Natural resources, corruption and trust:
A complex relationship

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Acknowledgements

Abstract

Do natural resources reduce social trust? And if so, do natural resources have a direct effect on trust, or is their effect indirect through variables such as corruption? This issue paper reviews the literature on natural resources and on trust. The existing theoretical and empirical literature suggests that natural resources can reduce trust through several indirect mechanisms. Notably, studies show that natural resources lead to institutional degradation, corruption, inequality, and civil war, all of which have been associated with reduced trust. The paper tests empirically whether there is a direct effect of natural resources on trust (The Pearl Hypothesis), using cross-country data. The results indicate that no such direct effect exists, suggesting that any effect of resources on trust runs through intermediate variables such as institutions, corruption, inequality, and civil war. Importantly, however, the relationship between corruption and trust turns out to be non-linear, indicating that the effect of natural resources on trust depends on the initial corruption level of a country.

1. Introduction

> *"Kino had found the Pearl of the World. The essence of pearl mixed with essence of men and a curious dark residue was precipitated. Every man suddenly became related to Kino's pearl, and Kino's pearl went into the dreams, the speculations, the schemes, the plans, the futures, the wishes, the needs, the lusts, the hungers, of everyone, and only one person stood in the way and that was Kino, so that he became curiously every man's enemy. The news stirred up something infinitely black and evil in the town: the black distillate was like the scorpion, or like hunger in the smell of food, or like loneliness when love is withheld. The poison sacs of the town began to manufacture venom, and the town swelled and puffed with the pressure of it"*

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John Steinbeck, The Pearl

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Kino, the main character in John Steinbeck's 1947 novel *The Pearl*, is a poor pearl-diver who one day happens upon an immensely valuable pearl. Rather than bring him and his family good fortune, the pearl makes Kino the target of the greed of others. The pearl buyers try to cheat him and he becomes a fugitive as others try to steal from him, the consequences of which are ultimately tragic, involving the death of his child.

Steinbeck seems to have hit the nail on the head with this story, long before the concepts of the resource curse or the paradox of plenty were invented (Auty, 1993: Karl, 1997). Following the seminal paper by Sachs and Warner (1995), a number of studies have shown that countries rich in certain natural resources, in particular petroleum and certain minerals such as diamonds, on average have lower economic growth rates than countries without such resources. These types of resources also seem to lead to institutional degradation in the form of lower levels of democracy, and to increased corruption, lower levels of human development, and civil war (Ross, 2001a; Leite and Weidmann, 1999; Bulte et al. 2005; Collier and Hoeffler, 2004). More recent studies indicate that political economy effects are important in creating the resource curse, countries with bad institutions of democratic accountability and the rule of law tend to see increased patronage and rent-seeking as a result of resource rents, leading to economic inefficiencies (Robinson et al., 2006; Mehlum et al., 2006; Collier and Goderis, 2007; Kolstad and Wiig, 2009). Natural resources such as oil or diamonds indeed seem to stir up "something infinitely black and evil" in the form of socially dysfunctional political behaviour.

The passage from Steinbeck's novel does, however, also point to one aspect of resource riches that has gone largely unexplored in the resource curse literature. Highly valuable resources may tend to make enemies of people, creating pressures with which a society swells and puffs. In other words, the presence of appropriable and contestable resources may challenge the very social fabric of a society, the formation of relationships, networks and trust needed for effective interaction and collaboration between people. This paper focuses on the effect of natural resources on trust. We limit our attention to natural resources that have other detrimental effects according to the resource curse literature, i.e. point source or appropriable resources such as petroleum and minerals. Different studies of trust define the concept in a number of different ways, as an attitude, an action, a relationship, a kind of social capital, or a decision (Nannestad, 2008). Here, we use a behavioural definition of trust as in (Fehr, 2009) and (Hong and Bohnet, 2007) where trust involves a willingness to accept vulnerability to others. A common distinction is between generalized or social trust, i.e. trust towards other people in general, and particularized trust, denoting trust towards people close to you for instance family or ethnic group. We focus on generalized or social trust, which has been argued to increase economic prosperity and the performance of political institutions, though the empirical evidence on such effects of trust may be inconclusive (Nannestad, 2008).

Remarkably little research has been published on the relationship between natural resources and social trust. The resource curse literature has put far more emphasis on formal institutions, than on informal

institutions such as norms or conventions. A negative relation between natural resources and social capital is posited by the theoretical model of Auty (2001), but explicit theory or empirical evidence on the impact of resources on trust does not seem to be available. If we merge the resource curse literature with the literature on determinants of generalized trust, it becomes clear that natural resources have an impact on factors which in turn may affect trust. For instance, natural resources may affect democracy, corruption, inequality or civil war, all of which have been suggested as determinants of trust. So from this we may infer that there is at least an indirect effect of natural resources on trust. But does the presence of natural resources in itself affect trust, is there in other words a direct effect of resources on trust? We know from theory that windfall gains may undermine cooperative norms (Svensson, 2000) and from experimental evidence that increased stakes may reduce trust (Johansson-Stenman et al, 2005), both of which suggest that such a direct effect may exist. In this paper, we test whether there is a direct effect of resources on trust, which we term The Pearl Hypothesis, using cross-country survey data on trust from the World Values Survey. The results indicate that no such direct effect exists, suggesting that any effect of resources on trust runs through intermediate variables such as institutions, corruption, inequality and/or civil war.

The paper is structured as follows. Section 2 reviews the literatures on the resource curse and on determinants of trust, with an emphasis on variables that link the two, i.e. variables that are affected by resources and in turn affect trust. These indicate potentially important indirect effects of resources on trust. We then elaborate on empirical and theoretical studies suggestive of a direct effect of resources on trust. Section 3 presents the data and methodology of our empirical approach, and tests for a direct effect of resources on generalized trust, controlling for variables reflecting potential indirect effects. Section 4 concludes.

2. Theoretical and empirical studies of natural resources and trust

Trust, putting yourself in a position where you are vulnerable to the actions of another, can be viewed in light of two different models of human behaviour. On the one hand, trusting behaviour may reflect rational self-interest, or a well-grounded belief that the other does not have an incentive to take advantage of your vulnerability. For instance, in repeated interactions between two individuals, taking advantage of someone who has shown you trust, may close down opportunities for future cooperation, resulting in a future loss to you which may exceed the short-term gain from your opportunism. On the other hand, trusting behaviour may reflect some sort of internalized norm or social motivation, where you choose to make yourself vulnerable even in cases where others have an incentive to take advantage of you. So according to this model, trusting behaviour may be exhibited even in one-shot interactions between strangers. The boundary between these two basic behavioural models of trust may not be hard and fast, since social norms may be viewed as based on rational self-interest in some broader sense, but this is nevertheless a useful distinction in outlining the basic theories proposed on determinants of trust.

In the rational self-interest model of trust, characteristics of a society that increase incentives not to take advantage of the vulnerability of others will increase observed trust. One obvious characteristic which would be important here are the formal institutions of a society, defined by North (1990, 1994) as "rules of the game" or more elaborately "humanly devised constraints that structure human interaction" and which "define the incentive structure of societies". Well-functioning institutions that promote the rule of law would for instance make violations of implicit or explicit contracts less attractive, making trust a less risky venture. Moreover, characteristics of a society that facilitate our ability to gauge or influence our view of the opportunism of others, for instance the availability of information on their track record, would have an effect on trust. Transparency of information, certain types of networks, or the past occurrence of events like civil war or ethnic strife may be examples of relevant characteristics.

By comparison, the internalized norm or social motivation model of trust leads to more of an emphasis on the extent to which a society has the characteristics needed for these norms to be activated and flourish. Trust may thus be greater in societies where people perceive that they have "a common stake with others" (Rothstein and Uslaner, 2005), or more generally where the proceeds of cooperative ventures are perceived to be fairly distributed. More trust may thus be observed in societies with a more even distribution of income or a more impartial allocation of positions, benefits and burdens. Characteristics like inequality or corruption (the antithesis to impartiality) may then reduce trust. In addition, cultural characteristics including religion may be more or less conducive to the formation of norms of this kind, and societies which differ in such characteristics may exhibit differences in trust. While formal institutions are important for impartiality, their effect on trust within this type of perspective is more ambiguous, as formal institutions may also crowd out social norms. For instance, a study by Cardenas et al. (2000) in Colombia revealed that the introduction of regulatory measures in handling local environmental dilemmas led to more self-interested behaviour among community members.

Consistent with these basic models of norms, a number of empirical studies have been conducted to test the effect on trust of a number of different variables. Explanatory variables at the social level include institutions, inequality, civil society participation, corruption, religion, ethnic and other types of fractionalization, civil war, and a number of other variables. The review of empirical studies of the determinants of trust conducted by Nannestad (2008) suggests that inequality and religion (share of Protestants in the population) are robust determinants of trust across studies, whereas the evidence is mixed on the effect of institutions, corruption and fractionalization, and civil society participation does not seem to affect trust. Since this paper is on the links between natural resources and trust, in what follows we focus on four explanatory variables of trust that are also related to natural resources;

institutions, corruption, inequality, and civil war. These are suggestive of important indirect linkages between natural resources and trust, which need to be controlled for in testing for a direct effect of resources on trust. In the following four subsections, we therefore review the evidence on the impact of natural resources on these four variables, and the evidence of their impact on trust. In the empirical estimation in section 3, we naturally also control for other determinants of trust, besides these four.

Empirical studies of trust are typically based on either of two main types of data. A number of studies use survey data from in particular the World Values Survey. This survey has been conducted in five rounds from 1981 to the latest one in 2005-2008, with expanding country coverage. The measure of generalized or social trust commonly employed in cross-country studies is the proportion of respondents in a country that answers "Most people can be trusted" to the survey question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?". Other studies use individual-level data from this and similar surveys, some of these studies also include both individual and country characteristics as explanatory variables. The other main type of data used is from experimental studies, where a so-called trust game or investment game is used to elicit the extent of trust among subjects. As data from these types of games form an important part of the basis for our hypothesis of a direct effect of natural resources on trust, we present the game and key results from experiments of this type in subsection 2.5.

Before turning to the various mechanisms linking natural resources and trust, let us look at some initial simple associations which suggest that the two are linked. Figure 1 presents a plot of the most recent score of 68 countries from the last two rounds of the World Values Survey (i.e. in the period 1999-2008), and also their average rates of natural resource export to GDP during the 1990s. The regression line indicates a negative relationship between natural resources and trust, which is significant at the 1% level.[1] This suggests that resource rich countries on average exhibit less trust, but we cannot tell from the figure whether this association holds up to the addition of other control variables, and relatedly whether it is due to a direct effect of resources on trust, or an effect that runs through intermediate factors such as institutions, corruption, inequality or civil war. This is what we test in section 3, following our review of mechanisms linking resources and trust.

2.1   Natural resources, institutions, and trust

We first consider evidence for a possible chain of effects from natural resources, through institutions, to trust. Though institutions and corruption are linked, and often collected under the heading governance, we separate the two and treat the effect through corruption in the next subsection, since institutions denote a set of rules whereas corruption denotes a type of conduct in part shaped by these rules, and the two are therefore conceptually distinct.

As argued above, the effect of institutions on trust is theoretically ambiguous. Farrell and Knight (2003) stress the importance of good institutions in creating incentives fostering trustworthiness. They help agents establish stable expectations about how others are going to act in common social situations. Good institutions hence promote generalized trust by diminishing the risk of trusting other people. Institutions may also influence norms or social motivations to trust. This may be because impartial institutions promote fairness which is conducive to trust. Or relatedly, Frey (2001:605) argues that a constitution based on the notion that citizens are on average reasonable human beings generates a crowding in impact on human virtue. It is also possible that formal institutions reduce the need for informal institutions such as trust, having instead a crowding out effect. Tabellini (2008:928) suggests that institutional crowding out is likely for local transactions, whereas "Distant transactions

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[1] Norway has been omitted from the figure as an obvious outlier with a high rate of natural resource exports and a high level of trust. With Norway included the natural resources coefficient is negative, but not significant. The inclusion or omission of Norway does not substantially affect the results presented in section 3, however.

are mainly enforced by the law, since informal means are unlikely to be sufficiently powerful. If so, an improvement in the quality of legal institutions is likely to crowd in better values. The reason is that better law enforcement makes moral behaviour economically less costly, which encourages the diffusion of generalized morality." As distant transactions are more closely related to the notion of generalized trust, this argument suggests that a positive relation between formal institutions and norms is likely.

Figure 1. Natural resources and trust (N=68)

Data sources: See Table 1.

The empirical studies of institutions and trust based on survey data suggest either no effect or a positive effect. One of the early econometric studies of the determinants of trust is Zak and Knack (2001). They found that various measures of formal institutions like property rights and contract enforceability significantly increase trust. A more recent study by Bjørnskov (2006) suggest that only a few variables have a significant effect on trust. The institutional variables used in this study, which include the rule of law, political rights, and democracy, are not among these significant variables. As institutions are likely to be endogenous, this study represents a methodological step forward by explicitly correcting for endogeneity through the use of instrument variables. This does not, however, significantly alter the results presented, and the exogeneity of the instruments used is questionable. Finding variables that are correlated with institutions but not trust is particularly challenging, which is why we do not use instrumental variable techniques in this paper.

On the other hand, some experimental studies of local commons problems suggest that formal institutions may crowd out informal institutions. As noted, the Cardenas et al. (2000) study of local environmental dilemmas in several villages in Colombia found that regulatory solutions that presumably would improve social welfare did not succeed. Individuals confronted with an external regulation began to make choices that were more consistent with pure self interests. External regulations changed cooperative norms where cooperation was previously sustained by such norms. In a review of the experimental literature, Cardenas and Carpenter (2008) found that there can be a negative relationship between formal and informal institutions (such as trust).

From the resource curse literature it is clear that natural resources may harm institutions (Acemoglu et al. 2005; Karl 1997; Ross 2001a,b; Collier and Hoeffler, 2009). Karl (1997), for instance, argues that rents mould the social and political institutions of a country into a rentier state. Ross (2001a) shows that access to resources undermines democracy through a rentier effect (lowering tax rates and raising spending rates), a repression effect (the increase of security forces) and a modernization effect (populations do not progress to industrial and service sector jobs), thereby postponing the development of proper democratic institutions. The process is analyzed in more detail by Ross (2001b), showing that following timber booms in several South-East Asian countries, politicians purposely destroyed institutions in order to acquire rents. Bulte et al (2005) find that point resources significantly decrease both the rule of law index and the government effectiveness, while Collier and Hoeffler (2009) emphasize how resources undermine institutions of control (checks and balances). Though the evidence on institutions and trust is not unequivocal, this suggests that a potential indirect effect of resources on trust runs through institutions.

2.2   Natural resources, corruption, and trust

Corruption is commonly defined as the abuse of public office for private gain, or more broadly the abuse of entrusted power for private gain. Even at a basic conceptual level, it is clear that there is a relation between corruption and some notion of trust, as corruption entails the violation of explicitly or implicitly assigned positions or power. However, whether a violation of the particular trust relationship on which the corruption definition is based (such as between citizens and political office holders) has an effect on generalized trust (trust between people in general) is not a matter of tautology, but needs to be tested through empirical studies. As noted above, the presence of corruption indicates an unfair allocation of social advantages and burdens, which may undermine socially motivated trust. While institutions are important to its reduction, corruption also has other determinants, which warrants a separate discussion of this phenomenon.

As with the empirical studies of the impact of institutions on trust, the evidence on corruption and trust is mixed. The early study of Zak and Knack (2001) found corruption to significantly reduce trust, using the Transparency International (TI) corruption index. A more recent study by Freitag and Bühlmann (2009) using individual level trust data and corruption data from the International Country Risk Guide, also found a significant negative relationship. Rothstein and Uslaner (2005), using the TI corruption index, find no direct effect of corruption on trust, only an indirect effect through inequality. As these studies use different corruption indices, trust data from different periods, and different specifications and estimation strategies, these findings are hard to aggregate. In subsequent estimations in section 3 we show, however, that the relation between trust and corruption is non-linear, and the failure to include a squared corruption term in previous analyses, may explain their lack of robust findings.

The evidence that natural resources increase corruption is, however, compelling (see Kolstad and Søreide, 2009, for a review). A number of recent studies give support to political economy explanations of the resource curse, where bad institutions give rise to patronage and rent-seeking (Robinson et al., 2006; Mehlum et al., 2006; Collier and Goderis, 2007; Kolstad and Wiig, 2009). Patronage can be defined as the use of public resources to secure political power, for instance by providing government positions to political supporters. Rent-seeking entails the socially costly pursuit of rents, where skilled agents use their time and talent to acquire a share of the resource rents, rather than engage in productive activity. Both terms can be viewed as a form of corruption. Direct empirical evidence that resources increase corruption is also available. Both the seminal study by Leite and Weidmann (1999) and more recent studies have also found that natural resources in the form of fuels or minerals tend on average to increase corruption (Aslaksen, 2007; Petermann et al., 2007). Coupled with the results from the trust literature, this entails the suggestion of an indirect link from resources to trust that runs through corruption.

2.3   Natural resources, inequality, and trust

In a key contribution on inequality and trust, Rothstein and Uslaner (2005) see generalized or social trust as determined by two types of inequality; economic inequality and inequality of opportunity. As noted earlier, a key mechanism linking inequality and trust is the sense of a shared fate with others; where inequality is large this shared fate is absent, and trust low. They also argue that inequality leads to less optimism about the future, which reduces the risk of trusting strangers. Moreover, they posit that more equal societies may more easily introduce inclusive or universalistic social welfare programs, which also increase trust. The equality of opportunity side of their argument basically mirrors the institutional and corruption arguments related above. In countries with less impartial institutions and high levels of corruption, inequality of opportunity is high, and social trust low. In addition to this, however, their argument suggests that absolute economic inequality matters.

Several empirical studies have tested the association between economic inequality and trust, typically using the Gini coefficient as a measure of income inequality. The results universally show a negative relationship between inequality and generalized trust. Uslaner (2002), Rothstein and Uslaner (2005), Bjørnskov (2006) and Freitag and Bühlmann (2009) all find a significantly negative effect of inequality, using data from different periods and different specifications. Moreover, Zak and Knack (2001) find a significantly negative relationship between trust and both income and land inequality, suggesting that the association may extent to asset inequality.

The relationship between natural resources and inequality is much less extensively documented. Ross (2007) points out that there is a lack of empirical studies of the impact of natural resources on the distribution of income, partly because there is a lack of data in income inequality for many resource rich countries. In principle, windfall gains could reduce inequality in the short run as they induce a structural transformation of the economy from the production of tradeable goods intensive in skilled labour, to the production of non-tradeables intensive in unskilled labour (see Goderis and Malone, 2009). In countries with impartial institutions, it would also be possible to use resource rents for distributive purposes. However, these cases are far from the reality of many resource rich countries, where institutions are not impartial and rents are captured by a political elite. Easterly (2001) finds that commodity production is associated with a lower income share the middle class which in turn explain lower cooperative behaviour and lower growth. Similarly, Sokoloff and Engerman (2000) document how the tropical commodity factor endowment of Latin America led to the concentration of wealth in the hands of a small elite which in turn led to their entrenchment in power. This gives some indications of a link between natural resources and inequality, which with the evidence on inequality and trust, suggests inequality as an intermediate variable between resources and trust.

2.4   Natural resources, civil war, and trust

A civil war is the ultimate break of a social compact and can have long lasting impact on generalized trust. It divides the population, generating fear and weakening the social fabric (Colletta and Cullen, 2000). During civil wars, children lose their parents and families are forced to move from their homes to more secure places. The not uncommon experiences from civil war of rapes and killing of civilians have long lasting psychological impacts. While econometric evidence estimating the effect of civil war on trust is more scarce, Rothstein and Uslaner (2005) find a significant negative effect (not revealing which measure of civil war is used) whereas Delhey and Newton (2005) find no significant effect (using a dummy indicating civil war during the preceding 50 year period). Nevertheless, the readily apparent detrimental impacts of civil war have lead to a large literature on how to restore trust and promote reconciliation in post-conflict situations.

There is a large debate on whether natural resources cause civil wars. The seminal paper by Collier and Hoeffler (2004) finds that natural resources have a significant impact on the probability that a civil war will begin in the near future. In their terms, civil conflict is caused by greed rather than grievance. Ross (2006) similarly finds that the likelihood of civil war rose sharply from the early 1970s to the late

1990s in countries that produced oil, gas, and diamonds. The effect of natural resources on the likelihood of conflict nonetheless remains controversial. In a review of the early literature Ross (2004:342) concludes that "the claim that primary commodity exports are linked to civil war appears fragile and should be treated with caution." As argued by Humphreys (2005), the correlation between commodities and conflict could be spurious or subject to other interpretations. For instance, many resource rich countries have great inequality (see section 2.3), they are vulnerable to terms of trade shocks and the resource extraction process can have negative social implications (forced migration, environmental impacts, reduced profitability of other sectors), all of which can generate grievances. Or, as argued by Fearon (2005), natural resource rich countries may have weaker states partly due to the lack of need for taxation, and weaker states face higher probabilities of conflict.

Many of the issues raised in the aftermath of Collier and Hoeffler (2004) relate to which type of mechanism and what type of resources matter for conflict - not whether or not resources matter. However, Brunnschweiler and Bulte (2009) argue that conflict is endogenous, and when taking this into account find no significant effect of resources on civil war. Di John (2007) similarly finds no robust link between oil resources and civil war. Nevertheless, it is possible that natural resources increase the likelihood of civil conflict, and that civil conflict reduces trust, making this another indirect link from resources to trust.

2.5   Is there a direct effect of natural resources on trust?

As noted earlier, in addition to surveys such as the World Values Survey, another way of measuring trust is through experiments. A number of experiments have been conducted using variants of the so-called "trust game" or "investment game" following Berg et al (1995). In this type of game, subjects are assigned roles of either sender or receiver. A sender is given an amount of money, and decides how much of this amount to send to the receiver. The amount sent is typically tripled before it reaches the receiver, who then decides how much of the tripled amount to return to the sender. If both sender and receiver are purely self-interested and rational, the receiver will keep all that the sender transfers, and knowing this, the sender will transfer nothing. This is the sub-game perfect equilibrium of the game. However, if the sender thinks the receiver is not wholly self-interested, he may send a positive amount. The amount sent by the sender is thus interpreted as an indicator of how trusting the sender is.[2]

A number of trust game experiments have been conducted in different countries using subjects drawn from different population groups, and using variations in design. In general, the experiments show that senders on average send a substantial fraction of their endowment, hence exhibiting trusting behaviour. Of particular interest to the topic of natural resources and trust, is the variant of the trust game experiment conducted by Johansson-Stenman et al. (2005). Conducting the experiment among household heads in rural Bangladesh, this study randomly divided subjects into three groups, with substantially different initial endowments given to the senders. The results revealed that senders gave a lower proportion of their endowment to the receiver, the higher their initial endowment. In other words, the more money the sender were given initially, the less trusting behaviour they exhibited. Increased stake size in the trust game thus appears to reduce trust, at least if we interpret a lower fraction given as less trusting behaviour.

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[2] Conversely, the amount returned by the respondent is taken as an indicator of trustworthiness. However, Glaeser et al (2000) point out that responses to survey questions on trust have a higher correlation with trustworthiness in these experiments than with trust. Similarly, it has been argued that the amount transferred by the sender may reflect willingness to take risk rather than trust, but Houser et al (forthcoming) provide evidence to the contrary.

This result has potential implications for the understanding of natural resources and trust. The initial endowment or stake given to the sender in the game is a form of windfall, in a similar manner as natural resource endowments are windfalls. What the experiment does is to look at how increases in windfalls affect the degree of trust among subjects. Since the subjects were randomly assigned to different groups and experiments are anonymous, differences in experiences related to inequality or opportunity or individual characteristics such as education or employment status should not drive differences in results. While higher endowments for some groups do introduce a potential experience of a greater inequality between sender and recipient, if senders are averse to inequality, this should prompt high-endowment senders to give more, not less, of their endowment. What the results of Johansson-Stenman et al (2005) seem to indicate is therefore a direct negative effect of windfalls on trust, i.e. an effect that does not run through inequality, institutions, or other intermediate variables. This provides motivation for testing whether such a direct effect can be found for natural resource endowments. Inspired by the Steinbeck passage quoted at the beginning, we call this The Pearl Hypothesis:

> The Pearl Hypothesis:
>
> *Natural resources directly reduce social trust.*

This hypothesis will be tested in the subsequent section, using cross-country data. In addition to the experimental evidence discussed above, there are also further theoretical arguments for this hypothesis. It has been suggested that trust is connected to cooperative behaviour, and the trust game is structurally somewhat similar to a prisoner's dilemma game or public good game. In a sense, sending and returning positive amounts in the trust game may be viewed as acts of sequential cooperation. The amount of trust observed may thus reflect the existence or absence of norms of cooperation or reciprocity. Using a rent-seeking model, Svensson (2000) shows that an increase in windfalls such as aid or natural resource rents undermine cooperative conduct by making deviation from a cooperative agreement on their use more tempting for individual groups or agents. Natural resources may thus undermine norms upon which trusting behaviour is premised.

3. Do natural resources reduce trust directly or indirectly?

To test whether natural resources have a direct effect on trust, we use regression analysis of cross-country data for 69 countries. (Details of the data and methodology, as well as results are presented in the appendix.) Our dependent variable trust is taken from the two most recent rounds of the World Values Survey (WVS), based on the survey question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?". Our main explanatory variable of interest is natural resources. As a proxy for natural resources we use the export value of resources as a percentage of GDP. This proxy is widely used in empirical studies of the resource curse from the seminal work of Sachs et al (1995) onwards, and in particular in empirical work testing political economy or institutional explanations of the resource curse (e.g. Mehlum et al., 2006).

As our other independent variables, corruption is measured by the Control of Corruption variable compiled by the World Bank Institute (WBI), which we have rescaled to run from 0 to 5, and where higher values indicates less corruption (more control of corruption). We use the Gini coefficient to measure inequality. The civil war index used is a dummy variable capturing the occurrence of internal war (with at least 1000 battle-related deaths per year). Tertiary enrolment and unemployment are included as measures of equality of opportunity (cf. Rothstein and Uslaner, 2005). Population size and protestant share in the population are also included as controls since they turn up significant in this and previous studies.

So, is there a direct effect of natural resources on trust, as The Pearl Hypothesis posits? Table 3 in the appendix presents the results from our main estimations. Regression 1 includes the broad natural resource measure, whereas regression 2 and 3 include measures of fuels and ores and metals, respectively. As it turns out, none of the three natural resource measures are significant. We are left with the conclusion that after controlling for other factors that affect trust, natural resources do not matter directly. This conclusion does not change if we consider second-order natural resource terms, or interaction terms between resources and other explanatory variables, natural resources and its related terms remain insignificant.

To the extent that natural resources affect trust, it then has to be through some intermediate variables. And we see from the results that several of the variables that have a significant effect on trust, are variables that other studies indicate are affected by natural resources. Corruption and its square are both significant, and their signs suggest a U-shaped relationship with trust, with a turning point at a corruption value of 3.02. In other words, reducing corruption decreases trust at high levels of corruption, and increases trust at lower levels. Inequality is significant and has a negative effect on trust. One or more years of civil war in the preceding decade negatively affect trust. All these three variables have been associated with natural resources, as discussed in section 2.

As the relationship of institutions or corruption with trust appears to be U-shaped, perhaps reflecting that different mechanisms crowding in and crowding out informal institutions are dominant at different levels of institutional development, the relationship between natural resources and trust is not necessarily a simple one. We explore implications of this result in the next section. In addition, tertiary enrolment positively affects trust, while unemployment has a significantly negative effect. In principle, natural resources may also affect both these variables, but as they are not widely discussed in the resource curse literature we have not focused on them here. The final two significant variables, share of protestants and population size are unlikely to be affects by resources, and the positive effect of population size is sensitive to the exclusion of China and India. In total, the empirical model used explains almost 75% of the variation in trust across countries.
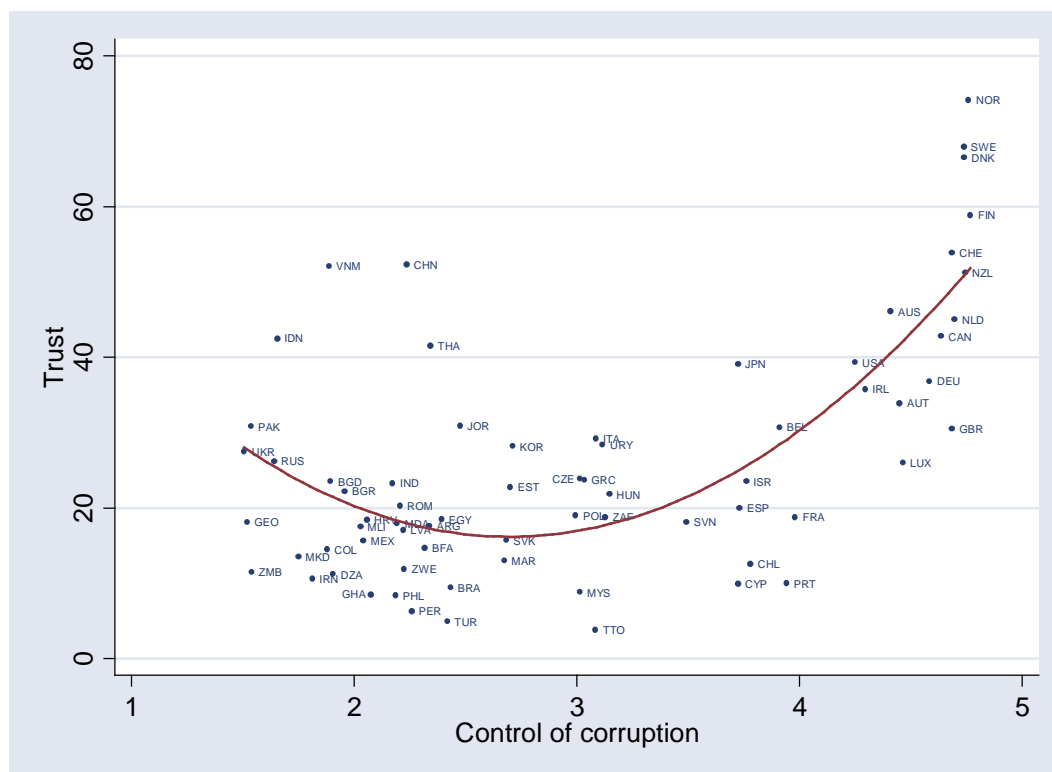
To sum up, our results suggest that there is no direct effect of natural resources on trust, but that there may be indirect effects through inequality, corruption or civil war. In other words, the negative association suggested by Figure 1 reflects the effect of natural resources on intermediate variables rather than a direct effect on trust. One important qualification should be noted in relation to these results. As shown in Table 2 in the appendix, the country sample used in our estimation includes variation in country rates of resource dependence. However, the maximum export share in the sample is 0.23, which means that a number of the most resource dependent economies in the world are left out. These include Angola, Bahrain, Brunei Darussalam, Congo, Gabon, Kuwait, Libya, Mongolia, Nigeria, Oman, Papua New Guinea, Qatar, Saudi Arabia, Suriname, Turkmenistan, and the United Arab Emirates. It may be the case that countries with high levels of resource dependence are structurally different in terms of the resource trust relationship, which we are unable to test with our data. This is a matter for further studies if and when more data on trust and its explanatory variables become available.

4. Discussion and implications for anti-corruption policy

There is an empirical relationship between corruption and social trust. The relationship is not a simple linear one, however: our results suggest that it is U-shaped. Figure 2 presents a simple plot of the 69 countries included in our analysis, and their scores on control of corruption (horizontal axis) and trust (vertical axis). The red line provides the best quadratic fit to these observations, approximating the results from the regression analysis. As we move from left to right in the figure, corruption is reduced. We see that at very high levels of corruption (to the left in the figure), moving towards lower corruption levels will reduce social trust. From about a level of corruption of 3, social trust starts to increase as corruption is reduced. In other words, reducing corruption reduces trust at high corruption levels, and increases trust at lower corruption levels.

Another way to see this is that formal institutions (reducing corruption) and informal institutions (trust) are substitutes at high corruption levels, and complements at low corruption levels. One possible interpretation of this is that when formal institutions are sufficiently dysfunctional and corruption very high, people have to resort to informal institutions to conclude the necessary transactions needed to survive. Trust in others is hence a necessity when corruption is high and formal institutions poor. People trust each other because they have to. On the other hand, when corruption is very low and formal institutions good, this instills a sense of trust in others perhaps based on the feeling that one has "a common stake with others" as suggested by Rothstein and Uslaner (2005). People trust each other because they want to, not because they have to.

Figure 2. The relationship between trust and control of corruption (N=69)

The effect of improving formal institutions is hence very different in the case when corruption is high and when corruption is low. Improved formal institutions (reduced corruption) in the first case means that trust becomes less of a necessity, and is reduced. Improved formal institutions in the second case means that trust becomes even more attractive and is increased. If we believe social trust to be important for development, this does not imply that we should avoid reducing corruption from high

levels. As Figure 2 shows, for feasible values of the control of corrupion variable, trust levels appear to be much higher at low levels of corruption (right side of the figure) than at high levels of corruption (left side of the figure). It is thus clearly advantageous for a society to move towards less corruption. However, countries moving from a high level of corruption are likely to face certain problems of transition, where social cohesion is reduced for a period of time. These problems need to be taken seriously, and may be one explanation why many democratizing developing countries appear to be stuck in democratic transition.

If the relationship between corruption and social trust displays a complex pattern, so will the relation of natural resources to trust. While increased natural resource dependency will likely increase corruption, corruption may in turn increase trust in highly corrupt societies and reduce trust in countries with little corruption, everything else equal. But remember that not everything else will be equal, as increased natural resource dependence may also affect trust through other channels. If natural resources increase inequality or the chance of civil war, this may in turn lead to less social trust. So, in addition to the possible effect through corruption, there are effects through inequality and civil war. In terms of Figure 2, this means that while increased natural resource dependence will move a society leftwards along the red curve, the curve will also shift down, as inequality and/or the probability of civil war increase. For societies with a low initial level of corruption, the total effect of natural resources on trust is unambiguously negative. For societies with a high initial level of corruption, natural resources have a positive effect on trust through its effect on corruption, but a negative one through its effect on inequality and civil war. The total effect on trust may be positive or negative, but even if it is positive, recall that the increase in corruption that follows from increased resource dependence will move a society further away from a more desirable state in which corruption is low and trust even higher.

These results on the relationship between natural resources, corruption and trust are novel. In particular, previous studies of corruption and trust have assumed a linear relationship which leads to a too simplistic understanding and analysis of these issues (see e.g. Aghion et al 2010). We would like to stress, however, that the novelty of our results also makes prudent a certain caution in their interpretation and use for policy purposes. Ideally, the uncovered relationships need to be subjected to further tests and be documented in other studies to provide a firm basis for precise policy implications. While we have taken care to avoid problems of endogeneity in our analysis through lagged independent variables, the problem of potential omitted variables remains and may influence our results. In other words, further tests are needed to establish the extent to which these results reflect causal mechanisms. The results are also tentative in the sense that a number of countries are excluded from our analysis, including a number of highly resource dependent countries, and there may be systematic patterns in the types of countries where in particular trust data are collected.

With these caveats in mind, and if the results hold up to further scrutiny, what are the possible implications for anti-corruption policy? The results suggest that the improvement in formal institutions such as democracy or the rule of law, both of which are important to combat corruption in resource rich countries, may in certain cases have surprising and negative side-effects. In highly corrupt societies, improvements in formal institutions may undermine informal institutions in the form of trust which have been in place to make up for deficiencies in formal institutions. This does not mean that improving formal institutions and reducing corruption are not important in promoting development, as their improvement will put societies on a trajectory towards a more favourable situation. However, agencies seeking to improve formal institutions in developing countries, whether resource rich or not, should be aware of the challenges countries face in a transition towards better institutions.

Moreover, if the side-effects are sufficiently serious, efforts to improve institutions may need to be combined with other types of interventions. For instance, it may be important to combine anti-corruption policies with more general economic policies conducive to maintaining social trust. These may include policies to reduce the degree of economic inequality in a country, or the level of unemployment. More generally, this means that while relying on narrow and institution-specific anti-

corruption policies may have an effect on corruption, it may not as effectively serve the end goal of anti-corruption policies, which is to promote development. For this, a broader approach may be needed. Somewhat paradoxically, one could argue that while mainstreaming anti-corruption into other activities has been a focus of donor agencies in recent decades, the above results suggest that other policies may need to be mainstreamed into anti-corruption work for that work to be effective in promoting development.

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Appendix I

Data and methodology

To test whether natural resources have a direct effect on trust, we use regression analysis of cross-country data. If there is a direct effect above and beyond the indirect effects working through inequality, corruption, civil war, or other intermediate variables, we should see a significant coefficient for the natural resources variables when controlling for intermediate variables, as well as other relevant control variables. Our main specification thus includes a number of explanatory variables that previous studies suggest matter for the level of trust, as presented in Table 1.

Table 1. Main variables

Variable	Explanation	Source
Trust	General trust	World Values Survey, 1999-2008
Inequality	Gini coefficient	UNU-Wider*
Corruption	Control of corruption	World Bank Institute (WBI) governance indicators*
Civil war	Internal war	UCDP/PRIO Armed Conflict Dataset*
Tertiary enrolment	Tertiary education enrolment ratio	World Bank World Development Indicators 2009
Population	Population size	World Bank World Development Indicators 2009
Unemployment	Percentage of labour force unemployed	World Bank World Development Indicators 2009
Protestant share of population	Protestants as share of population (1980)	La Porta et al. (1999)*
Natural resources	Fuels, ores and metals exports as share of GDP	World Bank World Development Indicators 2009
Fuel resources	Fuel exports as share of GDP	World Bank World Development Indicators 2009
Ores and metals	Ores and metals exports as share of GDP	World Bank World Development Indicators 2009

From The Quality of Government Institute

Our dependent variable Trust is taken from the two most recent rounds of the World Values Survey (WVS).[3] This survey has been conducted in five waves, the first in 1981 and the last in 2005-2008. The last wave covered 57 countries, and to increase the number of observations we have therefore added countries that were surveyed in the preceding round 1999-2003. This gives us trust data for a total of 91 countries for the period 1999-2008, and we have used the most recent data for countries included in both rounds.[4] As the selection of countries covered by several waves of the WVS is limited and dominated by developed countries, it is difficult to get a meaningful panel data set from the WVS, and we therefore employ cross-country regressions. The trust variable we have used is based on the survey question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?", which is question V23 in the most recent WVS wave and A165 in previous rounds, and which is commonly used in studies of general trust. The proportion of respondents what answer that "Most people can be trusted" is taken as the dependent variable observation for each country.

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[3] http://www.worldvaluessurvey.org/.

[4] Using the average of the two most recent rounds does not substantially alter the results.

Our explanatory variable of interest is natural resources. As a proxy for natural resources we use the export value of resources as a percentage of GDP. This proxy is widely used in empirical studies of the resource curse from the seminal work of Sachs et al (1995) onwards, and in particular in empirical work testing political economy or institutional explanations of the resource curse (e.g. Mehlum et al., 2006). The motivation for using this proxy when testing political economy hypotheses of the resource curse is that it better captures the rents from natural resources relative to other activity in an economy, and hence the relative profitability of patronage and rent-seeking, than for instance abundance measures of resources (Kolstad and Wiig, 2009). The same resource measure is relevant when studying the impact of resources on trust, as the stake size of a society-wide trust game depends on the relative size of windfall gains in the economy.[5] To take into account that different natural resources may affect trust differently, we employ three proxies, one broad index which includes both fuels and ores and metals, and two narrower ones capturing fuels, and ores and metals, respectively.

As our other independent variables, we use the Gini coefficient to measure inequality. Corruption is measured by the Control of Corruption variable compiled by the World Bank Institute (WBI), which we have rescaled to run from 0 to 5, and where higher values indicates less corruption. The WBI governance indicators are by now standard in empirical studies, and we have also run estimations using other governance indicators (voice and accountability, the rule of law, or government effectiveness) which give the same qualitative results as for corruption. The civil war index used is a dummy variable capturing the occurrence of internal war (with at least 1000 battle-related deaths per year). Tertiary enrolment and unemployment are included as measures of equality of opportunity (cf. Rothstein and Uslaner, 2005). Population size and protestant share in the population are also included as controls since they turn up significant in this and previous studies. We have also included a number of other control variables beyond those listed in Table 1, including various measures of fractionalization, gdp and gdp per capita, economic growth, literacy, primary and secondary education, trade openness, poverty, life expectancy, and urbanization, none of which significantly explain trust, and are hence omitted from the following presentation. Summary statistics for the variables included in our main specification are listed in Table 2, based on the 69 observations for which we have data on both trust and the explanatory variables (see Tables 4 and 5 below a list of the countries included and the correlation matrix).

Table 2. Summary statistics, main sample (N=69)

Variable	Mean	Std.Dev.	Min	Max
Trust	26.20	16.08	3.80	74.20
Inequality	37.63	10.26	23.13	64.90
Corruption	2.99	1.07	1.51	4.77
Civil war	0.12	0.32	0.00	1.00
Tertiary enrolment	30.57	18.78	0.80	72.51
Population (billion)	0.07	0.18	0.00	1.20
Unemployment	9.09	5.72	1.94	34.30
Protestant share of population	13.74	23.97	0.00	97.80
Natural resources	0.04	0.05	0.00	0.23
Fuel resources	0.02	0.05	0.00	0.23
Ores and metals	0.02	0.03	0.00	0.22

In order to avoid problems of reverse causality, i.e. the possibility that estimated relationships reflect an effect of trust on our independent variables rather than vice versa, we lag our explanatory variables. Since the trust data is taken from the period 1999-2008, we use data from the 1990s for the explanatory variables. To address problems of year-specific spikes of troughs in the variables, we use

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[5] As an alternative, we also used resource exports per capita, which produced similar results.

the mean of the explanatory variables in the period 1990-1999, which also mitigates the problem of measurement error. There are two exceptions. The civil war index takes the value one if there has been internal war in any year in the period 1990 to 1999, and zero otherwise. The protestant share of the population is measured as of 1980 by our data source La Porta et al (1999), but this likely makes little difference for results. While lagging the explanatory variables does address the possibility that uncovered associations are due to reverse causality, it does not fully address the possibility that estimated relationships reflect endogeneity in the sense that omitted country-specific variables may influence both our dependent and independent variables. Given the lack of meaningful panel data for the trust variable or good instrumental variables, however, this problem is hard to get around.

Results

Table 3 presents the results from our main estimations.

Table 3. Regression results. Dependent variable Trust 1999-2008.

	Regression 1	Regression 2	Regression 3
Inequality	-0.239**	-0.233**	-0.196*
	(0.11)	(0.11)	(0.11)
Corruption	-35.631***	-35.203***	-37.958***
	(7.85)	(8.20)	(8.30)
Corruption-squared	5.894***	5.834***	6.242***
	(1.28)	(1.32)	(1.34)
Civil war	-9.226***	-9.825***	-10.034***
	(2.76)	(2.75)	(2.52)
Tertiary enrolment	0.184***	0.192***	0.182**
	(0.07)	(0.07)	(0.07)
Population	21.625***	22.071***	21.619***
	(5.63)	(5.38)	(5.59)
Unemployment	-0.515**	-0.542**	-0.457**
	(0.21)	(0.21)	(0.18)
Protestant share of population	0.218***	0.212***	0.221***
	(0.07)	(0.07)	(0.06)
Natural resources	-1.062		
	(20.71)		
Fuel resources		18.192	
		(24.77)	
Ores and metals			-46.243
			(30.55)
Constant	78.147***	76.900***	80.272***
	(13.55)	(13.84)	(14.12)
R-squared	0.743	0.746	0.749
N	69	69	69

White standard errors in parentheses, *** indicates significance at the 1% level, ** at 5%, * at 10%.

Table 4. List of countries included in main estimation (N=69)

Algeria	Ghana	Pakistan
Argentina	Great Britain	Peru
Australia	Greece	Philippines
Austria	Hungary	Poland
Bangladesh	India	Portugal
Belgium	Indonesia	Romania
Brazil	Iran	Russian Federation
Bulgaria	Ireland	Slovakia
Burkina Faso	Israel	Slovenia
Canada	Italy	South Africa
Chile	Japan	South Korea
China	Jordan	Spain
Colombia	Latvia	Sweden
Croatia	Luxembourg	Switzerland
Cyprus	Macedonia	Thailand
Czech Republic	Malaysia	Trinidad and Tobago
Denmark	Mali	Turkey
Egypt	Mexico	Ukraine
Estonia	Moldova	United States
Finland	Morocco	Uruguay
France	Netherlands	Vietnam
Georgia	New Zealand	Zambia
Germany	Norway	Zimbabwe

Table 5. Correlation matrix for main estimation (N=69)

	Trust	Inequality	Corruption	Corruption-squared	Civil war	Tertiary enrolment	Population	Unemploy-ment	Protestant share	Natural resources
Trust	1									
Inequality	-0.4173	1								
Corruption	0.5538	-0.351	1							
Corruption-squared	0.6078	-0.3614	0.9917	1						
Civil war	-0.2743	0.2171	-0.3405	-0.3179	1					
Tertiary enrolment	0.4717	-0.3643	0.5956	0.6038	-0.0968	1				
Population	0.1557	-0.085	-0.1728	-0.1709	0.1893	-0.221	1			
Unemployment	-0.301	-0.0201	-0.1822	-0.1828	0.1119	0.041	-0.2372	1		
Protestant share	0.6445	-0.143	0.5486	0.5917	-0.193	0.3956	-0.1225	-0.0592	1	
Natural resources	-0.1103	0.1903	-0.2054	-0.1752	0.1719	-0.1642	-0.1095	0.3105	0.0907	1

Do natural resources reduce social trust? And if so, do natural resources have a direct effect on trust, or is their effect indirect through variables such as corruption? This issue paper reviews the literature on natural resources and on trust. The existing theoretical and empirical literature suggests that natural resources can reduce trust through several indirect mechanisms. Notably, studies show that natural resources lead to institutional degradation, corruption, inequality, and civil war, all of which have been associated with reduced trust. The paper tests empirically whether there is a direct effect of natural resources on trust (The Pearl Hypothesis), using cross-country data. The results indicate that no such direct effect exists, suggesting that any effect of resources on trust runs through intermediate variables such as institutions, corruption, inequality, and civil war. Importantly, however, the relationship between corruption and trust turns out to be non-linear, indicating that the effect of natural resources on trust depends on the initial corruption level of a country.

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