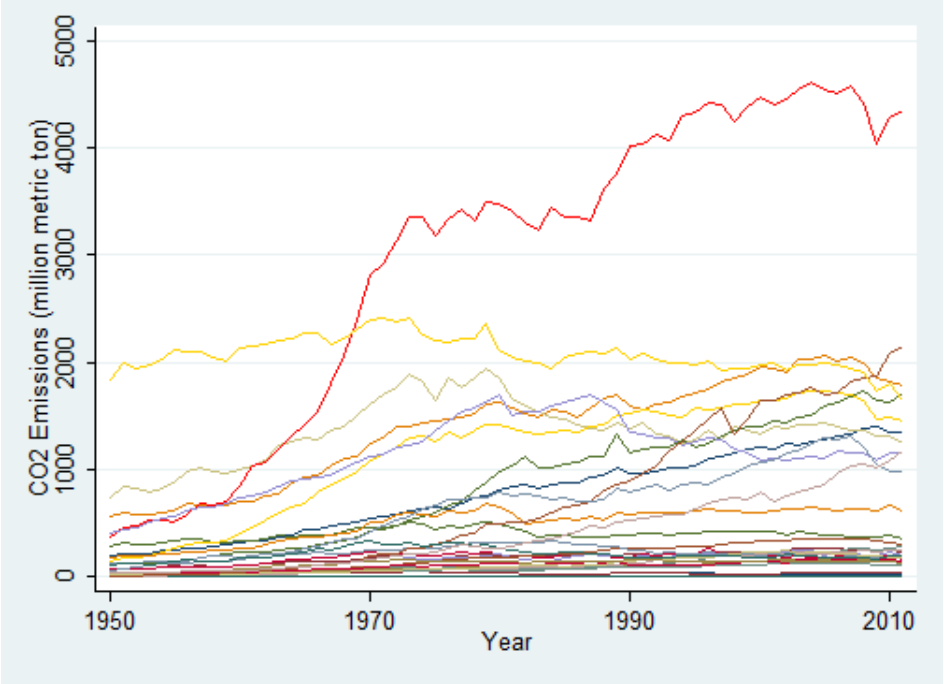

Figure A1: CO_2 Emissions in OECD countries: 1950-2010

Sources: Carbon Dioxide Information Analysis Center (CDIAC)

Table A1: Observations for Inherited Trust 1950 and 2010: GSS 1978-2014

County of origin	Inherited trust in 1950	Inherited trust in 2010
Africa	2,505	433
Austria	88	43
Belgium	36	16
Canada	216	119
Czechoslovakia	222	142
Denmark	175	37
Finland	86	37
France	491	109
Germany	4,385	921
Greece	29	81
Hungary	66	78
India	26	14
Ireland	3,216	731
Italy	809	869
Japan	20	38
Mexico	231	527
Netherlands	357	96
Norway	411	131
Poland	475	344
Portugal	44	44
Russian Federation	213	153
Spain	153	83
Sweden	376	128
Switzerland	108	22
United Kingdom	4,575	572
Yugoslavia	58	49

Table A2: Descriptive Statistics: GSS 1978-2014

	Cohort 1950		Cohort 2010	
Variables	Mean	SD	Mean	SD
Age	49.87	17.07	35.84	13.84
Men	0.45	0.50	0.46	0.50
Education	13.31	2.91	13.86	2.59
Income	10.53	2.46	10.84	2.33
Employed	0.61	0.49	0.72	0.45
Unemployed	0.04	0.21	0.07	0.25
Protestant	0.65	0.48	0.35	0.48
Catholic	0.22	0.41	0.37	0.48

Table A3: European Countries Only: Correlation between inherited trust of US descendants and trust in the country of origin

	Dependent variables	
	Inherited trust in 2010	Inherited trust in 1950
	(1)	(2)
Trust in source country	0.167***	0.082
	(0.058)	(0.066)
Age	0.004***	0.003***
	(0.001)	(0.000)
Men	0.058*	0.009
	(0.028)	(0.007)
Eduation	0.027***	0.037***
	(0.002)	(0.002)
Income	0.002	0.008***
	(0.004)	(0.001)
Unemployed	-0.021	0.009
	(0.030)	(0.027)
Employed	0.037	0.034**
	(0.037)	(0.012)
Catholic	0.001	0.047
	(0.035)	(0.028)
Protestant	0.036*	0.030***
	(0.019)	(0.009)
Constant	-0.271***	-0.353***
	(0.048)	(0.036)
Observations	2,898	10,577
R-squared	0.039	0.056

Notes: The sample is restricted to European countries in these regressions. The dependent variables in (1) and (2) are the level of trust inherited in 2010 and in 1950, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010.

Source: General Social Survey 1978-2014, European Social Survey wave 2010.

Table A4: Correlation between inherited trust of US descendants and trust in the country of origin: Sample decomposition by generation

	Dependent variables			
	Inherited trust in 2010 2nd 3rd generation	Inherited trust in 2010 4th generation	Inherited trust in 1950 2nd 3rd generation	Inherited trust in 1950 4th generation
	(1)	(2)	(3)	(4)
Trust in source country	0.379***	0.515**	0.380***	0.424
	(0.109)	(0.209)	(0.117)	(0.287)
Observations	2,359	1,109	2,139	10,123
R-squared	0.051	0.064	0.058	0.082

Notes: The dependent variables in (1) and (2) are the level of trust inherited by second-, third-generation immigrants in cohort 2010 and fourth-generation immigrants in cohort 2010, respectively. The dependent variables in (3) and (4) are the level of trust inherited by second-, third-generation immigrants in cohort 1950 and fourth-generation immigrants in cohort 1950, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Standard errors are clustered at the country level.

Source: GSS 1978-2014, WVS 2010, ESS 2010.

Table A5: Observations for Inherited Trust in 1920 and 1980
With 25 Years: GSS 1978-2014

	Inherited trust in 1920	Inherited trust in 1980
County of origin	with a 25-year lag	with a 25-year lag
Africa	716	2,237
Austria	14	131
Canada	67	310
Czechoslovakia	28	350
Denmark	38	187
Finland	12	116
France	153	468
Germany	1,339	4,100
Ireland	1,063	2,954
Italy	53	1,637
Mexico	27	633
Netherlands	137	341
Norway	89	484
Poland	45	806
Russian Federation	13	364
Spain	41	193
Sweden	70	454
Switzerland	42	99
United Kingdom	2,046	3,265

Table A6: Descriptive Statistics: GSS 1978-2014

	Cohort 1920		Cohort 1980	
Variables	with a 25-year lag		with a 25-year lag	
	Mean	SD	Mean	SD
Age	64.96	12.38	41.65	15.01
Men	0.42	0.49	0.46	0.50
Education	12.45	3.23	13.71	2.67
Income	10.03	2.66	10.76	2.33
Employed	0.38	0.48	0.71	0.45
Unemployed	0.02	0.15	0.06	0.23
Protestant	0.79	0.41	0.52	0.50
Catholic	0.15	0.36	0.29	0.45

Table A7: Inherited Trust in 1920 and 1980: with a 25-year lag

	Dependent variables			
	Inherited trust in 1920		Inherited trust in 1980	
	Coefficient	SD	Coefficient	SD
Country of Origin	Reference: Swedish ancestors - 1920			
Sweden			0.087	(0.047)
Africa	-0.200	(0.049)	-0.160	(0.045)
Austria	-0.260	(0.049)	0.120	(0.049)
Canada	0.050	(0.050)	0.054	(0.051)
Czechoslovakia	-0.021	(0.051)	0.053	(0.051)
Denmark	-0.160	(0.052)	0.180	(0.047)
Finland	-0.160	(0.040)	0.080	(0.047)
France	0.073	(0.051)	0.040	(0.048)
Germany	0.032	(0.051)	0.064	(0.047)
Ireland	0.011	(0.051)	0.061	(0.048)
Italy	0.036	(0.047)	-0.014	(0.052)
Mexico	0.110	(0.060)	-0.014	(0.051)
Netherlands	-0.046	(0.049)	0.032	(0.046)
Norway	0.200	(0.044)	0.140	(0.046)
Poland	0.016	(0.047)	0.016	(0.051)
Russia	-0.110	(0.046)	0.034	(0.046)
Spain	-0.005	(0.054)	0.049	(0.050)
Switzerland	0.120	(0.050)	0.074	(0.046)
United Kingdom	0.057	(0.050)	0.077	(0.046)

Notes: The dependent variable is the level of trust inherited by US immigrants from the periods 1920 and 1980 and measured by the following question, "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" We construct a binary trust variable that takes 1 if the respondent answered "Most people can be trusted" and takes 0 if the answer was either "Can't be too careful" or "Depends." Additional controls included in the model are: age, age square, gender, education, income, employment status, and religion as well as year fixed effects. Standard errors are clustered at the country level.

Source: General Social Survey: 1978-2014

Table A8: Correlation between inherited trust of US descendants and trust in the country of origin: with a 25-year lag, 1920-1980

	Dependent variables	
	Inherited trust in 1980	Inherited trust in 1920
Trust in source country	0.423**	0.459**
	(0.152)	(0.201)
Age	0.004***	0.001
	(0.000)	(0.001)
Men	0.022**	0.032**
	(0.008)	(0.014)
Education	0.035***	0.035***
	(0.003)	(0.003)
Income	0.006***	0.009***
	(0.002)	(0.003)
Unemployed	0.001	-0.041
	(0.021)	(0.039)
Employed	0.033**	0.010
	(0.013)	(0.025)
Catholic	0.040	0.164***
	(0.028)	(0.034)
Protestant	0.012	0.076**
	(0.016)	(0.031)
Constant	-0.508***	-0.417***
	(0.059)	(0.086)
Observations	11,948	3,786
R-squared	0.078	0.094

Notes: The dependent variables in (1) and (2) are the level of trust inherited by all immigrants (2nd, 3rd and 4th) in 1980 and in 1920, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Standard errors are clustered at the country level.

Source: General Social Survey 1978-2014, World Values Survey and European Social Survey wave 2010.

Table A9: Observations for Inherited Trust in 1950 and 2010 with Lag 50 Years: GSS 1978-2014

County of origin	Inherited trust in 1950 with a lag of 50 years	Inherited trust in 2010 with a lag of 50 years
Africa	981	1,980
Austria	21	128
Belgium	13	44
Canada	91	291
Czechoslovakia	51	335
Denmark	56	172
Finland	19	110
France	210	412
Germany	1,793	3,688
Greece	10	101
Hungary	11	139
India	12	25
Ireland	1,437	2,607
Italy	96	1,653
Mexico	51	671
Netherlands	174	311
Norway	151	430
Poland	77	786
Russia	24	363
Spain	51	189
Sweden	100	431
Switzerland	54	54
United Kingdom	2,572	2,756

Table A10: Descriptive Statistics: GSS 1978-2014

Variables	Cohort 1950 with a 50-year lag		Cohort 2010 with a 50-year lag	
	Mean	SD	Mean	SD
Age	61.55	13.7	40.39	14.93
Men	0.43	0.49	0.46	0.50
Education	12.74	3.19	13.73	2.65
Income	10.25	2.549	10.74	2.374
Employed	0.45	0.50	0.72	0.45
Unemployed	0.03	0.17	0.06	0.24
Protestant	0.76	0.43	0.50	0.50
Catholic	0.16	0.37	0.30	0.46

Table A11: Inherited Trust in 1950 and 2010: with a 50-year lag

	Dependent variables			
	Inherited trust in 1950		Inherited trust in 2010	
	Coefficient	SD	Coefficient	SD
Country of Origin	Reference: Swedish ancestors - 1950			
Sweden			0.059	(0.015)
Africa	-0.200	(0.02)	-0.190	(0.015)
Austria	-0.047	(0.017)	0.083	(0.016)
Belgium	0.200	(0.022)	0.130	(0.016)
Canada	0.022	(0.020)	0.039	(0.002)
Czechoslovakia	-0.068	(0.017)	0.046	(0.018)
Denmark	-0.094	(0.018)	0.160	(0.014)
Finland	-0.090	(0.019)	0.053	(0.017)
France	0.089	(0.018)	-0.011	(0.015)
Germany	0.039	(0.019)	0.028	(0.015)
Greece	0.300	(0.024)	-0.110	(0.013)
Hungary	0.140	(0.018)	0.061	(0.015)
India	-0.110	(0.021)	-0.250	(0.017)
Ireland	0.022	(0.019)	0.025	(0.016)
Italy	-0.006	(0.018)	-0.041	(0.019)
Mexico	0.130	(0.026)	-0.049	(0.019)
Netherlands	-0.055	(0.021)	0.010	(0.015)
Norway	0.170	(0.018)	0.098	(0.014)
Poland	0.019	(0.02)	-0.009	(0.018)
Russia	-0.077	(0.015)	0.012	(0.013)
Spain	0.032	(0.022)	-0.002	(0.019)
Switzerland	0.120	(0.018)	0.030	(0.014)
United Kingdom	0.052	(0.019)	0.042	(0.014)

Notes: The dependent variable is the level of trust inherited by US immigrants from the periods 1950 and 2010 and measured by the following question, "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" We construct a binary trust variable that takes 1 if the respondent answered "Most people can be trusted" and takes 0 if the answer was either "Can't be too careful" or "Depends." Additional controls included in the model are: age, age square, gender, education, income, employment status, and religion as well as year fixed effects. Standard errors are clustered at the country level.

Source: General Social Survey: 1978-2014

Table A12: Correlation between inherited trust of US descendants and trust in the country of origin: with a 50-year lag

	Dependent variables	
	Inherited trust in 2010	Inherited trust in 1950
Trust in source country	0.417***	0.433**
	(0.144)	(0.203)
Age	0.004***	0.001
	(0.000)	(0.000)
Men	0.027***	0.021*
	(0.008)	(0.012)
Education	0.034***	0.035***
	(0.003)	(0.003)
Income	0.006***	0.009***
	(0.002)	(0.003)
Unemployed	-0.011	-0.019
	(0.016)	(0.023)
Employed	0.025*	0.020
	(0.014)	(0.019)
Catholic	0.033	0.124***
	(0.028)	(0.030)
Protestant	0.010	0.035
	(0.017)	(0.028)
Constant	-0.493***	-0.355***
	(0.059)	(0.081)
Observations	11,160	5,102
R-squared	0.075	0.090

Notes: The dependent variables in (1) and (2) are the level of trust inherited by all immigrants (2nd, 3rd and 4th) in 2010 and in 1950, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Standard errors are clustered at the country level.

Source: General Social Survey 1978-2014, World Values Survey and European Social Survey wave 2010.

Table A13: Correlation between inherited trust of US descendants and trust in the country of origin: Sample decomposition by generation with a 50-year lag

	Dependent variables			
	Inherited trust in 2010 2nd 3rd generation	Inherited trust in 2010 4th generation	Inherited trust in 1950 2nd 3rd generation	Inherited trust in 1950 4th generation
	(1)	(2)	(3)	(4)
Trust in source country	0.411***	0.440*	0.204	0.413
	(0.058)	(0.252)	(0.207)	(0.320)
Observations	4,383	6,777	566	4,536
R-squared	0.058	0.074	0.056	0.094

Notes: The dependent variables in (1) and (2) are the level of trust inherited by second-, third-generation immigrants in cohort 2010 and fourth-generation immigrants in cohort 2010, respectively. The dependent variables in (3) and (4) are the level of trust inherited by second-, third-generation immigrants in cohort 1950 and fourth-generation immigrants in cohort 1950, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Standard errors are clustered at the country level.

Source: GSS 1978-2014, WVS 2010, ESS 2010.

Table A14: Observations for Inherited Trust in 1970 and 2010
With Lag 50 Years: GSS 1978-2014

County of origin	Inherited trust in 1970 with a 50-year lag	Inherited trust in 2010 with a 50-year lag
Africa	2,315	647
Austria	71	75
Belgium	34	23
Canada	222	166
Czechoslovakia	200	198
Denmark	173	56
Finland	77	51
France	468	157
Germany	4,059	1,421
Greece	36	80
Hungary	58	92
India	26	11
Ireland	3,002	1,042
Italy	665	1,133
Japan	15	58
Mexico	208	523
Netherlands	345	140
Norway	392	184
Poland	410	466
Portugal	38	53
Russia	173	229
Spain	143	99
Sweden	351	179
Switzerland	104	37
United Kingdom	4,413	914
Yugoslavia	48	70

Table A15: Descriptive Statistics: GSS 1978-2014

Variables	Cohort 1970 with a 50-year lag		Cohort 2010 with a 50-year lag	
	Mean	SD	Mean	SD
Age	51.41	16.93	36.98	14.27
Men	0.44	0.50	0.46	0.50
Education	13.22	2.95	13.89	2.58
Income	10.5	2.46	10.81	2.35
Employed	0.59	0.49	0.72	0.45
Unemployed	0.04	0.21	0.06	0.24
Protestant	0.66	0.47	0.39	0.49
Catholic	0.22	0.41	0.35	0.48

Table A16: Inherited Trust in 1970 and 2010: with a 50-year lag

	Dependent variables			
	Inherited trust in 1970		Inherited trust in 2010	
	Coefficient	SD	Coefficient	SD
Country of Origin	Reference: Swedish ancestors - 1970			
Sweden			0.003	(0.02)
Africa	-0.250	(0.022)	-0.190	(0.027)
Austria	0.059	(0.019)	-0.022	(0.019)
Belgium	0.200	(0.020)	-0.015	(0.020)
Canada	-0.016	(0.022)	0.023	(0.021)
Czechoslovakia	-0.023	(0.017)	0.003	(0.018)
Denmark	0.015	(0.018)	0.200	(0.017)
Finland	-0.006	(0.016)	0.010	(0.015)
France	0.003	(0.020)	-0.095	(0.021)
Germany	-0.006	(0.019)	-0.031	(0.022)
Greece	0.110	(0.018)	-0.230	(0.019)
Hungary	0.050	(0.017)	0.003	(0.018)
India	-0.210	(0.026)	-0.330	(0.028)
Ireland	-0.016	(0.020)	-0.023	(0.023)
Italy	-0.036	(0.019)	-0.100	(0.022)
Japan	-0.047	(0.017)	-0.022	(0.018)
Mexico	0.055	(0.022)	-0.130	(0.025)
Netherlands	-0.083	(0.020)	0.004	(0.021)
Norway	0.085	(0.019)	0.021	(0.020)
Poland	-0.006	(0.020)	-0.077	(0.021)
Portugal	-0.004	(0.020)	-0.099	(0.020)
Russian Federation	-0.046	(0.016)	-0.031	(0.017)
Spain	-0.074	(0.023)	0.018	(0.025)
Switzerland	0.005	(0.020)	0.053	(0.019)
United Kingdom	-0.001	(0.019)	0.015	(0.022)
Yugoslavia	-0.003	(0.016)	-0.018	(0.021)

Notes: The dependent variable is the level of trust inherited by US immigrants from the periods 1970 and 2010 and measured by the following question, "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" We construct a binary trust variable that takes 1 if the respondent answered "Most people can be trusted" and takes 0 if the answer was either "Can't be too careful" or "Depends." Additional controls included in the model are: age, age squared, gender, education, income, employment status, and religion as well as year fixed effects. Standard errors are clustered at the country level.

Source: General Social Survey: 1978-2014

Table A17: Correlation between inherited trust of US descendants and trust in the country of origin: with a 50-year lag, 1970-2010

	Dependent variables	
	Inherited trust in 2010	Inherited trust in 1970
Trust in source country	0.379***	0.425**
	(0.100)	(0.191)
Age	0.004***	0.003***
	(0.001)	(0.000)
Men	0.048**	0.016**
	(0.019)	(0.007)
Education	0.033***	0.035***
	(0.002)	(0.002)
Income	0.002	0.010***
	(0.003)	(0.001)
Unemployed	-0.045**	0.019
	(0.018)	(0.023)
Employed	0.019	0.032**
	(0.028)	(0.015)
Catholic	0.016	0.073***
	(0.032)	(0.024)
Protestant	0.017	0.011
	(0.016)	(0.016)
Observations	4,836	11,499
R-squared	0.069	0.083

Notes: The dependent variables in (1) and (2) are the level of trust inherited by all immigrants (2nd, 3rd and 4th) in 2010 and in 1970, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Standard errors are clustered at the country level.

Source: General Social Survey 1978-2014, World Values Survey and European Social Survey wave 2010.

Table A18: Correlation between inherited trust of US descendants and trust in the country of origin: Sample decomposition by generation with a 50-year lag, 1970-2010

	Dependent variables			
	Inherited trust in 2010 2nd 3rd generation	Inherited trust in 2010 4th generation	Inherited trust in 1970 2nd 3rd generation	Inherited trust in 1970 4th generation
	(1)	(2)	(3)	(4)
Trust in source country	0.297***	0.456***	0.312***	0.419*
	(0.056)	(0.117)	(0.104)	(0.209)
Observations	3,042	1,794	1,980	9,519
R-squared	0.054	0.076	0.059	0.087

Notes: The dependent variables in (1) and (2) are the level of trust inherited by second-, third-generation immigrants in cohort 2010 and fourth-generation immigrants in cohort 2010, respectively. The dependent variables in (3) and (4) are the level of trust inherited by second-, third-generation immigrants in cohort 1970 and fourth-generation immigrants in cohort 1970, respectively. Trust in source country is the average level of trust in the country of origin of the immigrants in 2010. Standard errors are clustered at the country level.

Source: GSS 1978-2014, WVS 2010, ESS 2010.

Data Appendix

The choice of our sample countries is guided by the set of countries of origin in the General Social Survey (GSS) that the respondents could choose from and they include some countries that do not perfectly overlap with current geographic boundaries (as of 2010 which is our data end point) such as Czechoslovakia, Yugoslavia and the Soviet Union. The survey also does not allow respondents to choose specific African countries from which their ancestors came since the whole continent (Africa) is provided as a single category. Thus in this section we explain how relevant countries are combined in order to make them consistent with our sample.

CO_2 Emissions We use fossil fuel CO_2 emissions data from the Carbon Dioxide Information Analysis Center (CDIAC). The data is given in thousand metric tons of carbon, which convert to thousand metric tons of carbon dioxide by multiplying the figures by 3.667 as advised. The 1950 to present CO_2 emission data are derived primarily from energy statistics published by the United Nations (2016).

We make modifications for the following five cases to make the emissions variable consistent with our unit of observations: Germany, Czechoslovakia, Yugoslavia, the Soviet Union and Africa. First, Germany has two observations for each year between 1945 and 1990 since the country was divided into Federal Republic of Germany and Former German Democratic Republic. We sum up emissions from these two parts of the country to one observation. Second, Czechoslovakia has one observation up to 1991 and from 1992 onwards emissions are separately reported for Czech Republic and Slovakia, which again corresponds to the political dissolution Czechoslovakia into two mentioned independent countries. However, since Czechoslovakia is the category used in the GSS we combine the emissions from Czech Republic and Slovakia and make them one observation. Yugoslavia is similar to the case of Czechoslovakia. It has one observation per year up to 1991 and splits to five observations (Bosnia & Herzegovina, Croatia, Macedonia, Slovenia and Montenegro & Serbia) from 1992. Again, we combine the five observations per year to one observation per year to make it comparable to the GSS division of the world. A similar treatment is applied to the former Soviet Union, which dissolved into 15 independent states in 1991 (namely, Armenia, Azerbaijan, Belarus, Estonia, Goergia, Kazakhstan, Kyrgyzstan, Latvia, Moldova, Lithuania, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan). We sum emissions from the 14 states (Moldova is missing in the dataset) to convert them into one observation.

The number of African countries in the dataset slowly increases over time, from 25 in 1950 (the starting point of our analysis) and 51 in 2010 (the end point of our analysis) out of

54 countries that make up Africa. We believe this omission is due to the small, almost negligible amount of emissions from African countries in earlier years. For instance, in 1950 the reported CO_2 in South Africa, the largest emitter in the continent, constitutes only about 1 percent of the global emissions and Egypt, the second largest emitter, accounts for less than 0.2 percent. Thus we proceed as we did with other countries and sum up emissions from all African countries included in the dataset for each year.

GDP per capita and Population Data on GDP per capita and population come from the Maddison Project that provides information on economic growth across countries between AD 1 and 2010. Fortunately, the database includes information on Czechoslovakia, Yugoslavia, the Soviet Union and Africa as a whole, so we did not have to process these variables to make them compatible with our sample countries.

Trade Openness We use version 7.3 of the Penn World Table for data on trade openness, which is defined as the sum of import and export divided by the GDP of the country. One peculiarity of this dataset is that for countries that constituted former Czechoslovakia, former Yugoslavia and the former Soviet Union the data begin in 1990. Thus we, reluctantly, replace the missing values for year 1950 with the values of 1990 for the relevant countries. However, as we discuss in footnote 19, excluding these countries does not affect the results of our analysis. For Africa, similarly as for GDP per capita and population data, we calculate the average openness to trade across all African countries for each year in our sample.

Quality of Political Institutions We use the Polity IV dataset by the Center for Systemic Peace for our variables related to the quality of formal institutions. What we do here is identical to what we do for the data on CO_2 emissions for the same set of relevant countries, except that now we calculate the mean instead of the sum.

Sectoral composition of economy We use International Historical Statistics by B.R. Mitchell (2013) for the measure of sectoral composition of economies worldwide. The database includes information on Czechoslovakia, Yugoslavia, and the Soviet Union. For Africa, we again calculate the average share of manufacturing industry for each year. Switzerland is missing in the database, so we complement the variable using Stohr (2016). Dropping Switzerland does not affect our findings (detailed results available upon request from authors).

Educational Attainment For historical data on primary school enrolment, we rely on

Lee and Lee (2016). The data begin in 1820 and continue to 2010 at a five-year interval. Former Yugoslavia countries and Slovak Republic are missing in the dataset. Thus we leave Yugoslavia as missing and allow Czech Republic to represent Czechoslovakia. For Africa, we again calculate the average rate of primary school enrolment in African countries for each year.

Religion Data on the share of non-religious individuals and religious fractionalisation in a country come from Barro (2003). The dataset includes only three time periods, 1900, 1970 and 2000. Thus we use 1970 and 2000 values for 1950 and 2010, respectively, in our analysis. For 1970, Germany is split in two states, East and West Germany, so we calculate the mean of the two values for that year. For Africa, we again calculate the average share of non-religious individuals and religious fractionalisation in African countries for each time period.

Urbanization and Population Density We use data on urbanization and population density from the World Bank. Unfortunately, the data begin in 1960, so for year 1950 we instead use the values of 1960 for 1950. To form a variable for former Yugoslavian countries, we take the average of the five countries (Bosnia & Herzegovina, Croatia, Macedonia, Slovenia and Montenegro & Serbia) for each year.