Institutions and Trade: Competitors or Complements in Economic Development?*

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This article contributes to the debate over the empirical relationship between trade openness and economic development. Unlike previous studies which treat trade openness and institutions as competitors in economic development, we find evidence that they are in fact complements. We also find that in order for a country to benefit from trade, its institutional quality has to be above a certain threshold level. These results are suggestive of an important complementary role for trade openness and institutions in economic development.

1 Introduction

The empirical relationship between trade and development at the cross-national level has been a topic of research for several decades now. Until recently, it appeared that a growing academic as well as policy consensus was emerging on the positive effects of trade on development.

Dollar (1992) using an ‘index of real exchange rate distortion’ and an ‘index of real exchange rate variability’, shows that outward orientation is good for economic growth. Sachs and Warner (1995) construct an index that combines all aspects

of trade policy and show that countries with an open trade regime, on average perform better than countries with closed trade regimes. Ben-David (1993) in contrast, show that trade liberalization leads to less dispersion in income across countries and hence convergence.

In another influential study, Frankel and Romer (1999) show that there is a positive relationship between trade volumes and national income to the extent that an increase in trade volume is the result of a reduction in natural or geographical barriers to trade rather than trade policy. They use the geographical component of trade volumes as an instrument to identify the effects of trade on income.

In the policy arena the World Bank (2002) emphasizes the advantages of trade openness especially for developing economies. In their report entitled ‘Globalization, Growth and Poverty’, they write:

‘Some 24 developing countries – with 3 billion people – have doubled their ratio of trade to income over the past two decades. The rest of the developing world trades less today than it did 20 years ago. The more globalized developing

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countries have increased their per capita growth rate from 1 per cent in the 1960s to 3 per cent in the 1970s, 4 per cent in the 1980s, and 5 per cent in the 1990s ... much of the rest of the developing world – with about 2 billion people – is becoming marginalized. Their aggregate growth rate was actually negative in the 1990s.’ (World Bank, 2002, pp. 4–5)

Nevertheless, this growing consensus was shattered by a Rodriguez and Rodrik’s (2000) critical survey of the literature. They show that the findings of the empirical literature are not robust due to the difficulties in measuring openness, statistically sensitive specifications, the collinearity of protectionist policies with other bad policies, and other econometric problems.¹ In an empirical study using data since 1870 Vamvakidis (2002) finds no support for a positive growth-openness connection before 1970.

In a recent published articles, Rodrik *et al.* (2004) also challenge Frankel and Romer’s (1999) result. Using an instrumental variable estimation technique and a cross-country study, they show that institutions dominate the influence of both trade and geography as the fundamental determinant of long-run economic development.² Rigobon and Rodrik (2005) analyse the inter-relationship between the rule of law, democracy, openness and income. They find that openness negatively impacts on per capita income levels.

The conclusion drawn by Rodrik *et al.* (2004) however is different from Dollar and Kraay (2003). Dollar and Kraay (2003) argue that cross-country regressions of the log-level of per capita GDP on instrumented measures of trade and institutional

quality are uninformative about the relative importance of trade and institutions in the long-run because of the very high correlation between the latter two variables. Using an empirical growth model and panel data they show that improvements in trade and institutions have positive effects on growth.

Given the doubts that these studies have created about the empirical relationship between trade and economic development, further research on this topic is certainly called for. In this study we take a fresh look at the empirical relationship between trade and development in a model which also accounts for the effects of institutions on development. Our major contributions are as follows.

Unlike previous studies which look at the partial effects of trade and institutions in a linear regression model and hence treat them as competitors in economic development, we consider the potential for complementarities between these two variables.³ We do this by introducing an interactive variable in the model which is the product of our measures of institutional quality and trade openness. We observe that the coefficient on the interactive variable is positive and statistically significant which is indicative of the complementary effects of trade and institutions on development. We also observe that in order for a country to benefit from trade, its institutional quality needs to be above a certain threshold level. This is indicative of the fact that to reap the full rewards of trade liberalization, countries should also focus on improving their institutional quality. Using a similar framework, we also test the inter-relationship between trade policy openness, institutions and economic development.

Our findings on the complementarities between trade and institutions in the process of economic development are closest in spirit to the findings of

¹ Lee *et al.* (2004) is an answer to Rodriguez and Rodrik (2000). They show that trade has a small but positive effect on growth when the reverse causality issues are handled appropriately.

² Their results build on the findings of the highly influential work by Acemoglu *et al.* (2001) which shows a strong impact of institutions on long-run economic development without claiming dominance. Bhattacharyya (2004) confirms this finding using post-war growth as a dependent variable. Sachs (2003) and Carstensen and Gundlach (2006) disagree with the long-run institutions result. Using a global sample they show that diseases are a major barrier to development in the long run. Bhattacharyya (2008a) shows that diseases like malaria are a major obstacle for development in Africa. Bhattacharyya (2009) reconciles these seemingly conflicting views and proposes a unifying framework.

³ Note that Dollar and Kraay (2003) also look at the complementary role of institutions and trade on growth and development. They do this by checking whether institutions and trade have statistically significant effects on long-run development in a linear model. They find that it is impossible to separate out these effects using cross-section data due to multicollinearity. However the effect can be shown using panel data leading them to conclude that both are important for development. They do not use an interactive term in their model except in footnote 11 (p. 158) where they report a positive coefficient on the interactive term in OLS regressions. This relationship is not robust to instrumented regressions in their dataset. Furthermore, their model does not provide estimates of institutional threshold.

Acemoglu *et al.* (2005).⁴ They use historical data to show that Western European countries with non-absolutist institutions (where merchants' property rights were relatively well-protected) benefited relatively more from Atlantic trade compared to countries with non-absolutist institutions (where merchants faced relatively high risk of expropriation of their property by the monarch). However, there are significant differences between our work and theirs. First, our results are more general as they are based on data from a large cross-national sample and not just Western Europe. Second, our main focus is on the period 1980–2004 whereas they focus on the period 1500–1850. Third, our focus is on trade in general whereas they look at the effects of Atlantic trade.

Other examples of related theoretical work include Acemoglu and Robinson (2006) and Rogowski (1989). Acemoglu and Robinson (2006) show that trade and institutional change interact through the transfer of skill-biased technology which increases the income share of the middle class. As the middle class enjoys more political power they successfully campaign for property rights protection and low taxes. The resulting higher quality institutions increase the gains from trade and hence boost development. Rogowski (1989) shows that trade affects development and institutions through changes in factor prices and domestic political alignments.

The rest of the article is structured as follows. In Section II, we specify the empirical strategy. In Section III, we introduce the dataset. In Section IV, we present our empirical results. Section V concludes.

II Empirical Strategy

To examine the potential for complementarities between institutions and trade share in economic development, we estimate an equation of the form:

$$\log y_{srt} = \alpha_r + \beta_t + \gamma_1 TR_{srt} + \gamma_2 INS_{srt} + \gamma_3 TR_{srt} * INS_{srt} + \mathbf{X}'_{srt} \Lambda + \varepsilon_{srt} \quad (1)$$

⁴ It is important to note that the treatment of interactive effects in Acemoglu *et al.* (2005) is much more comprehensive than ours. They look at the interactive effects of initial institutions and the volume of Atlantic and Mediterranean trade, Atlantic trade potential, possession of Atlantic coastline and ports etc. Note that their results are not directly comparable to ours as they use executive constraint as a measure of institutions and also a different sample of countries.

where $(\log y_{srt})$ is the natural logarithm of real GDP per capita PPP in country s in region r averaged over years $t - 4$ to t , α_r are regional dummy variables controlling for region-specific time-invariant unobserved heterogeneity,⁵ β_t are year dummy variables controlling for time-varying global shocks, TR_{srt} is the trade share of GDP in country s in region r averaged over years $t - 4$ to t , INS_{srt} is the quality of institutions in country s in region r averaged over years $t - 4$ to t , and $\mathbf{X}_{srt}$ is a vector of other control variables.

One of the major challenges in obtaining unbiased estimates of the above model is the potential for endogeneity or two-way causality. That is, while it is a possibility that better institutions and an open trade regime cause economic development, it is also possible that economic development triggers improvements in institutional quality and trade openness (see Rodrik *et al.*, 2004). If the latter is true, then a regression based on Equation (1) would spuriously attribute a direct effect of trade openness and institutions on income that is really due to income affecting them instead. To tackle this problem we use the instrumental variable method of estimation. An instrumental variable has to satisfy the twin conditions that it is correlated with the suspected endogenous variables (trade share and institutions) but uncorrelated with the error term in the levels regression. Following Acemoglu *et al.* (2001) and Rodrik *et al.* (2004) we use log settler mortality, log population density in 1500, fraction of population speaking English (ENGFRAC), fraction of population speaking other European languages (EURFRAC), Frankel and Romer (1999) constructed openness (CONST), landlocked dummy, and land area. We confirm below through Hausman test and over-identification test that these are appropriate instruments for the task at hand.

The point estimate of the direct impact of trade openness on development is $(\gamma_1 + \gamma_3 INS_{srt})$. We expect the coefficient γ_3 to be positive if there are complementarities between institutions and trade openness. If γ_3 is positive then there are two possible scenarios. First, for a positive estimate of γ_1 the net impact of trade openness on development is always positive given positive values of

⁵ The region dummies cover Europe and Central Asia, East Asia and the Pacific, Latin America, Middle East and North Africa, South Asia, and Sub Saharan Africa. Time invariant factors such as geography, culture are often region specific.

TABLE 1
Summary Statistics

Variable	Number of observations	Mean	Standard deviation (overall)	Standard deviation (between)	Standard deviation (within)	Minimum	Maximum
Log GDP per capita ($\log y_{srt}$)	1684	7.67	1.36	1.06	0.87	4.08	10.87
Trade share (TR_{srt})	1425	74.20	43.73	39.58	19.25	1.53	362.53
Trade policy openness since $t - 4$ (po_{srt})	1406	0.46	0.48	0.33	0.36	0	1
Trade policy openness since 1950 (PO_{srt})	1384	0.31	0.38	0.34	0.18	0	1
Expropriation risk (INS_{srt})	445	6.81	2.30	1.84	1.45	0	10

Note: For a detailed discussion of the definition and source of these variables, see Appendix II.

INS_{srt} . Second, for a negative estimate of γ_1 the net impact of trade openness on development will only be positive when the value of INS_{srt} is above a certain threshold level. In other words, only countries with institutional quality above the threshold level will benefit from trade.

We estimate another model to uncover potential complementarities between trade policy and institutions in economic development. The equation that we estimate is as follows:

$$\log y_{srt} = \alpha_r + \beta_t + \psi_1 po_{srt} + \psi_2 PO_{srt} + \psi_3 INS_{srt} + \psi_4 PO_{srt} * INS_{srt} + \mathbf{X}'_{srt} \Lambda + \xi_{srt} \quad (2)$$

where, po_{srt} is the trade policy openness in country s in region r averaged over years $t - 4$ to t , PO_{srt} is the longer-term trade policy measured by the fraction of open trade policy years in country s in region r since 1950 until year t . We also estimate this equation using the instrumental variable method. The interpretation of the partial effects in this case is similar to Equation (1) discussed above.

III Data

We use panel data. The master dataset consists of over 209 countries and covers the period 1950–2004. However, our preferred models (columns 4 and 12, Table 2) cover 58 countries and the time period 1980–1995. A list of 58 countries is provided in Appendix I and there are maximum four data points (1980, 1985, 1990 and 1995) for each country.

The major variables that we use in this study are: log GDP per capita, trade share, short run trade policy openness, long-run trade policy openness,

and expropriation risk. Table 1 presents summary statistics of the major variables and Appendix II reports definitions of all variables used in the study.⁶

The natural logarithm of GDP per capita PPP (in current international dollars) is used as a proxy measure of economic development. According to our sample, the country with the highest per capita income is Luxembourg in 2004 and the country with the lowest per capita income is China in 1950.

Measuring trade openness is always difficult. We use two measures of openness in our study. First, the trade share of GDP is used to reflect the degree of a country's engagement in trade. This has the obvious advantage of being clearly defined and well-measured. However, it does not tell us anything about why some countries trade more.⁷ In our sample, Hong Kong has the highest trade share and Myanmar has the lowest trade share.

Second, a trade policy measure is used to try and capture a range of policies that explain why some countries trade more than others. Sachs and Warner's (1995) trade policy index which runs from 1950 to 1990, is the most well-known attempt to quantify trade openness along these lines. We use this index through to 1990. Wacziarg and Welch (2003) update the Sachs and Warner (1995) index and extend it to 2000, which we use for the 1990s. The Sachs and Warner index is a dummy variable which classifies a country closed (and

⁶ The entire dataset can be located at <http://rspas.anu.edu.au/~sambit/>.

⁷ See Dollar and Kraay (2003) and Dowrick and Golley (2004) for a more detailed discussion on the advantages and disadvantages of the trade share measure of openness.

hence takes the value 0) if any of the following conditions apply: (i) its average tariff rate on imports of capital or intermediate goods is above 40 per cent; (ii) its non-tariff barriers cover 40 per cent or more of its import of capital and intermediate goods; (iii) its black market premium is 20 per cent or more; (iv) it has a socialist economic system; (v) it has a state monopoly on major exports.

Rodriguez and Rodrik (2000) provide the most well-known critique of Sachs and Warner's openness index. They show that the index suffers from measurement problems and is also correlated with other non-trade-related bad policies which make any econometric estimation of its effect on economic development unreliable. However, several recent studies including one by Rodrik use this index (see Giavazzi and Tabellini, 2005; Hausmann *et al.*, 2005; many others).⁸ We use the Sachs and Warner index because of its wide coverage (both cross-section and time series) and easy availability. We also use average tariff, black market premium, and real exchange rate distortions as proxy measures of trade policy. Our results are not robust to these measures. This is hardly surprising as these measures are only imperfect proxies of trade policy openness (see Dollar & Kraay, 2003; Wacziarg, 2001). They also have a very limited country and time coverage. In comparison, the Sachs and Warner index appears to be superior in capturing trade policy openness (Wacziarg, 2001). Also note that Wacziarg and Welch (2003) accounted for some of the old weaknesses in the index and significantly improved it in the updated version – the version that we use.

Using the Sachs and Warner index we calculate two indicators of trade policy openness indicator. First, is an indicator of short-run policy openness which is constructed by dividing the number of years of trade policy openness between $t - 4$ and t by 5. Second, is an indicator of long-run policy openness which is constructed by dividing the number of years of trade policy openness between 1950 and t by $t - 1950$. The first measure is expected to be endogenous so we use instrumental variables in our estimation. In contrast, we treat the second measure as exogenous as one would expect long-term trade policy going back to the 1950s not to be influenced by the current level of GDP per capita.

⁸ Also see Warner (2003) for a reply to Rodriguez and Rodrik (2000).

Finally, we follow the literature (see Knack & Keefer, 1995; Acemoglu *et al.*, 2001; Acemoglu & Johnson, 2005; Bhattacharyya, 2008b; many others) and use the Political Risk Services index of expropriation risk as our measure of institutional quality (see Appendix II for a brief description). The measure ranges from zero to ten where higher values indicate a lower probability of expropriation of private property by the state. There are other measures of institutions (such as rule of law, repudiation of contracts, executive constraints, corruption, and democracy) used in the literature. Bhattacharyya (2008b) estimates the role of each of these institutions on growth over the period 1980–2004. However, none of these measures are close to Douglass North's notion of good institutions. North (1981) defines good institutions as those that provide checks against expropriation by the government and other politically powerful groups (see North, 1981, pp. 20–27). Expropriation risk is perhaps the closest to North's definition as it captures the notion of an extractive state. Hence we use expropriation risk as our measure of institutions.

IV Evidence

This section systematically tests whether institutions and trade are complements in economic development. We first provide the basic results and then conduct some robustness tests.

(i) Basic Results

Table 2 presents the basic results.⁹ In column (1) we solely look at the partial relationship between contemporaneous trade shares and log GDP per capita. We observe that a one sample standard deviation (43.7 per cent) increase in the trade share of an average country results into a 1.2-fold increase in per capita GDP.¹⁰ This is undoubtedly a large effect and is statistically significant. However, the coefficient estimate of this model is a suspect of omitted variable bias. Trade may be correlated with other factors, and with institutions in particular, which also influence income in

⁹ Note that none of the models reported in Table 2 includes country fixed effects. This aspect is tackled in Table 4.

¹⁰ The partial effect of a one sample standard deviation increase in trade share is $\Delta \log y = \log y_1 - \log y_0 = \log(y_1/y_0) = 0.005 \times 43.7 \approx 0.22$ which can also be expressed as $y_1 = e^{0.22} y_0 \approx 1.2 y_0$ where y_1 and y_0 are final and initial incomes respectively.

TABLE 2
Institutions and Trade: Competitors or Complements in Economic Development

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Log GDP per capita (log y_{srt})											
Trade share (TR_{srt})	0.005*** (0.0005)	0.003*** (0.0008)	0.002 (0.0026)	-0.057** (0.0285)								
Trade policy openness since $t-4$ (po_{srt})					1.27*** (0.1062)	-0.02 (0.0908)	-0.88*** (0.2602)				0.04 (0.1039)	0.68 (0.9398)
Trade Policy Openness since 1950 (PO_{srt})								1.79*** (0.1299)	-0.03 (0.1385)	-1.22*** (0.3740)	-1.27*** (0.3965)	-8.2** (3.608)
Expropriation risk (INS_{srt})		0.22*** (0.0222)	0.78*** (0.1198)	0.43** (0.2171)		0.21*** (0.0214)	0.15*** (0.0266)		0.21*** (0.0202)	0.17*** (0.0228)	0.17*** (0.0245)	0.35* (0.2054)
$TR_{srt} \times INS_{srt}$				0.008** (0.0037)								
$po_{srt} \times INS_{srt}$							0.13*** (0.0374)					
$PO_{srt} \times INS_{srt}$										0.17*** (0.0501)	0.18*** (0.0507)	1.11** (0.5064)
Controls												
Region dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Countries	181	117	58	58	138	106	106	138	106	106	106	58
Observations	1334	393	216	216	1258	374	374	1246	374	374	374	219
Adjusted R^2	0.9928	0.9950			0.9652	0.9955	0.9956	0.9666	0.9955	0.9956	0.9956	
Hausman test			0.000	0.000								0.000
OID test			0.21	0.92								0.31

Notes: ***, ** and * indicates significance level at 1%, 5% and 10%, respectively against a two sided alternative. Figures in the parentheses are the respective standard errors. Columns (3), (4), and (12) reports Instrumental Variable (IV) estimates. The instruments used are log settler mortality, log population density in 1500, fraction of population speaking English (ENGERAC), fraction of population speaking other European languages (EURFRAC), Frankel and Romer (1999) constructed openness (CONST), landlocked dummy, and land area. The sample years are every fifth year from 1950 to 2004. All variables are five year averages except PO_{srt} which shows policy openness since 1950. Regressions involving INS_{srt} cover the period 1980–1995 because of data limitations.

which case our estimate will show an inflated effect of trade. In order to tackle this issue, we add institutions in column (2). We observe that both trade and institutions have positive effects on income and are statistically significant. The effect of trade on income diminishes from the unconditional estimate of column (1). However, there are still issues of reverse causality that this model does not address. In column (3) we estimate the model in column (2) using the instrumental variable (IV) method to tackle this problem. Our use of the IV method in this case is statistically valid on the grounds that institutions and trade share variables fail the Hausman test of exogeneity and the instruments pass the over-identification (OID) test of exogeneity. Note that institutional quality is the only variable that is statistically significant, while the coefficient of trade share is insignificantly different from zero. This confirms previous findings of Rodrik *et al.* (2004) that institutional quality is the dominant explainer of long-run variations in economic development.

The problem with this specification and the specifications adopted by previous studies is that it implicitly assumes institutions and trade are competitors in economic development. In column (4) we attempt to address this issue by introducing an interactive term which is the scalar product of each country's trade share and institutional quality to capture any possible complementarities between the two. This is our preferred model with trade share as the measure of trade.¹¹ We notice that the coefficient estimate of the trade share is negative and the coefficient estimate of the interactive term is positive. Both coefficients are statistically significant. The positive coefficient on the interactive term indicates that institutions and trade are complements in economic development. The negative and positive signs on the coefficient estimates of the trade share and the interactive term respectively are indicative of the fact that the relationship between trade and development is nonlinear. There is a threshold level of institutional quality for an average country beyond which the partial effect of trade on development is positive. For countries with institutions below this threshold, the partial effect of trade on development is in fact negative. Our model predicts that the threshold level of institutional quality is 7.1 that fits well within the

sample range of 1 and 10.¹² The point estimate suggests that a one sample standard deviation increase in trade share in a country with an average institutional quality of 7.2 over the period 1980–1995 will lead to a 1.03-fold increase in per capita GDP. To put this into perspective, the model explains 2.2-fold of the 10-fold per capita GDP difference between India (with a trade share of 21.78 and an institutional quality of 9.9) and the UK (with a trade share of 55.9 and an institutional quality of 10) in 1995.

The model predicts a positive impact of trade on development in the USA, Canada, New Zealand, Australia, Hong Kong, Gambia, Malaysia, India, Brazil, Papua New Guinea, Chile, South Africa, Ivory Coast, and Mexico in a sample of 58 former colonies. Gabon and Indonesia are predicted to have small negative effects and Haiti, Mali, Sudan, and Zaire register large negative effects. Appendix I lists predicted values for all 58 countries (see column TRhat).

In columns (5)–(12) we explore the relationship between trade policy openness and economic development. Point estimates reported in columns (5)–(7) are unreliable due to endogeneity. To tackle the endogeneity problems associated with the trade policy measure, we adopt two strategies. First, we use a long-run trade policy measure (fraction of openness years since 1950) instead of a contemporaneous trade policy measure (fraction of openness years since $t-4$). We assume the long-run trade policy measure to be exogenous. Second, we estimate our model using the instrumental variable method. In column (8) we look at the unconditional correlation between long-run trade policy openness and economic development. The point estimate is positive and statistically significant. In column (9) we add institutions into the specification and we observe that the long-run trade policy openness variable is no longer statistically significant. In column (10) we note that the coefficient

¹² The partial effect of trade on development is given by $-0.057 + 0.008INS_T$, where INS_T is the threshold level of institutional quality. The threshold is calculated by equating the partial effect to zero and solving for INS_T . We perform an F -test to check the statistical significance of the threshold estimate and we fail to reject the null (P -value = 0.55) of $H_0 : -(\gamma_1/\gamma_3) = 7.1$ against a two sided alternative. We also reject the $H_0 : \gamma_1 + \gamma_3 = 0$ (P -value = 0.048). The coefficient estimate is -0.05 (standard error: 0.0248) suggesting that an average country in the sample is not benefiting from trade.

¹¹ We also estimate our preferred model using log trade share and the results are qualitatively similar.

estimate of the interactive term is positive and statistically significant. In column (11) we add the contemporaneous trade policy openness variable. The model suggests that the long-run trade policy openness matters and the contemporaneous trade policy openness variable is no longer significant. This model may suffer from endogeneity. This is also revealed by the Hausman test of exogeneity of explanatory variables reported in column (12). The test rejects the null of exogeneity of the explanatory variables. Therefore, we estimate the model using the instrumental variable method in column (12). The estimates predict that the threshold level of institutional quality required for a positive partial effect of long-run trade policy openness on per capita GDP is 7.4.¹³ A one standard deviation increase in long-run trade policy openness in a country with institutional quality 7.5 will result in a 1.1-fold increase in its per capita income. In this case the model predicts a 2.8-fold difference in per capita income between India (open trade regime for 2 out of 45 years) and the UK (always open) in 1995 which is also less than the actual difference of 10-fold. South Africa, Ivory Coast, and Mexico are omissions from the list of countries with a positive partial effect when we use the long-run trade policy measure of openness. Appendix I reports predicted values for all 58 countries (see column POhat).

In Table 3 we report the first stage regressions of the IV estimates reported in columns (4) and (12) of Table 2. The instruments that we use for the IV estimation are valid as they are correlated with the suspected endogenous variables and also exogenous to the model. We perform an over-identification test to check the exogeneity of the instruments. The test *P-values* are reported in columns (4) and (12) of Table 2. The high *P-values* indicate that we fail to reject the null of exogeneity of the instruments. Countries with higher constructed openness (CONST) are likely to trade more (see column 1, Table 3 and also Frankel & Romer, 1999 for detailed explanation). Furthermore, countries with higher density of population generally trade less externally as there is a larger market for internal trade (note negative coefficient on LPOPDEN). A

similar explanation may apply for area. The negative partial correlation between EURFRAC and trade share may be driven by low trade share in Argentina, the USA, and Uruguay. In column (2) we report the first stage of the institutional quality variable. Countries with high European settler mortality in the past inherited extractive institutions from their colonizers and hence the negative relationship between log settler mortality and institutional quality (see Acemoglu *et al.*, 2001). Furthermore, countries with a high proportion of population speaking a Western European language (high EURFRAC) are observed to have strong institutions (see Hall & Jones, 1999). The major partial correlations reported in columns (3)–(5) can also be explained using the abovementioned arguments.

In Table 4 we explore in greater detail where the complementarities between trade and institutions are coming from by looking at the source of identification of the complementarities. If most of the identification is due to cross-sectional differences between countries that are permanent in nature then we will not find anything in fixed effect regressions. However, it could also be because of some common omitted factors such as culture or geography driving both the complementarities effect and per capita income. We try to explore this by introducing country fixed effects into our preferred models. Column (1) of Table 4 reports a regression involving the trade share when country fixed effects are introduced. We observe that the interactive term $TR_{srt} \times INS_{srt}$ is no longer statistically significant which may indicate that permanent cross-country differences are driving the complementarities effect and within country differences over time do not seem to matter that much. Geography can be a possible source of identification. In column (2) we test this by replacing country fixed effects with latitude. We notice that the coefficient on latitude is positive and statistically significant and the interactive term is no longer significant. This is perhaps indicative of the fact that geography is driving both the differences in living standards and complementarities between 'trade and institutions' over the very long run. This is consistent with previous findings in the literature that geography and disease environment shape the long-run evolution of institutions and trade (see Gallup *et al.*, 1998; Acemoglu *et al.*, 2001; Rodrik *et al.*, 2004; Bhattacharyya, 2009). Column (3) checks the impact of country fixed effects on the complementarities between contemporaneous trade policy openness and institutions. We find that this effect survives

¹³ We perform an *F*-test to check the statistical significance of the threshold estimate and we fail to reject the null (*P*-value = 0.97) of $H_0: -(\psi_2/\psi_4) = 7.4$ against a two sided alternative. We also reject the $H_0: \psi_2 + \psi_4 = 0$ (*P*-value = 0.023). The coefficient estimate is -7.1 (standard error: 3.114) suggesting that an average country in the sample is not benefiting from trade policy openness.

TABLE 3
Determinants of Institutions and Trade: First Stage for the Core Specifications

Dependent variables	(1) Trade share (TR_{srt})	(2) Expropriation risk (INS_{srt})	(3) $TR_{srt} \times INS_{srt}$	(4) Trade policy openness since $t - 4$ (PO_{srt})	(5) $PO_{srt} \times INS_{srt}$
Constructed openness (CONST)	2.05*** (0.2382)	0.015 (0.0115)	16.1*** (1.973)	0.0002 (0.0012)	0.01** (0.0044)
Landlocked dummy	-7.67 (6.989)	-0.53 (0.3379)	-74.6 (57.88)	0.05 (0.0326)	-0.25* (0.1393)
Log settler mortality (LSM)	-1.04 (2.555)	-0.21* (0.1235)	-29.9 (21.16)	0.008 (0.0155)	-0.03 (0.0539)
Log population density in 1500 (LPOPDEN)	-6.66*** (2.052)	-0.13 (0.0992)	-66.4*** (16.99)	-0.02* (0.0106)	-0.15*** (0.0414)
ENGFRAC	4.48 (9.948)	0.37 (0.4809)	11.5 (82.38)	-0.01 (0.0611)	0.12 (0.1966)
EURFRAC	-23.2** (11.07)	0.98* (0.5354)	-163.7* (91.70)	0.10 (0.0632)	0.02 (0.2204)
AREA	-0.004*** (0.0016)	0.0001 (0.0001)	-0.03** (0.0131)	0.000005 (0.000009)	0.00002 (0.00003)
Trade policy openness since 1950 (PO_{srt})				0.88*** (0.0389)	6.92*** (0.1710)
Controls:					
Region dummies	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES
Countries	59	59	59	66	60
Observations	219	219	219	705	226
Adjusted R^2	0.5365	0.6100	0.5820	0.6742	0.9535

Notes: ***, **, * and * indicates significance level at 1%, 5%, and 10% respectively against a two sided alternative. Figures in the parentheses are the respective standard errors. The variables used as instruments are correlated with the suspected endogenous variables which make them valid instruments.

TABLE 4
How Much Does Within-country Variation Matter?

Dependent variable	(1)	(2)	(3)	(4)	(5)
	Log GDP per capita ($\log y_{srt}$)				
Trade share (TR_{srt})	0.002 (0.0013)	0.0004 (0.0129)			
Trade policy openness since $t - 4$ (po_{srt})			-0.42*** (0.1116)	-0.16*** (0.0481)	-0.41 (0.6185)
Trade Policy openness since 1950 (PO_{srt})				0.83*** (0.2843)	-7.6** (3.423)
Expropriation risk (INS_{srt})	-0.009 (0.0122)	0.42*** (0.0971)	0.01 (0.0136)	0.016 (0.0129)	0.34*** (0.1187)
$TR_{srt} \times INS_{srt}$	-0.00003 (0.0001)	0.0003 (0.0018)			
$po_{srt} \times INS_{srt}$			0.05*** (0.0159)		
$PO_{srt} \times INS_{srt}$				0.05** (0.0230)	1.13** (0.4760)
Latitude		2.31*** (0.4664)			2.12*** (0.6060)
Controls					
Country dummies	YES	NO	YES	YES	NO
Region dummies	NO	YES	NO	NO	YES
Year dummies	YES	YES	YES	YES	YES
Countries	117	28	106	106	29
Observations	393	108	374	374	112
Adjusted R^2	0.9997		0.9995	0.9995	

Notes: ***, ** and * indicates significance level at 1%, 5% and 10% respectively against a two sided alternative. Figures in the parentheses are the respective standard errors. Columns (2) and (5) reports Instrumental Variable (IV) estimates. The instruments used are log settler mortality, log population density in 1500, fraction of population speaking English (ENGFRAC), fraction of population speaking other European languages (EURFRAC), Frankel and Romer (1999) constructed openness (CONST), landlocked dummy, and land area.

even in the presence of country fixed effects since the coefficient on $po_{srt} \times INS_{srt}$ is positive and statistically significant. This holds even when we add long-run trade policy openness. In column (4) we see that the coefficient on $PO_{srt} \times INS_{srt}$ is positive and statistically significant. In column (5) we check how much of this effect is due to permanent cross-country differences such as geography or culture and how much is due to within country differences. We do this by replacing country fixed effects with latitude. We observe that the complementarities effect survives which indicates that some part of this effect is coming from the within country variation.

The fundamental difference in the results between the trade share openness model and the trade policy openness models with the inclusion of country fixed effects and latitude could be because of the difference in the construction of

these two measures. Trade shares perhaps reflect a part of openness which is deeper and largely time invariant¹⁴ whereas trade policy is more influenced by short-term changes in the policy environment. However, we concede that in the absence of truly exogenous variation, our analysis does not fully resolve all the identification issues.

(ii) Robustness

We check the robustness of our basic results by using additional control variables (schooling, investment, foreign aid, ethnic fractionalization, black market premium, and mining share of GDP) that are reported by previous studies to be correlated with development. We also check the robustness

¹⁴ See Frankel and Romer (1999) for a discussion on this who claims that an increase in trade volume reflects a reduction in natural or geographical barriers to trade.

of our basic results across different continental sub-samples. Our results are reasonably robust with both the trade share and the long-run trade policy as measures of openness. Results are not reported but are available upon request.

V Conclusion

Our results suggest that there is a reasonably robust correlation between trade openness and economic development when the complementarities between institutions and trade are taken into account. This is done by introducing an interactive variable which is the scalar product of institutional quality and trade into the model. The coefficient on the interactive variable is positive and statistically significant which is indicative of the complementary effects of trade and institutions on development. However, questions regarding identification remain due to the absence of truly exogenous variation in macro trade data. The co-movement in trade institutions and development may be due to other factors (such as culture, geography or both) which are driving all three of them. Still, the fact that the results are robust to the inclusion of schooling, investment, foreign aid, ethnic fractionalization, black market premium, and share of mining to GDP is encouraging enough for an interpretation of this effect as the combined impact of trade and institutions on economic development.

We also observe that for the partial effect of trade on development to be positive, a country's institutional quality has to be above a threshold level. This is indicative of the fact that relaxing trade barriers or increasing trade share alone may not be beneficial for a developing country if sufficient resources are not simultaneously directed towards improving institutions. Strong institutions improve private investors' confidence which is crucial for economic development.

The results contribute to a growing body of literature regarding the inter-relationship between trade, institutions, and economic development. Regardless of the ongoing debates surrounding the empirical findings in this literature, the key challenge is to move beyond broad cross-country comparisons to detailed workings of institutions and trade policy within each country in order to understand more fully how they interact and impact on economic development.

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Appendix I

ISO code	Country	INS	TRhat	POhat
USA	United States	10	0.023	2.9
CAN	Canada	9.7	0.0206	2.567
NZL	New Zealand	9.7	0.0206	2.567
AUS	Australia	9.4	0.0182	2.234
HKG	Hong Kong	8.6	0.0118	1.346
GMB	Gambia	8.3	0.0094	1.013
MYS	Malaysia	8.3	0.0094	1.013
IND	India	7.9	0.0062	0.569
BRA	Brazil	7.8	0.0054	0.458
PNG	PNG	7.7	0.0046	0.347
CHL	Chile	7.6	0.0038	0.236

Appendix I (Continued)

ISO code	Country	INS	TRhat	POhat
ZAF	South Africa	7.3	0.0014	-0.097
CIV	Cote d'Ivoire	7.2	0.0006	-0.208
MEX	Mexico	7.2	0.0006	-0.208
GAB	Gabon	7.1	-0.0002	-0.319
IDN	Indonesia	7.1	-0.0002	-0.319
COL	Colombia	7	-0.001	-0.43
TTO	Trinidad and Tobago	7	-0.001	-0.43
VEN	Venezuela	6.9	-0.0018	-0.541
ECU	Ecuador	6.8	-0.0026	-0.652
PRY	Paraguay	6.8	-0.0026	-0.652
TZA	Tanzania	6.8	-0.0026	-0.652
CRI	Costa Rica	6.7	-0.0034	-0.763
JAM	Jamaica	6.7	-0.0034	-0.763
GIN	Guinea	6.6	-0.0042	-0.874
URY	Uruguay	6.6	-0.0042	-0.874
DZA	Algeria	6.5	-0.005	-0.985
CMR	Cameroon	6.3	-0.0066	-1.207
EGY	Egypt	6.3	-0.0066	-1.207
LKA	Sri Lanka	6.3	-0.0066	-1.207
KEN	Kenya	6.2	-0.0074	-1.318
DOM	Dominican Rep.	6.1	-0.0082	-1.429
TUN	Tunisia	6.1	-0.0082	-1.429
PER	Peru	6	-0.009	-1.54
TGO	Togo	6	-0.009	-1.54
MAR	Morocco	5.9	-0.0098	-1.651
SLE	Sierra Leone	5.9	-0.0098	-1.651
GHA	Ghana	5.8	-0.0106	-1.762
PAN	Panama	5.8	-0.0106	-1.762
SEN	Senegal	5.8	-0.0106	-1.762
ARG	Argentina	5.7	-0.0114	-1.873
PAK	Pakistan	5.6	-0.0122	-1.984
NER	Niger	5.5	-0.013	-2.095
NGA	Nigeria	5.2	-0.0154	-2.428
BOL	Bolivia	5.1	-0.0162	-2.539
HND	Honduras	5.1	-0.0162	-2.539
BGD	Bangladesh	5	-0.017	-2.65
COG	Congo, Rep.	5	-0.017	-2.65
NIC	Nicaragua	5	-0.017	-2.65
SLV	El Salvador	4.9	-0.0178	-2.761
GTM	Guatemala	4.8	-0.0186	-2.872
BFA	Burkina Faso	4.7	-0.0194	-2.983
MDG	Madagascar	4.6	-0.0202	-3.094
UGA	Uganda	4.6	-0.0202	-3.094
HTI	Haiti	4.1	-0.0242	-3.649
MLI	Mali	4	-0.025	-3.76
SDN	Sudan	3.9	-0.0258	-3.871
ZAR	Congo, Dem. Rep.	3.6	-0.0282	-4.204

Notes: TRhat_s is the partial effect $(-0.057 + 0.008 \times \overline{INS}_s)$ of a percentage point increase in trade share in country *s* where $\overline{INS}_s$ is the average expropriation risk over the period 1980–1995. Similarly, POhat_s is the partial effect $(-8.2 + 1.11 \times \overline{INS}_s)$ of a percentage point increase in PO in country *s*.

Appendix II

Dependent and Explanatory Variables:

Log GDP per capita ($\log y_{srt}$): Natural log of GDP per capita PPP (current international dollars), CGDP. Penn World Table, PWT 6.1.

Trade Share (TR_{srt}): (exports + imports)/GDP. WDI Online, The World Bank Group.

Trade Policy Openness since $t - 4$ (po_{srt}): Fraction of years open between t and $t - 4$.

Trade Policy Openness since 1950 (PO_{srt}): Fraction of years open between t and t -1950.

Expropriation Risk (INS_{srt}): risk of 'outright confiscation and forced nationalization' of property. It covers the period 1982–1997. Average of 1982–1983 is used as a proxy for 1980, average of 1984–1987 as a proxy for 1985, average of 1988–1992 as a proxy

for 1990, and average of 1993–1997 as a proxy for 1995, ICRG.

Instruments:

Constructed Openness (CONST): Frankel and Romer (1999).

Landlocked Dummy: Sachs and Warner (1995).

Log Settler Mortality (LSM): Acemoglu *et al.* (2001).

Log Population Density in 1500 (LPOPDEN): Acemoglu *et al.* (2002).

ENGFRAC: fraction of the population speaking English, Hall and Jones (1999).

EURFRAC: fraction of the population speaking western European languages (English, French, German, Portuguese, Spanish), Hall and Jones (1999).

AREA: CID Harvard Geography datasets.