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INSTITUTIONS AND TRADE: COMPETITORS OR COMPLEMENTS IN ECONOMIC DEVELOPMENT?*

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Abstract

In this paper we contribute 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 threshold level. These results are suggestive of a very important complementary role of both trade openness and institutions in economic development.

JEL Classification: F1; O1

Keywords: Trade; Institutions; Economic Development

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I. Introduction

The relationship between trade and development has been a topic of research for a few 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' show 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 the average perform better than countries with closed trade regime. Ben-David (1993), on the other hand show that trade liberalization leads to less dispersion in income across countries and hence convergence. More recently, Lee *et al.* (2004) find positive effect of openness on growth while properly controlling for the effect of growth on openness.

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 the increase in trade volume is a result of a reduction in natural or geographical barriers to trade and not trade policy. They use the geographical components of trade volumes as an instrument to identify the effects of trade on income.

In the policy arena, the World Bank emphasizes the advantages of trade openness especially for the 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 countries have increased their *per capita* growth rate from 1 percent in the 1960s to 3 percent in the 1970s, 4 percent in the 1980s, and 5 percent 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 (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. In an empirical study using data since 1870 Vamvakidis (2002) finds no support for a positive growth-openness connection before 1970.

In a recent paper, Rodrik *et al.* (2004) also challenge the Frankel and Romer (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.[1] Rigobon and Rodrik (2005) analyze the interrelationship between rule of law, democracy, openness and income. They find that openness negatively impacts income level.

This conclusion however is challenged by Dollar and Kraay (2003). They argue that cross-country regressions of the log-level of *per capita* GDP on instrumented measures of trade and institutional quality is uninformative about the relative importance of trade and institutions in the long-run because of 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

[1]Their results build on the findings of the highly influential work by Acemolgu *et al.* (2001) which shows a strong impact of institutions on long-run economic development without claiming dominance.

we take a fresh look at the empirical relationship between trade and development in a model which also accounts for the effect 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 look at the complementarities between these two variables. We do this by introducing an interactive variable in the model which is a product of the institutional quality measure and trade. 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 has to be above the threshold level. This is indicative of the fact that relaxing trade barriers or increasing trade share alone may not be beneficial for a country with weak institutions. In order to exploit the variation across time we estimate our model using panel data. Also, to tackle endogeneity problems we use instrumental variables to identify the complementary effects of trade and institutions on economic development.

Using a similar framework, we also test the relationship between trade policy openness and economic development. We find that long-run policy openness matters more than short-run policy openness and countries with better institutions benefit more from trade policy openness than countries with weak institutions.

We contribute to the literature by showing that trade and institutions are complements in economic development. Trade induces economic development and institutional change by strengthening commercial interest (see Acemoglu *et al.*, 2005). This is over and above the direct effect of institutions on development.[2] In this sense, our results are closest to the findings of

[2] Examples of theoretical models along this line are Acemoglu and Robinson (2006) and Rogowski (1989). Acemoglu and Robinson (2006) show that trade induces institutional change and economic development through the

Acemoglu *et al.* (2005)[3] who using historical data show that Western European countries with non-absolutist institutions (where merchants' property rights were relatively better 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 to 2004 whereas they focus on the period 1500 to 1850. Third, our focus is on trade in general whereas they look at the effect of Atlantic trade.

The rest of the paper 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 the study.

II. Empirical Strategy

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

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

where $\log y_{srt}$ is a measure of current level of economic development in country s in region r averaged over years $t-4$ to t typically measured by the natural logarithm of real GDP *per capita* PPP, α_r are regional dummy variables controlling for region specific time invariant unobserved

transfer of skill-biased technology which increases the income share of the middle class. Rogowski (1989) show that trade affects development and institutions through changes in factor prices and domestic political alignments.

[3] In a related paper using cross-section data for the 1990s (averaged) Neeman *et al.* (2006) show that corruption is negatively correlated with GNP *per capita* in a sample of open economies. In a sample of closed economies however there is no relationship.

heterogeneity[4], β_t are year dummy variables controlling for time varying global shocks, TR_{srt} is 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 endogeneity or two way causality. It is a possibility that better institutions and an open trade regime cause economic development. It is also possible that economic development triggers improvement in institutional quality and trade openness (see Rodrik *et al.*, 2004). If the latter is true, then we would spuriously attribute a direct effect of trade openness and institutions on income that is really due to income influencing them. To tackle this problem we use instrumental variable method of estimation following Acemoglu *et al.* (2001) and Rodrik *et al.* (2004). 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.

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 can be two possible scenarios. First, for a positive

[4] 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.

estimate of γ_1 the net impact of trade openness on development is always positive given positive values of 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 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:

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

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 and 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 are used as instruments.

The point estimate of the direct impact of long-run trade policy openness on development is $(\psi_2 + \psi_4 INS_{srt})$. We also expect the coefficient ψ_4 to be positive if there are complementarities between institutions and long-run trade policy openness. Similar to equation (1), if ψ_4 is positive then there can be two possible scenarios. First, for a positive estimate of ψ_2 the net impact of long-run trade policy openness is always positive given positive values of INS_{srt}. Second, for a negative estimate of ψ_2 the net impact of long-run trade policy openness will only be positive when the value of INS_{srt} is above certain threshold level. In other words, only countries with institutional quality above the threshold level will benefit from long-run trade policy openness.

III. Data

We use panel data. The master dataset consists of over 209 countries and covers the period 1950 to 2004. However, our preferred models (columns 4 & 12, Table 2) cover 59 countries and the time period 1980 to 1995. A list of 59 countries is provided in Appendix A 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 B reports definitions of all variables used in the study.

Natural logarithm of GDP *per capita* PPP (in constant 2000 international dollars) is used as a proxy measure of economic development. The overall standard deviation in the data is approximately 1.53. Looking at the between and within standard deviations, we see that the most of the variation is cross-sectional (1.45 between standard deviation) as opposed to time series (0.34 within standard deviation). The data comes from 185 countries and in most of the cases it covers 8 time periods. According to our sample, the country with the highest *per capita* income is Kuwait and the country with the lowest *per capita* income is Liberia.

Measuring trade openness is always difficult. We use two measures of openness in our study.

First, is the trade share of GDP which shows the degree of a countries engagement in trade. This obviously has the advantage of being clearly defined and well measured. However, this does not tell us anything about why some countries trade more.[5] The data on trade share spans 186 countries and approximately 8 time periods (1960 – 2000). The standard deviation in the data is

[5]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.

43.7 and most of the variation is cross-sectional (39.6 between standard deviation). In our sample, Hong Kong has the highest trade share and Myanmar has the lowest trade share.

Second, the trade policy measure which attempts to address the issue of why some countries trade more. Sachs and Warner (1995) is the most well known attempt to quantify trade openness along these lines. We use the Sachs and Warner (1995) trade policy index for our study. This index runs from 1950 to 1990. Wacziarg and Welch (2003) update the Sachs and Warner (1995) index and extend it to 2000. We also use the Wacziarg and Welch (2003) figures for the 1990s. The Sachs and Warner index is a dummy variable which classifies a country closed (and 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 percent; (ii) its non tariff barriers cover 40 percent or more of its import of capital and intermediate goods; (iii) its black market premium is 20 percent or more; (iv) it has a socialist economic system; (v) it has a state monopoly on major exports.

The well known critique of Sachs and Warner openness index and their findings is Rodriguez and Rodrik (2000). They show that the index suffers from measurement problems and is also correlated with other non trade related bad policies which makes 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; Persson, 2005; and many others).[6]

Using the Sachs and Warner index we calculate two types 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

[6] Also see Warner (2003) for a reply to Rodriguez and Rodrik (2000).

instrumental variables in our estimation to tackle the endogeneity problem. 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.*

The within variation (0.36 within standard deviation) in the short-run measure of trade policy is greater than the between variation (0.33 between standard deviation) whereas the within variation (0.18 within standard deviation) in the long-run measure of trade policy is less than the between variation (0.34 between standard deviation). Algeria, Central Africa Republic, Angola are among the countries that are closed in the long-run whereas Barbados, Cape Verde island, Cyprus, Iceland are among the countries that are open in the long-run.

Finally, we follow the literature (see Knack and Keefer, 1995; Acemoglu *et al.*, 2001; Acemoglu and Johnson, 2005; and many others) and use the Political Risk Services index of expropriation risk as our measure of institutional quality (see Appendix B 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 (rule of law index, repudiation of contracts, executive constraints, corruption, democracy etc.) used in the literature. However, none of these measures except rule of law have statistically robust effects on economic development (see Bhattacharyya, 2008). The problem with the rule of law index however is that it is not available in a panel. Hence we use expropriation risk which is the most robust statistically. Furthermore, expropriation risk is also the closest to North's (1981) definition of good institutions[7] as it captures the notion of extractive state. The between variation (1.84 between standard deviation) in this variable is higher than the within variation (1.45 within standard deviation). In our sample Japan, Luxembourg, United Kingdom, the Netherlands are among the

[7] North (1981) defines good institutions as those that provide checks against expropriation by the government and other politically powerful groups. (see pp. 20-27)

countries with the best set of institutions whereas Niger, Nigeria, Panama are among the countries with the weakest 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.

A. Basic Results

Table 2 presents the basic results. In column (1) we solely look at the partial relationship between contemporaneous trade shares and log GDP *per capita*. We observe that one sample standard deviation (43.7 percent) increase in trade share in an average country results into a 1.5 fold increase in *per capita* GDP. 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 can be correlated with other factors especially institutions which influence income and in that case our estimate is showing 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 they are statistically significant. The effect of trade on income diminishes from the unconditional estimate of column (1). One sample standard deviation increase in trade share by an average country now results into 1.2 fold increase in *per capita* GDP. However, there are issues of reverse causality that this model does not address. If income affects trade rather than trade affecting income, then this estimate is erroneously attributing the effect of high income on trade to the effect of trade on income. 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 overidentification (OID) test of exogeneity. We notice that institutional quality is the only variable that is statistically significant and the coefficient of trade share is insignificantly

different from zero. This confirm previous findings of Rodrik *et al.* (2004) and Acemoglu *et al.* (2001) that institutional quality is the dominant explanator of long-run variations in economic development. However, our coefficient estimate is different from the prediction of the Rodrik *et al.* (2004) model. Our model predicts a 17 fold increase in *per capita* GDP in an average country if institutional quality is improved by one sample standard deviation. In contrast Rodrik *et al.* (2004) model predicts a 5.5 fold increase in *per capita* GDP. The difference in prediction perhaps stems from the following three facts. First, we utilize the time series variation in the data as opposed to Rodrik *et al.* (2004)'s cross-section approach. Second, we use trade share as an explanatory variable as opposed to Rodrik *et al.* (2004)'s log trade share. Third, we use expropriation risk as our proxy for institutions as opposed to Rodrik *et al.* (2004)'s rule of law index.

The problem with this specification and the specifications adopted by the previous studies is that it implicitly assumes institutions and trade are competitors in economic development. In column (4) we make an attempt to address this issue by introducing an interactive term which is a scalar product of trade shares and institutions to capture any possible complementarities between the two. This is our preferred model with trade share measure of trade. We notice that the coefficient estimate of 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 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 7.7 which sit well within the sample range of 1 and 10.[8] The point estimate suggests that one sample standard deviation increase in trade share in a country with an average institutional quality 7.8 over the period 1980 to 1995[9] will lead to a 1 fold increase in *per capita* GDP. To put this into perspective, the model explains 2 fold of the 57 fold *per capita* GDP difference between India (trade share 21.78 and institutional quality 9.9) and the U.K (trade share 55.9 and institutional quality 10) in 1995.

We also plot the partial effect of trade on development against institutions (see Figure 1). The model predicts positive effects of trade on development in the United States, Canada, New Zealand, Australia, Hong Kong, Gambia, Malaysia, India, Brazil, and Papua New Guinea in a sample of 59 former colonies. Chile and South Africa are predicted to have small negative effects and Mali, Sudan, and Zaire register large negative effects. Appendix A lists predicted values for all 59 countries (see column TRhat).

In columns (5) to (12) we explore the relationship between trade policy openness and economic development. In column (5) we look at the unconditional correlation between short-run or contemporaneous trade policy openness and log GDP *per capita*. The point estimate is positive and statistically significant. The model predicts that one standard deviation increase in contemporaneous trade policy openness in an average country will lead to a 1.2 fold increase in *per capita* GDP. However, this model like column (1) also suffers from omitted variable problems. To tackle this issue we add institutions in column (6). We notice a pattern similar to the coefficient estimates reported in column (3). Institutional quality is the only statistically significant variable and the coefficient on the contemporaneous trade policy variable is statistically insignificant. In column (7)

[8] The partial effect of trade on development is given by $-0.077 + 0.01 INS^T$, 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.

[9] Due to data limitations this regression only covers 1980 to 1995.

we add an interactive term which is the scalar product of the contemporaneous trade policy variable and institutional quality. We observe that the point estimate of the coefficient of the interactive term is positive and statistically significant. This indicates that there is complementarity between trade and institutions even when trade is measured by a contemporaneous trade policy variable. The negative coefficient on trade policy and a positive coefficient on interactive term suggest that there is a threshold level of institutional quality beyond which the partial effect of trade policy on economic development is positive.[10] For countries lying below the institutional quality threshold, the partial effect is negative. The threshold level of institutions required to make contemporaneous trade policy work is 6.5 which is also within the sample range of 1 and 10. However, this model suffers from endogeneity. It is highly likely that current level of development affecting contemporaneous or short-run trade policy rather than causality running in the opposite direction. In that case the point estimates of this model are unreliable.

To tackle the endogeneity problems associated with a 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. We discuss them as follows.

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. The size of the estimate is also comparable with the size that we worked out in column (5). A one sample standard deviation increase in long-run trade policy openness in an average economy will lead to a 1.2 fold increase in the *per capita* GDP. In column (9) we add institutions into the specification and we observe that the long-run trade policy openness variable is no longer

[10]The partial effect of contemporaneous trade policy on development is given by $-1.63+0.25INS^{T}$.

statistically significant. The only statistically significant variable is institutional quality. To check for complementarities between long-run trade policy openness and institutional quality, in column (10) we add an interactive term which is defined as a scalar product of these two variables. We observe that the coefficient estimate of the interactive term is positive and statistically significant. This is indicative of the fact that long-run trade policy openness and institutions are complements in economic development. The threshold level of institutional quality required for the partial effect of long-run trade policy openness on economic development to be positive is 6.4.[11] In column (11) we add the contemporaneous trade policy openness variable. The model suggests that the long-run trade policy openness matter and the contemporaneous trade policy openness variable is no longer significant. The threshold level of institutional quality in this case is 6.3. This model with institutions and contemporaneous trade policy as explanatory variables suffers from problems of 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. To tackle this problem, we estimate the model using the instrumental variable method which is reported in column (12). This is our preferred model with the long-run trade policy openness measure of trade. The estimates suggest that the threshold level of institutional quality required for a positive partial effect of long-run trade policy openness on *per capita* GDP is 7.3. According to the point estimates on the long-run trade policy variable and the interactive term, one standard deviation increase in long-run trade policy openness in a country with institutional quality 7.4 will result in a 1.1 fold increase in its *per capita* income. In this case the model predicts a 69 fold difference in *per capita* income between India (open trade regime for 2 out of 45 years) and the U.K. (always open) in 1995 which is greater than the actual difference of 57 fold. The partial effect plot (see Figure 2)

[11]The partial effect of long-run trade policy openness on development is given by $-1.85+0.29INS^T$. The threshold is calculated by equating this to zero.

reveals that Chile and South Africa are additions to the list of countries with a positive partial effect when we use the long-run trade policy measure of openness. Appendix A reports predicted values for all 59 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 overidentification test to check the exogeneity of the instruments. The test *p-values* are reported in columns (4) and (12) of Table 2. They confirm that the instruments are exogenous. The high *p-values* indicate that we fail to reject the null of exogeneity of the instruments. In column (1) of Table 3 we notice that the partial relationship between trade share and 'Frankel and Romer (1999) constructed openness instrument' is positive. We also notice that the relationship between trade share and population density in 1500, EURFRAC, and area are negative. A reasonable explanation for the negative coefficient on population density in 1500 is perhaps the fact that countries with higher density of population in general trades less externally as there is a larger market for internal trade. If population density is persistent over time then this effect is also likely to persist over time. A similar explanation might work for area as well. Countries with larger area are likely to trade less than countries with smaller area because of the greater opportunity to trade internally in the former. The negative effect of EURFRAC is perhaps because of the low trade share in many of the Francophone African economies as well as the English and Spanish speaking United States. In column (2) we report the first stage of the institutional quality variable. Institutional quality is negatively related to the log settler mortality instrument and positively related to EURFRAC which confirms previous findings of Acemoglu *et al.* (2001) and Rodrik *et al.* (2004). Column (3) reports the first stage relationship between the interactive term $TR_{srt} * INS_{srt}$ and the instruments. Constructed openness registers a positive and statistically significant relationship and population

density in 1500, EURFRAC, and area registers a negative and statistically significant relationship with the interactive term. Column (4) reports the first stage relationship between contemporaneous trade policy openness and the instruments. We observe that long-run trade policy openness is positively related to contemporaneous trade policy openness. This is indicative of the persistence in the trade policy data. Population density in 1500 is also negatively related to contemporaneous trade policy openness and the coefficient is statistically significant. Finally, column (5) reports the first stage regression of the interactive term $PO_{srt} * INS_{srt}$. Both the landlocked dummy and the population density in 1500 instrument register statistically significant negative effect on the interactive term $PO_{srt} * INS_{srt}$. Long-run trade policy openness also registers a positive and statistically significant effect on $PO_{srt} * INS_{srt}$ in this model.

In Table 4 we explore in greater detail where the complementarities between trade and institutions are coming from. In other words, we look 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 the fixed effect regressions. However, it could also be because of some common omitted factors such as culture or geography driving both complementarities effect and *per capita* income. We try to explore this by introducing country fixed effects into our preferred models reported in columns (4), (7), (10), and (12) of Table 2. Column (1) of Table 4 reports a regression involving trade share when country fixed effects are introduced. We observe that the interactive term $TR_{srt} * INS_{srt}$ is no longer statistically significant which is perhaps indicative of the fact that the permanent cross-country differences are driving the complementarities effect and within country differences over time does 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'. 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). 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 even in the presence of country fixed effects since the coefficient on $po_{srt} * INS_{srt}$ 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 $PO_{srt} * INS_{srt}$ is positive and statistically significant. In column (5) we check how much of this effect is due to permanent cross-country difference such as geography or culture and how much is due to within country difference. We do this by replacing country fixed effects with latitude. We observe that the complementarities effect survives which indicates some part of this effect is coming from the within country variation.

The fundamental difference in 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 share perhaps reflects a part of openness which is deeper and largely time invariant[12] whereas trade policy does get influenced by short-term changes in the policy environment. However, we do admit that in the absence of truly exogenous variation, our analysis does not resolve the identification issues.

B. Robustness

[12]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.

In Tables 5 and 6 we report the robustness tests on our two preferred models (columns (4) and (12) of Table 2). In Table 5 we focus on the robustness of the partial effect of trade share on economic development by adding additional control variables which are often reported by previous studies to be correlated with development. In column (1) we introduce schooling as an additional control variable. The complementarities between trade share and institutions survive as we have a positive and statistically significant coefficient estimate on the interactive term $TR_{srt} * INS_{srt}$. The threshold level of institutional quality required for trade to work in this case is 4. This is well within the sample range but certainly on the lower side when compared to our preferred estimate of 7.7. In column (2) we add investment and find that the complementarities effect survives. The institutional quality threshold in this case is 8 which is close to our preferred estimate. In columns (3), (4), (5), and (6) we add foreign aid, ethnic fractionalization, black market premium, and share of mining to GDP as additional controls respectively. We observe that the complementarities effect holds in all the cases. The institutional quality thresholds in these models are 7.1, 7.4, 9, and 8 respectively which are all close to the preferred estimate of 7.7.

In Table 6 we report the robustness results involving the trade policy openness measures. By adding additional controls we check the robustness of the partial effect of long-run trade policy on economic development. We use the same set of additional controls as Table 5. The complementarities effect holds in all the cases as the interactive variable $PO_{srt} * INS_{srt}$ is positive and statistically significant. The institutional quality thresholds for the partial effect of long-run trade policy on *per capita* GDP to be positive are 6.7, 7.1, 6.7, 7.3, 7.1, and 7.3 for specifications when schooling, investment, foreign aid, ethnic fractionalization, black market premium, and share of mining to GDP are used as additional control variables respectively. These estimates are not far from our preferred estimate of 7.3.

Therefore based on these tests it is perhaps fair to say that the observed complementarities between trade openness (both trade share and trade policy) and institutions in the data is reasonably robust to the inclusion of additional controls variables into our model.[13] We also notice that the estimate of the threshold level of institutional quality required for a positive effect of trade (both trade share and trade policy) is also reasonably robust.

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 a 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 can be due to some other factors (culture or 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 employed into improving institutions. Strong institutions improve

[13] We have performed robustness tests of our model across different continental sub-samples. Our results are reasonably robust. Results are not reported due to space constraint but are available upon request.

private investors' confidence which is crucial for economic development. We list the partial effects for individual countries in our sample of 59 former colonies in the appendix.

The results contribute to a growing body of literature on trade and development and perhaps open up the whole debate on the interrelationship between trade, institutions, and economic development. The challenge however is to take this beyond broad cross-country comparison to the detailed workings of institutions and trade policy and its impact on economic development.

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Table 1: Summary Statistics

Variable	Number of obs.	Mean	Standard Deviation	Minimum	Maximum
Log GDP per capita ($\log y_{srt}$)	1473	7.45	1.53	4.30	10.99
Trade Share (TR_{srt})	1425	74.20	43.73	1.53	362.53
Trade Policy Openness since $t-4$ (po_{srt})	1406	0.46	0.48	0	1
Trade Policy Openness since 1950 (PO_{srt})	1384	0.31	0.38	0	1
Expropriation Risk (INS_{srt})	445	6.81	2.30	1	10

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

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

	(1)	(2)	(3)	**(4)**	(5)	(6)	(7)	(8)	(9)	(10)	(11)	**(12)**
Dependent Variable:	**Log GDP per capita ($\log y_{srt}$)**											
Trade Share (TR_{srt})	0.01*** (0.0006)	0.004*** (0.0012)	0.002 (0.0042)	-0.077* (0.0444)								
Trade Policy Openness since $t-4$ (po_{srt})					0.39*** (0.0765)	-0.01 (0.1284)	-1.63*** (0.3709)				-0.01 (0.1458)	0.71 (1.349)
Trade Policy Openness since 1950 (PO_{srt})								0.52*** (0.1022)	0.20 (0.1964)	-1.85*** (0.5362)	-1.84*** (0.5687)	-12.2** (5.336)
Expropriation Risk (INS_{srt})		0.26*** (0.0318)	1.23*** (0.1906)	0.77** (0.3345)		0.31*** (0.0314)	0.20*** (0.0391)		0.30*** (0.0298)	0.23*** (0.0339)	0.23*** (0.0362)	0.57* (0.3044)
$TR_{srt} * INS_{srt}$				0.01* (0.0058)								
$po_{srt} * INS_{srt}$							0.25*** (0.0533)					
$PO_{srt} * INS_{srt}$										0.29*** (0.0717)	0.29*** (0.0726)	1.68** (0.7474)
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	179	117	59	59	135	105	105	135	105	105	105	59
Observations	1355	399	219	219	1115	367	367	1098	367	367	367	220
Adjusted R^2	0.9848	0.9873			0.9862	0.9897	0.9902	0.9862	0.9897	0.9901	0.9901	
Hausman test			0.000	0.000								0.000
OID test			0.50	0.16								0.47

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 (ENGFRAC), 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 to 1995 because of data limitations.

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

	(1)	(2)	(3)	(4)	(5)
Dependent Variables:	**Trade Share (TR_{srt})**	**Expropriation Risk (INS_{srt})**	$TR_{srt} * INS_{srt}$	**Trade Policy Openness since $t-4$ (po_{srt})**	$PO_{srt} * INS_{srt}$
Constructed Openness (CONST)	2.05***	0.015	16.1***	0.0002	0.01**
	(0.2382)	(0.0115)	(1.973)	(0.0012)	(0.0044)
Landlocked Dummy	-7.67	-0.53	-74.6	0.05	-0.25*
	(6.989)	(0.3379)	(57.88)	(0.0326)	(0.1393)
Log Settler Mortality (LSM)	-1.04	-0.21*	-29.9	0.008	-0.03
	(2.555)	(0.1235)	(21.16)	(0.0155)	(0.0539)
Log Population Density in 1500 (LPOPDEN)	-6.66***	-0.13	-66.4***	-0.02*	-0.15***
	(2.052)	(0.0992)	(16.99)	(0.0106)	(0.0414)
ENGFRAC	4.48	0.37	11.5	-0.01	0.12
	(9.948)	(0.4809)	(82.38)	(0.0611)	(0.1966)
EURFRAC	-23.2**	0.98*	-163.7*	0.10	0.02
	(11.07)	(0.5354)	(91.70)	(0.0632)	(0.2204)
AREA	-0.004***	0.0001	-0.03**	0.000005	0.00002
	(0.0016)	(0.0001)	(0.0131)	(0.000009)	(0.00003)
Trade Policy Openness since 1950 (PO_{srt})				0.88***	6.92***
				(0.0389)	(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?

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	**Log GDP per capita ($\log y_{srt}$)**				
Trade Share (TR_{srt})	0.002* (0.0013)	0.006 (0.0189)			
Trade Policy Openness since $t-4$ (po_{srt})			-0.36*** (0.1076)	-0.17*** (0.0459)	-0.63 (0.9038)
Trade Policy Openness since 1950 (PO_{srt})				0.72** (0.2784)	-12.3** (5.002)
Expropriation Risk (INS_{srt})	0.017* (0.0099)	0.63*** (0.1423)	0.02* (0.0117)	0.016 (0.0112)	0.47*** (0.1735)
$TR_{srt} * INS_{srt}$	-0.00001 (0.0001)	-0.001 (0.0027)			
$po_{srt} * INS_{srt}$			0.04** (0.0152)		
$PO_{srt} * INS_{srt}$				0.05** (0.0225)	1.79** (0.6956)
Latitude		3.56*** (0.6835)			2.98*** (0.8855)
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	105	105	29
Observations	399	108	367	367	112
Adjusted R^2	0.1877		0.2768	0.4893	

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.

Table 5: Robustness Check: Trade Share

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	**Log GDP per capita ($\log y_{srt}$)**					
Trade Share (TR_{srt})	-0.04 (0.0301)	-0.08* (0.0499)	-0.071** (0.0309)	-0.074* (0.0452)	-0.09* (0.0583)	-0.08* (0.0478)
Expropriation Risk (INS_{srt})	0.48* (0.2852)	0.90** (0.4149)	0.25 (0.2994)	0.78** (0.3314)	0.82** (0.4262)	0.69** (0.3612)
$TR_{srt} * INS_{srt}$	0.01** (0.0039)	0.01* (0.0066)	0.01** (0.0040)	0.01* (0.0059)	0.01* (0.0074)	0.01* (0.0063)
Controls:						
Region Dummies	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES
Additional Controls:	Schooling	Investment	Foreign Aid	Ethnic Fractionalization	Black Market Premium	Mining
Countries	50	58	55	59	55	59
Observations	189	216	204	219	184	219

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. All regressions are estimated using the instrumental variable estimation method. 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.

Table 6: Robustness Check: Trade Policy

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	**Log GDP per capita ($\log y_{srt}$)**					
Trade Policy Openness since $t-4$ (po_{srt})	-0.37 (0.8357)	1.73 (2.402)	0.21 (1.326)	0.72 (1.434)	1.04 (1.964)	1.07 (1.521)
Trade Policy Openness since 1950 (PO_{srt})	-9.1*** (3.458)	-23.3* (12.72)	-16.4*** (4.974)	-13.1* (7.788)	-17.8** (6.951)	-13.2** (5.802)
Expropriation Risk (INS_{srt})	0.34 (0.2676)	0.51 (0.4754)	0.10 (0.3078)	0.57 (0.3812)	0.29 (0.4641)	0.53 (0.3240)
$PO_{srt} * INS_{srt}$	1.36*** (0.4814)	3.3* (1.773)	2.43*** (0.7132)	1.8* (1.076)	2.51** (1.004)	1.8** (0.8010)
Controls:						
Region Dummies	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES
Additional Controls:	Schooling	Investment	Foreign Aid	Ethnic Fractionalization	Black Market Premium	Mining
Countries	50	58	55	59	55	59
Observations	190	217	205	220	182	220

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. All regressions are estimated using the instrumental variable estimation method. 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.

Figure 1: Partial Effect of Trade on Development

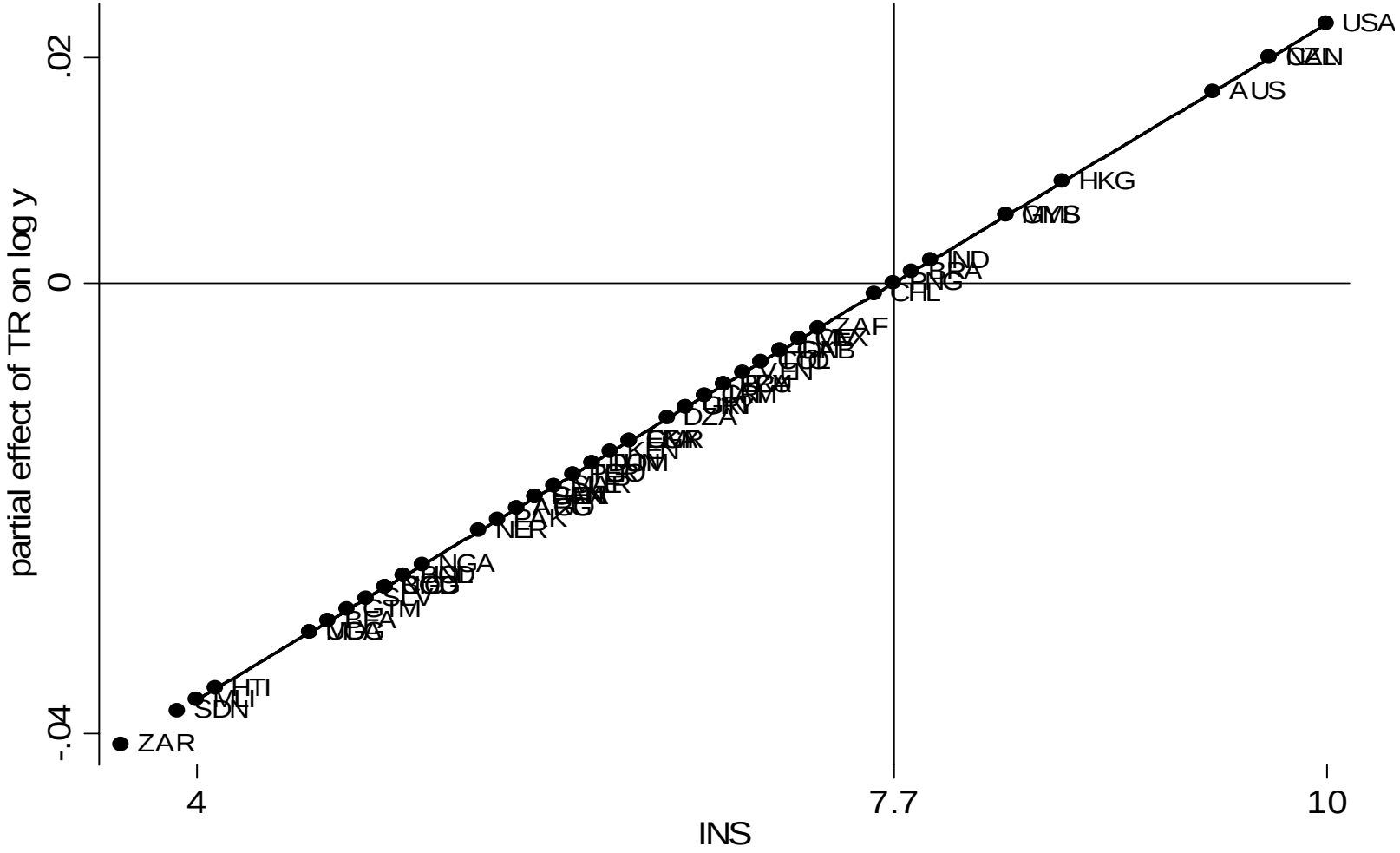
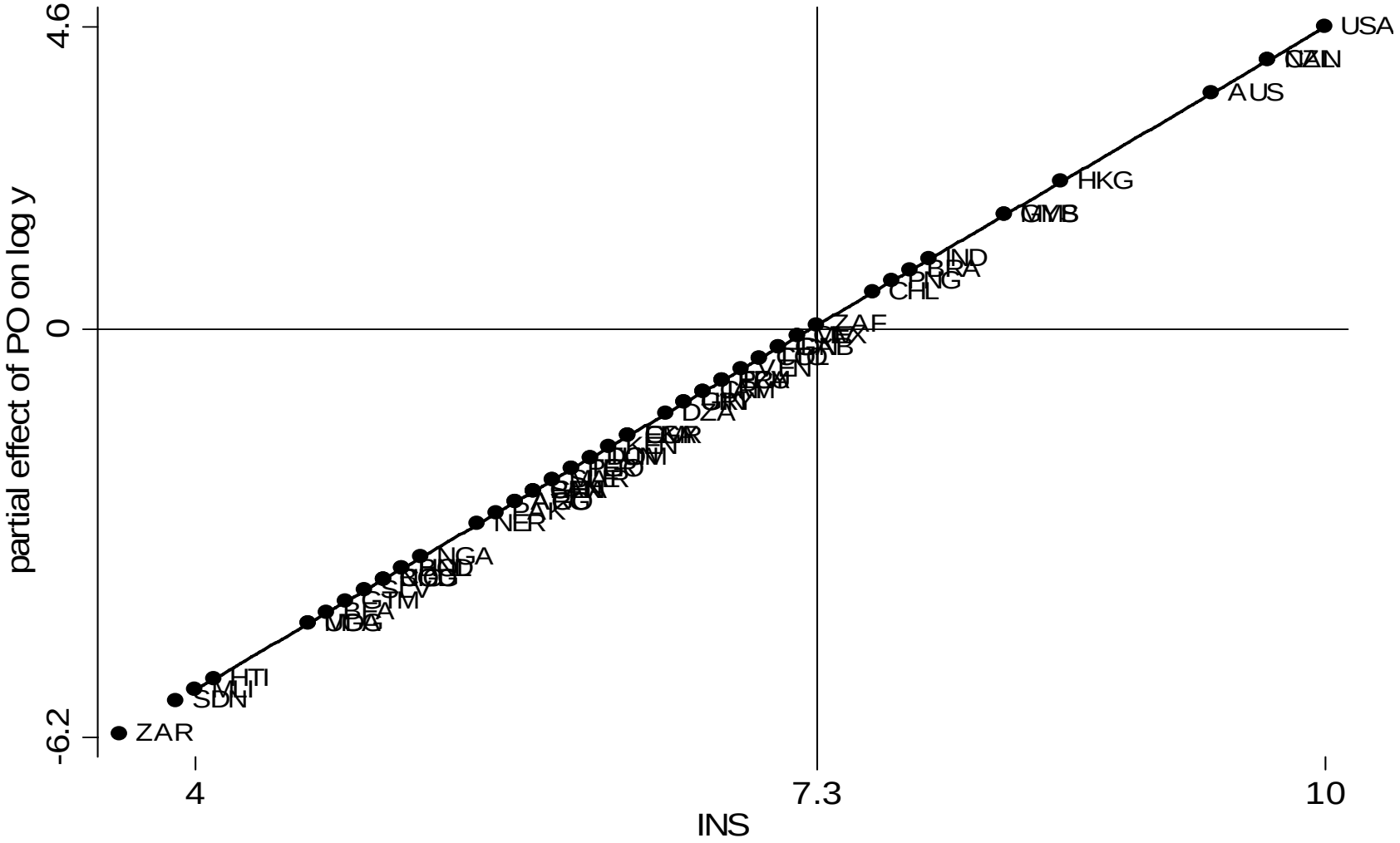


Figure 2: Partial Effect of Long Run Trade Policy on Development



Appendix A:

iso code	country	INS	TRhat	POhat
USA	United States	10	0.023	4.6
CAN	Canada	9.7	0.02	4.096
NZL	New Zealand	9.7	0.02	4.096
AUS	Australia	9.4	0.017	3.592
HKG	Hong Kong	8.6	0.009	2.248
GMB	Gambia, The	8.3	0.006	1.744
MYS	Malaysia	8.3	0.006	1.744
IND	India	7.9	0.002	1.072
BRA	Brazil	7.8	0.001	0.904
PNG	PNG	7.7	0	0.736
CHL	Chile	7.6	-0.001	0.568
ZAF	South Africa	7.3	-0.004	0.064
CIV	Cote d'Ivoire	7.2	-0.005	-0.104
MEX	Mexico	7.2	-0.005	-0.104
GAB	Gabon	7.1	-0.006	-0.272
IDN	Indonesia	7.1	-0.006	-0.272
COL	Colombia	7	-0.007	-0.44
TTO	Trinidad and Tobago	7	-0.007	-0.44
VEN	Venezuela	6.9	-0.008	-0.608
ECU	Ecuador	6.8	-0.009	-0.776
PRY	Paraguay	6.8	-0.009	-0.776
TZA	Tanzania	6.8	-0.009	-0.776
CRI	Costa Rica	6.7	-0.01	-0.944
JAM	Jamaica	6.7	-0.01	-0.944
GIN	Guinea	6.6	-0.011	-1.112
URY	Uruguay	6.6	-0.011	-1.112
DZA	Algeria	6.5	-0.012	-1.28
CMR	Cameroon	6.3	-0.014	-1.616
EGY	Egypt	6.3	-0.014	-1.616
LKA	Sri Lanka	6.3	-0.014	-1.616
KEN	Kenya	6.2	-0.015	-1.784
DOM	Dominican Rep.	6.1	-0.016	-1.952
TUN	Tunisia	6.1	-0.016	-1.952
PER	Peru	6	-0.017	-2.12
TGO	Togo	6	-0.017	-2.12
MAR	Morocco	5.9	-0.018	-2.288
SLE	Sierra Leone	5.9	-0.018	-2.288
GHA	Ghana	5.8	-0.019	-2.456
PAN	Panama	5.8	-0.019	-2.456
SEN	Senegal	5.8	-0.019	-2.456
AGO	Angola	5.7	-0.02	-2.624
ARG	Argentina	5.7	-0.02	-2.624
PAK	Pakistan	5.6	-0.021	-2.792
NER	Niger	5.5	-0.022	-2.96
NGA	Nigeria	5.2	-0.025	-3.464
BOL	Bolivia	5.1	-0.026	-3.632
HND	Honduras	5.1	-0.026	-3.632
BGD	Bangladesh	5	-0.027	-3.8
COG	Congo, Rep.	5	-0.027	-3.8
NIC	Nicaragua	5	-0.027	-3.8
SLV	El Salvador	4.9	-0.028	-3.968
GTM	Guatemala	4.8	-0.029	-4.136

BFA	Burkina Faso	4.7	-0.03	-4.304
MDG	Madagascar	4.6	-0.031	-4.472
UGA	Uganda	4.6	-0.031	-4.472
HTI	Haiti	4.1	-0.036	-5.312
MLI	Mali	4	-0.037	-5.48
SDN	Sudan	3.9	-0.038	-5.648
ZAR	Congo, Dem. Rep.	3.6	-0.041	-6.152

Appendix B:

Dependent and Explanatory Variables:

Log GDP per capita ($\log y_{srt}$): Natural log of GDP per capita PPP (constant 2000 international dollars). WDI Online, The World Bank Group.

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 to 1997. Average of 1982 to 1983 is used as a proxy for 1980, average of 1984 to 1987 as a proxy for 1985, average of 1988 to 1992 as a proxy for 1990, and average of 1993 to 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 other European languages, Hall and Jones (1999).

AREA: CID Harvard Geography datasets.

Control Variables:

Schooling: Average years of schooling, Barro and Lee (2000).

Investment: Penn World Table version 6.2.

Foreign Aid: WDI Online, The World Bank Group.

Ethnic Fractionalization: Alesina *et al.* (2003).

Black Market Premium: A black market exchange rate that is depreciated by 20% or more relative to the official exchange rate averaged over years $t-4$ to t, Sachs and Warner (1995).

Mining: Fraction of GDP in Mining, Hall and Jones (1999).

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