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Trade, trust and the rule of law

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ABSTRACT

Well-functioning institutions, both formal (i.e. rule of law) and informal (i.e. trust), facilitate economic exchange. To investigate the nature of the relationship between formal and informal institutions, we analyze bilateral trade patterns in a sample of 16 European countries between 1996–2009. Our results show that trust and rule of law are substitutes, as the positive effect of trust on trade is conditional on the quality of the rule of law. When the rule of law of the importing country increases relative to that of the exporter, the effect of trust on trade decreases. The decline in the effect of trust on trade is less for importers than for exporters, a result that can be attributed to the risk of non-payment that exporters run.

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1. Introduction

Economic exchange is facilitated by well-functioning formal and informal institutions (North, 1990; Hall and Jones, 1999; Acemoglu et al., 2001, 2002; Kerekes and Williamson, 2008). North (1994) and Williamson (2000) classify trust as an informal institution and the judicial system as a formal institution. Historical evidence suggests that both trust and formal institutions are important for the process of economic development (Greif, 1994, 2006; Boettke et al., 2008).

Trust, which is based on deeply rooted cultural traditions (Fukuyama, 1995; Putnam et al., 1993; Tabellini, 2008a), is defined as the willingness to permit others' actions to influence one's welfare (Sobel, 2002). More precisely, an agent is willing to take a risk on the actions of others based on the belief that potential trustees will "do what is right" (Hoffman, 2002).

Since contracts are usually incomplete, a trader has an incentive to expropriate the rights of another trader. To prevent opportunistic behavior, such as hold-up, traders have to divert resources to monitoring and contract enforcement activities. Costs induced by these activities will shy away potential traders. In the context of international trade, this is especially true for exporters who run the risk of non-payment. Trust may mitigate these transaction costs and thereby affect economic outcomes.

Studies have linked trust to economic growth (Knack and Keefer, 1997; Zak and Knack, 2001; Beugelsdijk et al., 2004; Francois and Zabojnik, 2005), the amount of trade (Guiso et al., 2009), government regulation and functioning (Alesina and Zhuravskaya, 2011; Aghion et al., 2010; Fine, 2001; Putnam et al., 1993), corruption (Bjørnskov, 2011) and size of the welfare state (Bjørnskov and Bergh, 2011). One recurring discussion concerns the nature of the relation between trust and formal institutions (Tabellini, 2008a,b).

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Trust and formal institutions are considered to be two different transaction cost reducing channels and as such serve as substitutes. [Anderson and Young \(2006\)](#) argue that country differences in contract enforcement, i.e. formal institutions, create uncertainty concerning the expected payoff from a trade transaction. Although institutions like the International Court of Arbitration are supposed to alleviate this type of disputes, the ultimate enforcement power resides with national courts. Since traders cannot foresee when and where economic disputes will happen, they face uncertainty as to which national court will enforce the contract. When heterogeneity in judicial quality creates uncertainty, informal channels, such as trust, may then have a significant effect on trade. Alternatively, when formal institutions function properly, the trust channel can be hypothesized to be less important. It is against this background that we explore the nature of the relationship between trust and formal institutions. We do so in the context of bilateral trade, because that allows us to relate trust of exporters in importers (and vice versa) to the intensity of market transactions between them while controlling for the quality of institutions in both countries.

In relating formal institutions and trust to trade, existing studies have either focused on formal institutions or on trust, but the interplay between trust and formal institutions has not been explicitly considered so far. Most studies have focused on the role of formal institutions. [De Groot et al. \(2004\)](#) and [Berkowitz et al. \(2006\)](#) show that countries with a higher quality of formal institutions trade more. [Anderson and Marcouiller \(2002\)](#) report that inadequate formal institutions constrain trade as much as tariffs do. Recent literature examines whether institutional quality determines a country's comparative advantage. In particular, [Levchenko \(2007\)](#) demonstrates that countries with better institutions specialize in goods that are institutionally dependent. [Nunn \(2007\)](#) reports that countries with good contract enforcement specialize in the production of goods for which relationship-specific investments are most important. A similar result was found by [Ma et al. \(2010\)](#) using firm level data.

Studies investigating how trust affects trade are less common. [Guiso et al. \(2009\)](#) show that pairs of European countries with high mutual trust trade more than country pairs with low mutual trust. Others test the relationship between trust and trade indirectly, such as [Rauch \(2001\)](#) and [Rauch and Trindade \(2002\)](#) who find that co-ethnic business networks (characterized by high trust levels) reduce the information costs needed for trading more differentiated goods.

To investigate the relation between trust and formal institutions, we analyze bilateral trade patterns in a sample of 16 European countries over the period 1996–2009. Following [Guiso et al. \(2009\)](#), we use a historically determined measure of trust based on a series of Eurobarometer surveys between 1970 and 1996. The quality of formal institutions is measured using World Bank indicators ([Kaufmann et al., 2009](#)).

In a carefully specified gravity equation, we show that trust in the trading partners has a significant positive effect on bilateral trade, a finding in line with [Guiso et al. \(2009\)](#). Moreover, and this is our first contribution, our results suggest that this positive trust effect is conditional on the quality of formal institutions. When the institutional quality of the importing country is relatively low compared to that of the exporter, the positive effect of trust on trade is larger than when the institutional quality of the importer is similar to that of the exporter. In other words, exports from country A to the importing country B will increase when the exporters living in A trust the importers living in B more, and trust becomes more important when the institutional quality of importing country B is lower than that of exporting country A. Trust substitutes for a relative lack of well-functioning institutions.

Our second novel finding is that this substitution effect between trust and institutions differs between the exporter's trust in the importer and the importer's trust in the exporter. We find that the substitution effect between trust and institutions is larger for exporter's trust in importers than vice versa. This can be attributed to the differing nature of the expropriation risk for exporter and importers, which is larger for exporters because they run the risk of non-payment.

Our most fundamental contribution is that we show that trust and formal institutions interact in such a way that they can be considered substitutes, and that this substitution effect differs between exporters and importers. Our results imply that by improving the quality of institutions countries can offset the negative lack-of-trust effect on trade. Whereas recent literature on the role of culture in economics, including the literature on trust, seems to suggest that countries are locked in to long run positions related to their (un) favorable cultural endowments, our study shows that this is not necessarily true in the context of trade.

2. Data and sample

To test whether the effect of culture-rooted bilateral trust on trade is conditional on institutional quality, our empirical strategy consists of two steps. First, we deduct the time dimension of a series of social surveys conducted discontinuously between 1970 and 1996. This approach results in a proxy for trust that captures its time-invariant part. Then, this proxy will be used to examine the effect of bilateral trust on trade after 1995. Since the proxy for trust is generated before the sample period used to estimate a gravity model, we make sure that the causality runs from trust to trade and the trust proxy does not capture institutional well-functioning. The use of this time invariant trust variable in the second stage is validated by the fact that trust is largely determined by historical factors, which means that its time-invariant part will not alter after the survey period.

2.1. Time invariant trust

Trust does not change easily ([Rainer and Siedler, 2009](#); [Guiso et al., 2008](#)). The measure of bilateral trust used in this study is obtained from a subsample of surveys conducted by Eurobarometer in various years and countries. The first survey was conducted in 1970 in only five countries while the last survey in 1996 included 17 countries. A detailed description of the selected subsample

Table 1

List of surveys from eurobarometer.

Source: <http://www.gesis.org/dienstleistungen/daten/umfragedaten/eurobarometer-data-service/>.

No.	Country sampled	Number of years present in survey	Years present
1	Austria	1	1996
2	Belgium	8	1970, 1976, 1980, 1986, 1990, 1993, 1994, 1996
3	Denmark	7	1976, 1980, 1986, 1990, 1993, 1994, 1996
4	Finland	2	1993, 1996
5	France	8	1970, 1976, 1980, 1986, 1990, 1993, 1994, 1996
6	Greece	6	1980, 1986, 1990, 1993, 1994, 1996
7	Ireland	7	1976, 1980, 1986, 1990, 1993, 1994, 1996
8	Italy	8	1970, 1976, 1980, 1986, 1990, 1993, 1994, 1996
9	Netherlands	8	1970, 1976, 1980, 1986, 1990, 1993, 1994, 1996
10	Norway	1	1993
11	Portugal	5	1986, 1990, 1993, 1994, 1996
12	Spain	5	1986, 1990, 1993, 1994, 1996
13	Sweden	1	1996
14	Great Britain	7	1976, 1980, 1986, 1990, 1993, 1994, 1996
15	Northern Ireland	7	1976, 1980, 1986, 1990, 1993, 1994, 1996
16	(West)Germany	8	1970, 1976, 1980, 1986, 1990, 1993, 1994, 1996

is reported in Table 1. In view of data availability and the degree of homogeneity in trading rules and income levels, we restrict the analysis to 16 European countries.¹ The weighted average of Great Britain and Northern Ireland is used as score for the UK.

In each country, about 1000 representative individuals were asked the following “I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust, or no trust at all.” According to Guiso et al. (2004), this type of question measures generalized trust, which shows how much trust people have towards a random member of an identifiable group. Guiso et al. (2009) show that the Eurobarometer survey question indeed reports the subjective probability that a random person is trustworthy. It differs from personalized trust that people develop through repeated interactions (Greif, 1993; Beugelsdijk and Maseland, 2011). Since this study focuses on international trade, it is more suitable to use generalized trust.

Answers to the above trust question are recoded to 1 (no trust at all), 2 (not very much trust), 3 (some trust) and 4 (a lot of trust). Then, they are matched in pairs of countries for each year. Since countries differ in their years of participation and the survey methods varied over time, there are potential measurement errors that can lead to biased results. Thus, we follow Guiso et al. (2009) and collapse the trust measure by averaging the residuals of the regression of $Trust_{ijt}$ on calendar-year dummies $Year_t$.

$$Trust_{ijt} = \sum_{t=1}^T \gamma_t Year_t + u_{ijt}$$

$$Trust_{ij} = \frac{\sum_{t=1}^T \hat{u}_{ijt}}{T} = \frac{\sum_{t=1}^T (Trust_{ijt} - \hat{\gamma}_t Year_t)}{T}$$

Then, the generated (population weighted) averaged residuals, $Trust_{ij}$, will be used to show the trust a representative individual from country i has towards a randomly selected individual from country j . Cases are dropped when i is equal to j . The value of $Trust_{ij}$ is reported in Table 2.

As the data in Table 2 show, systematic differences exist regarding the extent to which inhabitants from a country trust inhabitants from other countries, and the extent to which inhabitants of a country are trusted. People from Scandinavian countries and the Netherlands have more trust in people from other countries. This may suggest that people excessively apply the level of trustworthiness of their own countrymen to people from other countries, which is consistent with the experimental evidence provided by Sapienza et al. (2007). Meanwhile, on average, people in southern Europe are less trusted by inhabitants from other European countries. Swedes receive most time-invariant trust from people in other countries in the sample, while Portuguese receive the least trust from people in other countries.

In order to test whether our trust variable is time-invariant, we relate trust to an array of historical variables. Appendix A shows the results. Our findings are in line with the conclusion of Guiso et al. (2009), i.e. our bilateral trust variable is largely determined by fixed historical factors. We use this generated proxy for trust in our analysis of trade flows.

2.2. Trade data and the gravity model

The data on commodity trade are obtained from UN Comtrade for the period from 1996 to 2009.² The advantage of this dataset is that it provides bilateral trade statistics among the 16 countries included in this study. Primacy was given to the commodity trade flows reported by the importing country, as these are more accurate than those from exporting countries (see Feenstra et al., 2005).

¹ France, Belgium, The Netherlands, Germany, Italy, Denmark, Ireland, Great Britain, Northern Ireland, Greece, Spain, Portugal, Norway, Sweden, Finland, and Austria.

² Guiso et al. (2009) use data from Feenstra et al. (2005), which is no longer available after 2000. Thus, we use UN Comtrade, which is the original source for Feenstra et al. (2005).

Table 2

Matrix for time invariant trust (*100).

Country <i>j</i>																
Country <i>i</i>	Den	Nor	Net	Swe	Bel	Fin	Aus	UK	Ger	Fra	Ire	Spa	Por	Gre	Ita	Average
Denmark		70.2	54.0	60.7	39.7	39.9	41.6	43.0	30.9	7.4	23.2	−13.0	−11.5	−17.9	−25.4	24.5
Norway	71.4		44.8		36.0			45.2	17.8	11.7	19.0	−25.3	−22.0	−29.3	−17.0	13.9
Netherlands	50.6	50.2		53.8	39.6	44.9	10.1	24.0	8.1	−3.1	0.9	−14.6	−5.1	−20.2	−40.1	14.2
Sweden	76.8	85.0	53.4		43.4	69.1	72.7	63.2	32.9	23.9	46.0	5.6	16.6	7.5	1.0	42.6
Belgium	21.9	11.2	13.0	19.1		11.6	3.3	8.7	−0.5	16.5	−4.1	−20.3	−26.0	−34.3	−35.2	−1.1
Finland	49.8	68.2	34.1	54.8	27.3		49.0	38.0	9.0	11.4	12.4	−19.6	−12.8	−12.4	−29.3	20.0
Austria	14.7	20.1	14.9	24.9	14.5	13.8		−21.2	29.0	−17.8	−25.0	−21.8	−30.5	−28.2	−37.0	−3.5
UK	31.2	22.8	33.9	19.8	10.8	14.7	8.0		−22.2	−42.7	−11.8	−32.3	−7.3	−26.1	−28.8	−2.2
Germany	18.8	12.3	12.8	19.4	4.9	4.6	18.4	−6.9		9.1	−19.6	−13.2	−31.0	−27.6	−39.3	−2.7
France	17.7	17.1	15.6	19.2	28.4	11.1	−9.7	−21.4	−0.9		−6.7	−11.1	−19.5	−25.7	−32.5	−1.3
Ireland	20.2	12.7	21.4	11.9	14.2	11.5	12.8	1.7	−3.4	2.0		−14.7	−13.6	−28.7	−13.7	2.5
Spain	−6.8	−0.6	4.7	3.5	−7.1	−9.2	−14.9	−50.4	−14.2	−42.7	−23.1		−29.1	−33.4	−19.5	−17.3
Portugal	−13.9	−58.1	−10.0	−55.8	−13.6	−62.1	−67.2	−13.3	−26.5	10.6	−29.0	−21.0		−38.8	−24.9	−30.3
Greece	−22.5	−40.0	−23.5	−29.1	−18.6	−38.1	−47.8	−44.9	−49.5	−1.2	−24.3	−7.4	−18.9		−45.3	−29.4
Italy	−8.5	−2.1	−1.8	8.5	−14.9	−1.6	−13.7	−24.3	−15.1	−9.4	−41.5	−15.0	−46.3	−38.8		−16.0
Average	23.0	19.2	19.1	16.2	14.6	8.5	4.8	2.9	−0.3	−1.7	−6.0	−16.0	−18.4	−25.3	−27.6	0.7

Explanatory notes: The original scores are rescaled by 100 times. Country *j* (in the row) receives trust from Country *i* (in the column). Country *j*'s are organized in a descending order according to the average trust they receive from other countries (shown in the last row, in bold). As shown above, Denmark on average receives the most trust from other European countries while Italy and Greece are least trusted by other European countries. The average trust that Country *i* gives to other European countries are listed in the last column in bold. Sweden and Finland project lots of trust while Portugal and Greece do not tend to trust citizens from other European countries. Each cell represents the general trust from a representative individual from Country *i* has towards a randomly selected individual from country *j*. For instance, the trust of a random Danish in a random citizen from Norway is equal to 70.2.

Since we are interested in the transaction cost reducing effect of formal institutions, we measure institutional quality by the effectiveness of property rights protection and contract enforcement. As our primary measure of institutional quality, we use the “rule of law” indicator from Kaufmann et al. (2009), which captures perceptions of individuals on the effectiveness and predictability of the judiciary and the enforcement of contracts. One advantage of this measure is that it reflects the effectiveness of judicial system (*de facto* judicial quality), which differs from *de jure* judicial quality. Another advantage is that both “rule of law” and bilateral trust measure perception of agents. Kaufmann et al. (2009) provide data for 1996, 1998, 2000 and sequential years afterwards. In order to test the sensitivity of the results to the use of alternative measures of judicial quality, we also use the “legal structure and security of property rights” from Gwartney et al. (2009) and the average of all the indicators provided by Kaufmann et al. in Section 4 as a robustness check.

The gravity model used here is developed from Anderson and van Wincoop (2003) and Anderson (2011). It is consumption-based and assumes that trade is driven by love of variety instead of resource endowments. Instead of using average trade flows (see e.g. Rose, 2004), we use bilateral imports as the dependent variables. It follows the unidirectional trade predicted by the theory (e.g. Anderson and van Wincoop, 2003) and can better capture multilateral resistance (Subramanian and Wei, 2007; Baldwin and Taglioni, 2006).

We extend the framework of Subramanian and Wei (2007) and use the following regression model:

$$\begin{aligned} \text{LnExport}_{jit} = & \alpha_0 + \alpha_1 \text{GDP}_{it} + \alpha_2 \text{GDP}_{jt} + \alpha_3 \text{Distance}_{ij} + \beta_1 \text{Trust}_{ji} + \beta_2 \text{IQ}_{ijt-1} \\ & + \beta_3 \text{Trust}_{ji} * \text{IQ}_{ijt-1} + \beta_4 \mathbf{X}_{ij} + \sum \theta_{it} d_{it} + \sum \theta_{jt} d_{jt} + \varepsilon_{ijt} \end{aligned} \quad (1)$$

where d_{it} 's are a list of time-varying importer dummies (that are $k_i * \text{Year}_t$, the interactive terms between importing-country fixed effects, k_i , and year fixed effects, Year_t). d_{jt} 's are a list of time-varying exporter dummies (that are $\lambda_j * \text{Year}_t$, the interactive terms between exporting-country fixed effects, λ_j , and year fixed effects, Year_t). The d_{it} 's and d_{jt} 's are essentially dummies that serve to proxy for “multilateral resistance” (similar model specifications are used in Guiso et al., 2009 and Eicher et al., 2012).

LnExport_{jit} is the aggregated export of goods (in logarithm) from country *j*, the exporter, to country *i*, the importer, in year *t*. The exporter represents the demand side in the trade context while the importer represents the supply side. We include the usual determinants in a gravity model: $\text{GDP}_{i(j)t}$, the logarithm of real GDP per capita in country *i(j)* in year *t*, and Distance_{ij} which measures the geographic distance between the importing country *i* and the exporting country *j*.³

To test our hypotheses, we add *Trust*, which is measured as explained above. We analyze both Trust_{ij} and Trust_{ji} . We start with Trust_{ji} , i.e. the trust the exporter *j* has in the importer *i*. We do so because the risk of non-payment holds for the exporter, making the exporter rely on either the institutional quality of the importing country *i* or the trust the exporter has in the importer. This allows us to capture the substitution effect between trust and rule of law. When two countries trade, and the importer has a poor judicial system, the exporter would fear the default of his payment. This uncertainty will shy away potential exporters.

³ By including time-varying importer and exporter dummies, the usual determinant in a gravity model: $\text{GDP}_{i(j)t}$, the logarithm of real GDP per capita in country *i(j)* in year *t*, becomes redundant. We also ran all our models in Tables 4 and 5 while excluding GDP per capita of the importing and exporting country, and results remain qualitatively the same.

Institutional quality is measured as the difference between the institutional quality of country i and country j in year $t - 1$, $IQ_{ijt} - 1$. We also include the interaction between trust and institutional quality, $Trust_{ji} * IQ_{ijt} - 1$. Since international trade can influence the development of legal systems (Acemoglu et al, 2005) as well, we use $IQ_{ijt} - 1$ instead of IQ_{ijt} to avoid a potential simultaneity problem.

Finally X_{ij} is a vector of three determinants in international trade referring to commonality: 1) *Common border*, a dummy for whether country i and country j share borders; 2) *Common language*, a dummy for whether country i and country j share the same official language; and 3) *Common legal origin*, a dummy for whether country i and country j share the same legal origin. The summary statistics of the variables listed above are reported in Table 3.

3. Empirical results

We first estimate a gravity model excluding trust and institutional quality. All model specifications include time-varying importer dummies (d_{it} 's) and time-varying exporter dummies (d_{jt} 's).⁴ The results are shown in Table 4. In model 1, export from country j to country i is regressed upon the levels of their GDP per capita and the geographic distance between them. The results are in line with other studies finding that GDP significantly affects trade while distance has a negative impact on trade.

In model 2, we add the proxy for trust ($Trust_{ji}$) from the exporter towards the importer to the gravity model. We find a positive and significant effect of trust on trade, a result in line with Guiso et al. (2009). The result implies that assuming other variables the same, an increase of trust by one standard deviation (0.302, i.e. the trust from Swedes to Italians increases to the trust Swedes have in Germans) leads to an increase in trade (i.e. the export from Italy to Sweden) by 19%.

We use $IQ_{ijt} - 1$ in model 3 to test whether two trading countries' judicial quality has an impact on trade volumes. Since the gravity model used is consumption-based and is driven by the demand side, $IQ_{ijt} - 1$ is the difference between $IQ_{it} - 1$ and $IQ_{jt} - 1$. When $IQ_{ijt} - 1$ is positive, the importer is superior to the exporter in terms of effectively protecting property rights and enforcing contracts. If it is negative, the exporter has a more effective legal system. The coefficient for $IQ_{ijt} - 1$ is positive and significant at the level of 1%. It implies that an improvement in institutional quality of the importer relative to the exporter has a positive impact on international trade, a result in line with studies showing that formal institutions affect trade. In model 4 we include $Trust_{ji}$ and $IQ_{ijt} - 1$ simultaneously. The coefficients for both variables are positive and significant at the 1% level.

In model 5 we include $Trust_{ji}$ and $IQ_{ijt} - 1$ and the interaction term $Trust_{ji} * IQ_{ijt} - 1$ to assess the interaction between trust and formal institutions. The coefficients for $Trust_{ji}$ and $IQ_{ijt} - 1$ have a positive sign and a significance level as in the previous models, while the coefficient for $Trust_{ji} * IQ_{ijt} - 1$ is negative and significant at the level of 1%. To get a better understanding of the nature of the relationship between trust and institutional quality, we calculate the marginal effect of trust on trade. The marginal effect of $Trust_{ji}$ on $LnExport_{jit}$ is calculated as follows:

$$\frac{\partial LnExport_{jit}}{\partial Trust_{ji}} = \beta_1 + \beta_3 * IQ_{ijt} - 1. \quad (2)$$

With the corresponding estimated standard error:

$$\hat{\sigma} = \sqrt{\text{var}(\beta_1) + IQ_{ijt}^2 \text{var}(\beta_3) + 2 * \text{cov}(\beta_1, \beta_3) * IQ_{ijt} - 1}. \quad (3)$$

We plot the marginal effect in Fig. 1 with the associated 95% confidence interval.

When there is no difference in institutional quality between exporter and importer ($IQ_{ijt} - 1 = 0$), trust has a positive and significant effect on trade. For negative values of $IQ_{ijt} - 1$, thus when the importer has a lower institutional quality than the exporter, the marginal effect of trust is higher than when $IQ_{ijt} - 1 = 0$. When the importer has a higher institutional quality than the exporter (for positive values of $IQ_{ijt} - 1$), the importer's trust in the exporter becomes less relevant, even insignificant at one standard deviation above the mean of $IQ_{ijt} - 1$. The effect of trust on trade becomes smaller when $IQ_{ijt} - 1$ increases. When the importer improves its judicial system relative to the exporter, trust plays less of a role.

3.1. Trust from the importer's perspective: $Trust_{ij}$

Because of our interest in the role of trust and institutions in facilitating exports, we so far focus on the trust from exporting country j to importing country i . We now turn our attention to the trust from the demand side ($Trust_{ij}$, i.e., the trust from importing country i to exporting country j). The results testing the effect of $Trust_{ij}$ on trade are shown in models 6–8.

⁴ We use time varying exporter and importer dummies to control for unobserved heterogeneity. To control for unobserved bilateral heterogeneity between trading partners Baier and Bergstrand (2007) and Eicher and Henn (2011) suggest using country-pair specific dummies to fully account for all time-invariant bilateral heterogeneity. However, as Eicher and Henn (2011) indicated, the drawback of this approach is that all time-invariant explanatory variables are absorbed into the country-pair fixed effects. Since our research interest lies on $Trust_{ji}$, which is a time-invariant variable, we cannot use country-pair specific dummies to fully account for any unobserved bilateral heterogeneity. The alternative solution suggested by Egger (2004) to apply Hausman–Taylor type methodology into the correlated common effect pooled (CCEP) estimation approach (e.g. Serlenga and Yongsheol, 2007) is not possible either. The Hausman–Taylor method assumes that the potential endogenous time-invariant variables can be explained by the time-variant variables in the model. $Trust_{ji}$ in our model is exogenous and historically determined (demonstrated in Appendix A), which means it cannot be determined by the time-variant variables in our model (i.e. GDP and institutional quality). For the other variables, the use of the Hausman–Taylor method implies strong assumptions about what variables are endogenous and exogenous. Thus, we use Eq. (1) as our baseline model.

Table 3
Summary statistics.

Variable	Description	Obs	Mean	S.D.	Min	Max	Source
$LnExport_{ijt}$	Log of export (in thousands of USD) from country j to country i in year t	2828	14.839	1.608	10.015	18.552	UN comtrade
$Distance_{ij}$	Log of distance in kilometers between the major cities (mainly, capital cities) of the respective countries.	2828	7.081	0.642	5.153	8.121	CEPII
$GDP_{i(j)t}$	Natural logarithm of GDP per capita of country $i(j)$ in year t	2520	10.164	0.237	9.528	10.896	PWT 6.3
$Trust_{ij}$	The averaged residuals of regressing the mean of answers to the trust question from country j to country i in survey year t on calendar-year dummies t	2787	0.010	0.302	−0.672	0.850	Eurobarometer
$IQ_{ijt} [KK\&M]$	The difference between the institutional quality of country i and country j in year t ($IQ_{it} - IQ_{jt}$), where $IQ_{i(j)t}$ is the de facto judicial quality of $i(j)$ in year t	2100	0.000	0.593	−1.659	1.659	Kaufmann et al. (2009)
$IQ_{ijt} [G\&L]$	The difference between the institutional quality of country i and country j in year t ($IQ_{it} - IQ_{jt}$), where $IQ_{i(j)t}$ is the de facto judicial quality of $i(j)$ in year t	1680	0.000	1.532	−3.900	3.901	Gwartney et al. (2009)
$ IQ_{ijt} [KK\&M]$	The absolute difference between the institutional quality of country i and country j in year t ($ IQ_{it} - IQ_{jt} $), where $IQ_{i(j)t}$ is the de facto judicial quality of $i(j)$ in year t	2100	0.465	0.368	0.000	1.659	Kaufmann et al. (2009)
$AIQ_{ijt} [KK\&M]$	The difference between the institutional quality country i and country j in year t using the mean of the 6 indexes for governance qualities included in Kaufmann et al. (2009)	2100	0	0.531	−1.350	1.350	Kaufmann et al. (2009)
$Export_ROW_{it}$	The exporting country's total exports in % of GDP.	2828	41.662	18.612	16.146	99.423	WDI
$Import_ROW_{it}$	The importing country's total imports in % of GDP	2828	38.999	15.054	16.916	84.145	WDI
$Common\ language$	A dummy for whether country i and country j share the same official language	2828	0.028	0.165	0	1	Jon Haveman's website
$Common\ border$	A dummy for whether country i and country j share borders	2828	0.148	0.355	0	1	Jon Haveman's website
$Common\ legal\ origin$	A dummy for whether country i and country j share the same legal origin	2828	0.275	0.447	0	1	Djankov et al. (2007)

We add $Trust_{ij}$ to the gravity model in model 6. The coefficient for $Trust_{ij}$ is positive and significant at the level of 1%. It is larger than the standardized beta for $Trust_{ji}$. It implies that the trust from the demand side has a stronger impact on trade and is in line with the assumption that trade is demand-driven. Model 7 includes both $Trust_{ij}$ and IQ_{ijt-1} . Similar to model 4, the coefficient for $Trust_{ij}$ and IQ_{ijt-1} is both positive and significant at the level of 1%. Model 8 includes both $Trust_{ij}$ and IQ_{ijt-1} , and the interactive term $Trust_{ij} * IQ_{ijt-1}$. The coefficients for $Trust_{ij}$ and IQ_{ijt-1} are still positive and significant at the level of 1%, while the coefficient for $Trust_{ij} * IQ_{ijt-1}$ is negative and significant at the level of 1%. Moreover, the standardized beta for $Trust_{ji} * IQ_{ijt-1}$ is higher than the beta for $Trust_{ij} * IQ_{ijt-1}$.

Fig. 2 plots the marginal effect of $Trust_{ij}$ on trade, together with the 95% confidence interval. Fig. 2 closely resembles Fig. 1. Again, the marginal effect has a downward slope, meaning that as the institutional quality of the importer is relatively low, the effect of trust on trade gets larger.

By plotting the two slopes of Figs. 1 and 2 together in Fig. 3, we can clearly see that the slope of the marginal effect of $Trust_{ji}$ on $LnExport_{jit}$ is much steeper than the slope of the marginal effect of $Trust_{ij}$ on $LnExport_{jit}$. As the importer improves its judicial system, the positive effect of (supply side) $Trust_{ji}$ on $LnExport_{jit}$ diminishes faster than the effect of (demand side) $Trust_{ij}$ on $LnExport_{jit}$. The intuition is clear: if the importer has a poor judicial system, the exporter would fear the default of his payment, and an improvement in the institutional quality of the importer will reduce the required trust of the exporter in the importer more than vice versa.

4. Robustness checks

We test the robustness of our main results along several dimensions, the results of which are shown in Table 5. The main results (i.e. models 5 and 8 in Table 4) are included to facilitate comparison (Panel A of Table 5). First, we test our model using an alternative model specification with respect to the year and country specific dummies (Panel B). Second, instead of using the lagged institutional quality measure, we use current values (Panel C). Third, we split our sample into two time periods, one before the launch of the Euro (Panel D), and one after (Panel E). Finally we use alternative measures of institutional quality (Panel F) and an alternative measure of difference in institutional quality by taking the absolute difference between the institutional quality of country i and country j in year $t - 1$, $|IQ_{ijt-1}|$ (Panel G). We collapse the data and re-run the model in a cross section setting (Panel H). Finally, we control for out of sample trade (Panel I).⁵

In each panel, we start with the model specification of model 5 in Table 4 (column 1), and then the model specification of model 8 in Table 4 (column 2). For brevity, only the coefficients and standard errors for $Trust_{ji}$ ($Trust_{ij}$), IQ_{ijt-1} and their interactive terms are reported.

⁵ For each of these robustness checks, we also estimated a model including an additional set of commonality variables (i.e. common border, common language, common legal origin). Since these variables are also determinants for $Trust_{ij}$ (Guiso et al., 2009), adding these controls rules out that the effect of trust on trade is merely due to its connection with these three variables. The results are qualitatively similar to the results shown in Table 5 (detailed results available upon request).

Table 4

Main results.

$\ln \text{Export}_{ijt}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance_{ij}	−0.960*** 0.0231	−0.879*** 0.0250	−0.861*** 0.0387	−0.838*** 0.0397	−0.843*** 0.0234	−0.942*** 0.0366	−0.833*** 0.0357	−0.837*** 0.0356
GDP_{it}	−115.1*** 31.17	−93.00*** 29.87	−1.583*** 0.470	−1.804*** 0.716	−104.3*** 29.10	−0.706** 0.356	−1.296*** 0.438	−3.005*** 0.333
GDP_{jt}	38.47*** 10.22	24.84*** 7.804	2.006*** 0.450	2.050*** 0.550	104.3*** 29.10	1.333*** 0.287	1.513*** 0.480	3.057*** 0.420
Trust_{ji}		0.640*** 0.0663	0.701*** 0.0975	0.961*** 0.107				
IQ_{ijt-1}			1.516*** 0.153	1.477*** 0.296		1.256*** 0.144	1.521*** 0.161	1.690*** 0.174
$\text{Trust}_{ji} * \text{IQ}_{ijt-1}$				−1.210*** 0.194				
Trust_{ij}					0.859*** 0.0653		0.876*** 0.0904	0.772*** 0.0987
$\text{Trust}_{ij} * \text{IQ}_{ijt-1}$								−0.411*** 0.158
Constant	750.1*** 199.6	672.9*** 211.5	15.61*** 2.833	17.13*** 3.155	19.49*** 2.113	13.94*** 2.560	17.46*** 2.942	19.06*** 2.822
Time-varying importer dummies	YES	YES	YES	YES	YES	YES	YES	YES
Time-varying exporter dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2520	2484	1241	1241	2484	1260	1251	1251
R-squared	0.931	0.937	0.936	0.939	0.937	0.930	0.937	0.937

Robust standard errors in the second row while *p < 0.1, **p < 0.05, and ***p < 0.01.

4.1. Panel B: separate exporter, importer, and year dummies

So far we used time varying importer and exporter dummies. Here we separate year specific dummies from the importer and exporter fixed effects. The model specification is shown below in Eq. (4). It includes year dummies, Year_t , importing-country dummies, k_i , and exporting-country dummies, λ_j . Although IQ_{ijt-1} turns insignificant now, the main results on the interaction effects are supported. The coefficients for Trust_{ji} and Trust_{ij} are both positive and significant at the 1 percent level. Both $\text{Trust}_{ji} * \text{IQ}_{ijt-1}$ and $\text{Trust}_{ij} * \text{IQ}_{ijt-1}$ have negative and significant coefficients while the former is larger.⁶

$$\ln \text{Export}_{ijt} = \alpha_0 + \alpha_1 \text{GDP}_{it} + \alpha_2 \text{GDP}_{jt} + \alpha_3 \text{Distance}_{ij} + \beta_1 \text{Trust}_{ji} + \beta_2 \text{IQ}_{ijt-1} + \beta_3 \text{Trust}_{ji} * \text{IQ}_{ijt-1} + \beta_4 X_{ij} + \sum \gamma_t \text{Year}_t + \sum \theta_i k_i + \sum \theta_j \lambda_j + \varepsilon_{ijt} \quad (4)$$

4.2. Panel C: current values of institutional quality

We used the lagged value of IQ_{ijt} instead of its current value in Table 4 to test how the difference in institutional quality influences the marginal effect of trust on trade. In Panel C, for the whole sample period, we investigate whether our main results are sensitive to the use of IQ_{ijt} instead of IQ_{ijt-1} . We find that the coefficients for Trust_{ji} and Trust_{ij} are significantly positive. Although $\text{Trust}_{ji} * \text{IQ}_{ijt-1}$ is negative but insignificant, the interaction effect from the exporter side $\text{Trust}_{ij} * \text{IQ}_{ijt-1}$ remains significantly negative. One reason for the insignificant interaction term on the importer's side may be related to the contemporaneous interaction between trade and institutional quality.

4.3. Panel D: results for the period 1996–2000

To test whether our results are robust to the launch of the Euro, we separate our sample into two periods: the period before 2001 (1996–2000) and the period afterwards (2001–2009). Then, we redo the regressions separately for each period. Estimating models in the first period with IQ_{ijt-1} from Kaufmann et al. (2009) leaves us with observations for 1997 and 1999 only, which may explain the insignificant and negative result for IQ_{ijt-1} . Still, the coefficients for Trust_{ji} and Trust_{ij} are significant and positive. While $\text{Trust}_{ji} * \text{IQ}_{ijt-1}$ has a strongly negative and significant coefficient, the coefficient for $\text{Trust}_{ij} * \text{IQ}_{ijt-1}$ is negative but insignificant.

4.4. Panel E: results for the period 2001–2009

The results for the period from 2001 to 2009 show that the coefficients for Trust_{ji} , IQ_{ijt-1} and Trust_{ij} are significant. Meanwhile, the coefficients for the interactive terms ($\text{Trust}_{ji} * \text{IQ}_{ijt-1}$ and $\text{Trust}_{ij} * \text{IQ}_{ijt-1}$) are both negative and significant. More importantly, the coefficient of $\text{Trust}_{ji} * \text{IQ}_{ijt-1}$ is much higher than that of $\text{Trust}_{ij} * \text{IQ}_{ijt-1}$.

⁶ Using year dummies and time varying importer and exporter dummies, we continue to find a significantly negative interaction effect.

Note: the figure shows the marginal effect of $Trust_{ji}$ on commodity trade flows for various values of IQ_{ijt-1} (including the 95% confidence interval).

Fig. 1. Exporter: Marginal effect of $Trust_{ji}$ on $LnExport_{jit}$.

4.5. Panel F: alternative indicator of institutional quality

We use two alternative measures of institutional quality. First, an alternative measure of judicial quality, “legal structure and security of property rights”, is developed by Gwartney et al. (2009). It is constructed by using multiple other studies, including Global Competitiveness Reports, International Country Risk Guide, and World Bank’s Doing Business surveys. It covers several dimensions, such as judicial independence, impartial court and legal enforcement of contracts. It is available every 5 years for the period from 1970 to 1995. From 2000 onwards, the proxy is reported for each sequential year. Thus, we can only use it for the second period, 2001–2009. For this period, the two proxies for judicial quality, Kaufmann et al. (2009) and Gwartney et al. (2009), have a .90 correlation. Again, both $Trust_{ji}$ and $Trust_{ij}$ have a positive coefficient which is significant at 1 percent level. While the interactive term, $Trust_{ji} * IQ_{ijt-1}$, has a negative coefficient that is significant at the 1 percent level, the coefficient for $Trust_{ij} * Q_{ijt-1}$ is not significantly different from zero.

Second, the Kaufmann indicators are characterized by measurement errors.⁷ The Kaufmann dataset provides not only mean country scores, but also a standard error. This standard error differs mainly between developed and developing countries. Because our sample consists of European countries only, there is no difference in the error with which the Kaufmann data are measured. In other words, controlling for the error in our regression essentially boils down to a correction that is similar for all observations, and will thus not lead to a different interpretation of our results. In our analysis we used the rule of law indicator of the World Bank. In addition to this rule of law indicator, the Kaufmann data contain 5 more measures of institutional quality. These six measures are highly correlated (mostly $> .75$), but to explicitly test whether our results are robust to the choice of a specific indicator of institutional quality, we averaged the six measures. By taking an average of all the indicators we reduce the problem of measurement error instead of focusing on a single indicator. Panel F in Table 5 shows the results when using the average of these six indicators. We find robust support for the interaction effect from the exporter’s perspective, but no support for the substitution effect from the importer’s perspective.

4.6. Panel G: alternative measure of institutional quality difference $|IQ_{ijt-1}|$

In Panel G, we use an alternative measure of difference in institutional quality between importer and exporter. We take the absolute value of IQ_{it-1} minus IQ_{jt-1} . While IQ_{ijt-1} ranges from -1.66 to 1.66 , $|IQ_{ijt-1}|$ ranges from 0 to 1.66 . We redo the regressions with the model specifications as in Panel A. Note that the interpretation of this alternative measure of institutional quality difference differs from the main model, as taking the absolute value implies that the direction of the institutional quality effect can no longer be inferred from the results. The results are shown in Panel G. Although the sign of $|IQ_{ijt-1}|$ is negative (suggesting that a mere mismatch between institutional quality levels has a negative effect on trade), $Trust_{ji(ij)}$ has a positive sign and is significant at 1%. Most importantly, however, we still find that the interactive terms between $|IQ_{ijt-1}|$ and $Trust_{ji(ij)}$ have the same negative sign and significance level as in Panel A of Table 4. The reason why the results are similar to the main results when taking the absolute value is that most changes in institutional quality are positive.

⁷ See Kaufmann et al. (2007) and references therein for a discussion of these and other criticisms raised against the Kaufmann data.

Note: the figure shows the marginal effect of $Trust_{ij}$ on commodity trade flows for various values of IQ_{ijt-1} (including the 95% confidence interval).

Fig. 2. Importer: Marginal effect of $Trust_{ij}$ on $LnExport_{ijt}$.

4.7. Panel H: cross-section

In Panel H, we redo the regressions in a cross-section setting. To do so, we collapse the dataset by averaging time-varying variables over the sample period. We regress the mean of IQ_{ijt} over period 1996–2009 and other country-pair variables upon the average export (in natural logarithm) from country i to country j over the same period and other country-pair variables (see Eq. (5)). Both the importer dummies and exporter dummies are included to deal with country-specific effects.

$$\overline{LnExport}_{ji} = \alpha_0 + \alpha_1 \overline{GDP}_i + \alpha_2 \overline{GDP}_j + \alpha_3 \overline{Distance}_{ij} + \beta_1 \overline{Trust}_{ji} + \beta_2 \overline{IQ}_{ij} + \beta_3 \overline{Trust}_{ji} * \overline{IQ}_{ij} + \beta_4 \overline{X}_{ij} + \sum \theta_i k_i + \sum \theta_j \lambda_j + \varepsilon_{ij} \quad (5)$$

The results are shown in Panel H. The coefficients for $\overline{Trust}_{ji} * \overline{IQ}_{ij}$ are negative and significant at 10 percent level. $\overline{Trust}_{ji} * \overline{IQ}_{ij}$ is not significantly different from zero. Moreover, both $\overline{Trust}_{ji}$ and $\overline{Trust}_{ij}$ are positive and significant at 1 percent level.

4.8. Panel I: control for out of sample trade

Even though the countries in our sample mostly trade with other countries in our sample,⁸ the exclusion of trade with countries in the rest of the world may potentially bias the estimates and pose specific problems for countries in the sample that trade relatively much with countries outside the sample. For that reason we run a regression in which we control for the trade with the countries not included in the sample.⁹ We do so by including two additional variables. We include the importing country's total imports to the rest of the world (i.e. total imports minus the imports from country j) in % of GDP and the exporting country's total exports to the rest of the world (i.e. total exports minus the exports to country i) in % of GDP. We use all the trade measures in % of GDP to avoid potential multicollinearity with the GDP measures included in the regressions. As the results in Panel I in Table 5 show, we continue to find support for our interaction effect. A plot of the marginal effect of trust corroborates the findings shown in Figs. 1, 2 and 3 (these figures are available upon request).

The main results show that i) trust and formal institutions interact in such a way that they can be considered substitutes, and ii) this effect is stronger for exporters' trust in importers than vice versa. In our robustness analysis, we continue to find these effects, although the weaker substitution effect for importers is not robust. Note that main effects cannot be interpreted directly, but require the interaction effect to be included as well (Brambor et al., 2006). In addition to the robustness tests shown in Table 5, we have therefore also drawn all the marginal effect figures – similar to Figs. 1 and 2 – for all these model specifications. We continue to find support for our hypothesis (the 18 figures are available upon request).

Finally, we have examined a potential non-linear effect of institutional quality such that a similar unit increase in institutional quality for countries with low average institutional quality is larger than for countries with a high average institutional quality or trust. We have tested for this by adding the squared term of IQ in our main models. The results (available on request) show that the impact of institutional quality both follow an inverted U-shape. For institutional quality we find, based on the estimated coefficients, that the inflection point ranges from 2.2 to 7.6. Since IQ_{ijt-1} 's maximum is 1.66, the non-linear part is out of our sample. This means that we are dealing with the linear part of IQ 's impact on exports where the slope is positive. We also included the squared

⁸ On average, a country's trade with countries within EU amounts to 46% while its trade with countries outside EU is about 53%.

⁹ We thank one of the reviewers for pointing this out.

Note: The upper line is the marginal effect of $Trust_{ji}$ on $LnExport_{jit}$, and the lower line is the marginal effect of $Trust_{ij}$ on $LnExport_{jit}$.

Fig. 3. Im(ex)porter: Marginal effect of $Trust_{ij}/Trust_{ji}$ on $LnExport_{jit}$.

term of trust to our basic model to test for a non-linearity of trust. We find that the marginal impact of trust is higher at higher levels of trust. We continue to find support for our interaction effect such that when institutional quality improves, the marginal impact of trust on exports is smaller. The non-linearity of trust implies that this substitution effect between institutional quality and trust is stronger when trust levels are low. Detailed results are available on request.

5. Conclusions

In this paper we complement the extant literature on the importance of trust and formal institutions for economic exchange. We do so by investigating the nature of the relationship between these two types of institutions in the context of international trade. We not only find that both institutions and trust matter for trade, but also that the effect of trust on trade depends on whether the importing country's judicial quality is sufficiently good for the exporting country. When the importing country does not have well-developed legal institutions relative to the exporting country, there is uncertainty concerning potential expropriation and defaults. This kind of uncertainty makes traders rely on informal institutions, such as trust, to assess future payoffs. When the

Table 5
Robustness checks.

	Column (1): $Trust_{ji}$			Column (2): $Trust_{ij}$		
	$IQ_{jit} - 1$	$Trust_{ji}$	$Trust_{ji} * IQ_{jit} - 1$	$IQ_{jit} - 1$	$Trust_{ij}$	$Trust_{ij} * IQ_{jit} - 1$
Panel A: Main models						
Default results (from Table 4, columns 5 and 8)	1.48(0.30)***	0.96(0.11)***	-1.21(0.19)***	1.69(0.17)***	0.77(0.10)***	-0.41(0.16)***
Panel B: Separate exporter, importer, and year dummies						
Model incl ex/importer-year dummies (Eq. (4))	-0.07(0.12)	0.94(0.10)***	-1.10(0.18)***	-0.08(0.12)	0.78(0.10)***	-0.35(0.15)**
Panel C: Current values of institutional quality						
Model Q_{jit} (Kaufmann et al., 2009)	30.30 (10.33)***	0.81 (0.08)***	-0.70 (0.13)***	36.44 (10.10)***	0.84 (0.08)***	-0.10 (0.12)
Panel D: Results for the period 1996–2000						
Model Q_{jit-1} Kaufmann et al. (2009), 96–00	-1.49 (0.18)***	0.78 (0.18)***	-1.02 (0.30)***	-0.13 (0.17)	0.86 (0.17)***	-0.20 (0.28)
Panel E: Results for the period 2001–2009						
Model Q_{jit-1} Kaufmann et al. (2009), 01–09	1.47 (0.29)***	1.06 (0.13)***	-1.32 (0.25)***	-0.83 (0.18)***	0.72 (0.12)***	-0.52 (0.19)***
Panel F: Alternative indicator of institutional quality						
Model $Q_{jit} - 1$ Gwartney et al., 2009, 01–09	-0.18 (0.28)	0.81 (0.09)***	-0.26 (0.05)***	-0.31 (0.28)	0.84 (0.09)***	-0.19 (0.47)
Composite measure of six indicators	2.04(0.12)***	0.78(0.09)***	-0.81(0.15)***	-2.19(0.16)***	0.83(0.08)***	-0.13(0.14)
Panel G: Absolute difference in institutional quality						
Model with $ IQ_{jit} - 1 $	-0.44(0.06)***	0.94(0.12)***	-1.22(0.20)***	-0.28(0.07)***	1.13(0.12)***	-1.01(0.19)***
Panel H: Cross-section						
Model cross-section (Eq. (5))	0.85(0.06)***	0.87(0.19)***	-0.77(0.10)***	-0.07(0.18)	0.84(0.06)***	-0.11(0.09)
Panel I: Control for out of sample trade						
Model with $Export_ROW_{jit}$ and $Import_ROW_{it}$	0.01(0.19)	0.76(0.09)***	-1.02(0.18)***	1.36(0.20)***	0.50(0.07)***	-0.50(0.14)***

Robust standard errors in the second row while * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

importing country improves its formal institutions relative to the exporting country, traders rely less on trust. Moreover, our results suggest that exporters shift their reliance on trust to the judicial system faster than importers. The reason is not hard to understand. When the importing country has a malfunctioning judicial system, the exporter is the expropriation target.

Our results are robust to the use of different proxies and different sample periods. Thus, our finding generally suggests that formal institutions and informal institutions are substitutes in the setting of international trade. Under the absence of formal institutions, traders base their decisions on informal institutions. When well-functioning institutions are in place, the effect of informal institutions disappears. Our findings complement those of Ahlerup et al. (2009), who show that the effect of trust on economic growth is conditional on the quality of institutions.

Our finding suggests that exporters bear the main risk of non-payment of a bilateral trade transaction. In the context of trade in heterogeneous goods, as opposed to homogenous goods where quality is less of an issue, importers may also bear part of the risk. Trust is more important for trade in heterogeneous goods for which quality may be non-contractable and is also less visible for courts (Guiso et al., 2009). It would be interesting to explicitly test this proposition by looking at trade in heterogeneous goods. Doing so would provide an even more fine-grained picture of the role of institutions and trust in the context of trade.

Whereas recent literature on the role of culture in economics, including the literature on trust, seems to suggest that countries are locked in to long run positions related to their cultural endowments, our study shows that this is not necessarily true in the context of trade. While Guiso et al. (2009) show the disadvantage in trade for countries that receive little trust, our findings imply that countries can eliminate this disadvantage by improving the quality of their formal institutions. Just like culture, institutions change only slowly, but the time frame with which institutions change is generally much shorter than that of culture. Williamson (2000) mentions a time period of 10 to 100 years for institutional change, but 100 to 1000 years for cultural change. Thus, although our results suggest that good institutions may substitute for long-term cultural effects, such institutional changes cannot be expected to happen overnight.

Having shown how institutional quality interacts with bilateral trust, follow-up research could try to disentangle the institutional black box by unraveling the most relevant types of institutions for trade. A fine-grained analysis of the relation between traded product groups and different sets of rules and regulations will shed more light on which types of formal institutions matter most.

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Appendix A. Determinants of trust

To show that trust is largely cultural-rooted and time invariant, we follow Guiso et al. (2009) and explain bilateral trust with match-specific variables. These match-specific variables are historical and do not vary over time. Additionally, both country-of-origin fixed effects and country-of-destination fixed effects are included. Country-of-origin fixed effects are used to control for the fact that people apply the level of trustworthiness of their own countrymen towards people from other countries (Glaeser et al., 2000; Sapienza et al., 2007). The regression model for bilateral trust takes the following form:

$$Trust_{ij} = \sum \theta_i k_i + \sum \theta_j \lambda_j + \beta X_{ij} + v_{ij} \quad (A1)$$

where k_i is the country-of-origin (where trust originated) fixed effect, λ_j is the country-of-destination (where trust is received) fixed effect, and X_{ij} is the match-specific variables that are rooted in culture and can explain bilateral trust. The values for X_{ij} depend on country pairs.

According to Guiso et al. (2009), countries differ in their trust towards the inhabitants of other countries for several reasons. One is the difference in the information sets people possess: better information leads to a more accurate estimate. An alternative is that a cultural-rooted bias can be passed over several generations and form the perception of trustworthiness today. To capture these two possible reasons, we select proxies for information and proxies for cultural similarity. Table A1 offers a description of all the match-specific variables used.

The proxies for information include the geographic distance ($Distance_{ij}$) between the two countries, a dummy variable indicating whether two countries share the same official language (*Common language*), the commonality between two languages, and a dummy variable indicating whether two countries share a common border (*Common border*). To capture the commonality between two languages, we use a measure (*Linguistic common roots*) created by Fearon and Laitin (2003). It is based on a count of the number of common branches two languages share in the language trees reported by Ethnologue.com. As two languages share more common branches, fewer efforts are needed for citizens from one country to understand the language spoken in another country.

Table A1

Descriptive statistics of data used in the Appendix.

Variable	Obs	Mean	Std. Dev.	Min	Max	Source
<i>Trust_{ij}</i>	207	0.00738	0.301656	−0.67224	0.849558	Eurobarometer
<i>Common language</i> (official)	207	0.028986	0.168173	0	1	Jon Haveman's website
<i>Distance_{ij}</i> (geography)	207	7.086713	0.643405	5.153484	8.120583	Jon Haveman's website
<i>Common border</i>	207	0.140097	0.347929	0	1	Jon Haveman's website
<i>War</i>	207	1.024115	2.139889	0	10.58356	COW version 3.0
<i>Religious distance</i>	206	0.459115	0.277538	0.011283	0.851569	Alesina et al. (2003)
<i>Somatic distance</i>	207	9.47343	5.117837	0	20	Guiso et al. (2009)
<i>Genetic distance</i> (fst * 1000)	206	55.49029	43.19188	4	204	Cavalli-Sforza et al. (1996)
<i>Common legal origin</i>	207	0.270531	0.445311	0	1	Djankov et al. (2007)
<i>Linguistic common roots</i>	207	0.555161	0.25162	0	0.9	Ethnologue.com

Note: the source of the bilateral data as shown on Jon Haveman's website is the CEPII dataset (see www.cepii.fr).

The proxies for culture can be further categorized into three groups: 1) religious similarity (*Religious distance*); 2) ethnic distance (*Somatic distance*, *Genetic distance*) and 3) interactions in past history (*War*). To calculate religious distance, we obtain the percentage of people belonging to each religious denomination in one country from Alesina et al. (2003). To take into account the level of fragmentation, the measure for religious distance has the following form:

$$\frac{\sum_w (\rho_{iw} - \rho_{jw})^2}{2(1 - \sum_w \rho_{iw} * \rho_{jw})} \quad (\text{A2})$$

where $\rho_{i(j)w}$ represents the fraction of individuals in country $i(j)$ who have religion w .

Two measures are used to capture ethnic distance. The first is the *Genetic distance* between indigenous populations developed by Cavalli-Sforza et al. (1996). It measures differences in the genetic composition between two populations by summing the differences in frequencies of these polymorphisms.¹⁰ Secondly, *Somatic distance* developed by Guiso et al. (2009) is used to account for the fact that people trust people who look like them more than those who do not (De Bruine, 2002). Furthermore, we adopt the classification of Djankov et al. (2007) and construct a dummy variable (*Common legal origin*) equal to one if the countries share the same legal origin. The last measure (*War*) for historical interactions captures the conflicts between countries. Presumably, countries with a long history of wars and conflict will mistrust each other. We compute the number of years a country pair has been in a war between 1816 and 1970 by using the COW (Correlates of War) dataset. Although including wars before 1816 will provide us with more incidences, it is hard to believe that those wars are relevant. European countries began to have their current shape after 1800. Another advantage of this dataset is that it provides detailed information on where the battles took place and which states were involved. By using this information, we took border changes into consideration.

Table A2 includes all the regressions. Both country-of-origin and country-of-destination fixed effects are included. In column (1), we use all the match-specific variables. To improve the model, we take a general-to-specific model selection procedure. Starting with the model specification in column (1), the least significant variable from the regression is dropped one at a time. The procedure ends when only significant variables remain. The result is reported in column (2).

In column (2), only three variables remain significant. Countries with a long history of conflicts and wars will have a tendency to mistrust each other. Moreover, it supports the argument of Guiso et al. (2009) and De Bruine (2002) that people trust people who look like them more than those who do not. When two populations lack common somatic traits, they tend not to trust each other. The effect of somatic distance on bilateral trust is constantly significant at the level of 1%. Although the dummy variable indicating whether two countries have the same legal origin is only significant at the level of 10%, it has the expected positive sign. It suggests that the similarity in formal institutions facilitates the formation of trust between two populations.

In columns (3) to (11), we regress one of the match-specific variables upon *Trust_{ij}* at a time. Most of them are significant at the level of 1%, except the dummy variable indicating whether two countries share the same official language and genetic distance. One reason is that not many European country pairs share the same official language. The effect of linguistic similarity on trust can be verified by the coefficient for linguistic common roots. This variable is not only statistically significant at the level of 1% but also economically highly significant. Moving from having none common branches in the language tree to sharing one common branched would improve one population's trust upon another by 0.262.

By using the model specification in column (2), variation in *Trust_{ij}* can be largely explained. Moreover, when one match-specific variable is regressed upon *Trust_{ij}* at a time, most of them tend to be significant and have the expected sign. Since country-of-origin and country-of-destination fixed effects are time-invariant as well, we conclude that *Trust_{ij}* does not vary much over time and thus that it is appropriate to use it as an explanatory variable in our model for trade flows.

¹⁰ The calculation for this measure is similar to Eq. (A2), which measures religious distance.

Table A2

Determinants of bilateral trust in Europe.

<i>Trust_{ij}</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>War</i>	−0.012** 0.006	−0.011** 0.005	−0.012* 0.006								
<i>Somatic distance</i>	−0.016*** 0.003	−0.017*** 0.002		−0.019*** 0.002							
<i>Common legal origin</i>	0.041 1.254	0.047* 0.027			0.172*** 0.027						
<i>Common language</i>	0.073 −0.600					0.097 0.064					
<i>Distance_{ij}</i>	0.006 0.033						−0.104*** 0.021				
<i>Common border</i>	0.029 0.041							0.119*** 0.026			
<i>Religious distance</i>	−0.022 0.056								−0.197*** 0.043		
<i>Genetic distance</i> (<i>fst</i> * 1000)	0.0002 0.0003									0.0000 0.0003	
<i>Linguistic common roots</i>	0.075 0.120										0.524*** 0.103
Observations	205	207	207	207	207	207	207	207	206	206	207
R-squared	0.846	0.847	0.755	0.841	0.798	0.754	0.775	0.768	0.768	0.751	0.790

Robust standard errors in the second row while *p < 0.1, **p < 0.05, and ***p < 0.01. All regressions include country-of-origin and country-of-destination fixed effects.

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