INSTITUTIONS AND TRADE: COMPETITORS OR COMPLEMENTS IN ECONOMIC DEVELOPMENT?

Sambit Bhattacharyya

School of Economics, Finance and Marketing, RMIT University

Steve Dowrick and Jane Golley

School of Economics, Australian National University

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University of Melbourne, Australia

Abstract

A recent paper by Dowrick and Golley (2004) finds that the impact of trade on growth varies with income. In particular, during the period 1980-2000, trade is observed to yield larger benefits for the more advanced economies. This result is backed up by Dejong and Ripoll (2005) who show that the richer countries benefit more from tariff reduction than the poorer countries. These findings raise the question, what is it about high levels of per capita income that enable richer economies to take better advantage of trade? It appears that the reason behind the success of the high income economies is the high quality institutions. These institutions not only boost growth directly but they impact economic performance indirectly by improving trade. We capture the complementarity between institutions and trade by estimating an empirical growth model which includes an interactive term involving these two variables. Better quality institutions are indicative of lower transaction costs which facilitates trade. It also ensures better distribution of the gains from trade paving the way for further trade and growth.

INTRODUCTION

The prime importance of institutions has been argued by Rodrik, Subramanian and Trebbi (2004) who show that a measure of the 'Rule of Law' dominates the influence of both trade and geography as the fundamental determinant of long-run economic development. The title of their paper captures their conclusion: 'Institutions Rule'. Their results build on the findings of the highly influential work of Acemolgu, Johnson and Robinson (2001) which demonstrates the strong impact of institutions without claiming dominance.

The conclusion of Rodrik *et al.* has been challenged by Sachs (2003), who presents evidence that geographical conditions conducive to the transmission of malaria do have a direct impact on long-run levels of development. Sachs's findings are backed up by Batten and Martina (2005) who present additional evidence of the importance of the disease environment, over and above the influence of institutions, in explaining various measures of economic development and well-being.

A further challenge comes from Glaeser, La Porta, Lopez-de-Silanes and Shleifer (2004) who report that the historical variables use by Rodrik and Acemoglu *et al.* (2001) as instruments to control for the endogeneity of current institutions are also highly correlated with current levels of human capital. They argue that the evidence on the importance of institutions can also be used to support the 'human capital' view of the world, in which poor countries accumulate human and physical capital and only subsequently improve their institutions.

In this paper we present evidence to support the views of Glaeser *et al.* We go further to suggest that the empirical evidence in this debate has been analysed in a framework that is theoretically implausible and demonstrably misspecified: a framework that we characterise as the 'levels of development' approach. It turns out that the empirical level specification is a special case of the growth specification which can be distinguished by a straightforward test for an omitted variable. We argue in Section 1 that the growth framework is preferred not only on statistical grounds, but also because it more meaningful and relevant.

In Section 2 we repeat the Rodrik *et al.* tests for a dominant explanation, but this time in a growth framework. We augment the competition between institutions, trade and geography by including a measure of human capital. We go beyond the 'horse-

race' set up to explore the suggestion of1, Johnson and Robinson (2005) that there may be significant complementarities between commercial and political development. Building on recent empirical findings, we investigate the interactions between trade, income and institutions.

1. Which framework – growth or levels?

The levels framework adopted by Rodrik *et al.* and other recent papers[1] centers on a cross-country regression where the dependent variable is the current level of economic development, typically measured by the natural logarithm of real GDP *per capita*, y_{iT}, where i indexes countries and T indicates the year. The explanatory variables consist of a measure of the 'quality' of contemporary institutions, I_{iT}, and a vector of other explanatory variables, $\mathbf{X}_{iT}$:

$$y_{iT} = \alpha I_{iT} + \beta \mathbf{X}_{iT} + \varepsilon_i \quad (1)$$

The alternative framework that we propose is to investigate the impact of institutions and other determinants of development on the growth rate since some initial year t: $\hat{y}_i \equiv y_{iT} - y_{it}$. The growth regression takes the form:

$$\hat{y}_i = \gamma y_{it} + \alpha I_{iT} + \beta \mathbf{X}_{iT} + e_i \quad (2)$$

where the term y_{it}, representing log GDP *per capita* in some initial year t, captures the conditional convergence effect typically found in empirical growth models, as predicted by both the neo-classical model of Mankiw, Romer and Weil and by models of international technology transfer, such as Dowrick and Rogers (2002).

It is apparent that the levels regression (1) is nested within the growth specification, since (2) can be rewritten as:

$$y_{iT} = (1+\gamma) y_{it} + \alpha I_{iT} + \beta \mathbf{X}_{i\tau} + e_i \quad (3)$$

The null hypothesis, H_0: $(1+\gamma) = 0$, reduces (3) to the levels regression, whilst rejection of the null favours the growth specification.

The economic intuition behind this test is that the levels regression is implicitly explaining the steady state distribution of income levels. This assumption is explicit in the augmented Solow-Swan model derived by Mankiw, Romer and Weil (1992)

[1] Examples of papers using the levels approach are Rodrik, Subramanian and Trebbi (2004), Acemoglu, Johnson and Robinson (2001), Glaeser, La Porta *et al.* (2004) and Sachs (2003).

who use investment rates as the proximate determinants of the neo-classical steady state. Mankiw *et al.* go on to show that if economies are not in their steady states, the transitional dynamics of the neo-classical model are captured by the addition of the 'initial' income level in a growth regression.[2] If economies actually are in steady-state, as explained by the right-hand-side variables in equation (1), then the addition of the lagged dependent variable, as in equation (3), should add no explanatory power.

The levels framework has more fundamental problems. It makes little sense in terms of prediction and policy. For example, in the Rodrik paper the quality of institutions is measured by the 'Rule of Law' in the year 2000. The estimated coefficient, α, is positive and strongly significant. The literal interpretation of the Rodrik result is that if Bangladesh were to adopt best-practice legal safeguards for international investors and to invest in a judiciary and police force to guarantee swift enforcement of contracts – thus gaining a top score on the evaluation of Rule of Law – then their standard of living would overnight become equivalent to Switzerland's.

Well, maybe not overnight. Perhaps that is being too literal. But over a year? Or a decade? Or a century? The Rodrik approach is silent on the relevant time-span, as is the similar approach adopted by Acemoglu *et al.* (2001).

The fundamental problem with the Levels of Development approach is that it ignores the process of development. This failing is obscured by the fact that Rodrik *et al.* follow Acemoglu *et al.* (2001) in using a plausible historical story to motivate the use of an historical variable – the mortality rate amongst European colonial clergy and military in the 18th and 19th centuries – to act as an instrumental variable in estimating the impact of current institutions on the current level of development.

As Acemoglu tells the story, Europeans chose to settle in colonies where the climate was relatively hospitable, bringing with them traditions and expectations of European institutions, particularly in relation to property rights (at least the property rights of the settlers). These expectations were conducive to 'good' institutions being established and continued throughout the colonial and post-colonial periods. On the other hand, where mortality was high, Europeans would not settle, and the colonial authorities would impose authoritarian rule and set up exploitative institutions which continued to have an influence through the institutions of post-colonial society.

This is a plausible story. It provides an explanation why settler mortality might

[2] A similar point has been made previously by Caselli et al and by Sachs (2003).

be correlated with current institutional quality in countries which were subjected to European colonisation. But it is not an explanation for the huge differences that we observe in current levels of development. An instrumental variable is just an instrument – satisfying the twin conditions that it is correlated with current institutions but uncorrelated with the error term in the levels regression. The instrument is not an explanatory variable.

In order to demonstrate the importance of institutions for the current level of development, one would have to track the development of institutions over the past 200 years – the period over which the huge differences in GDP *per capita* have developed – and estimate the impact of past, not current, institutional differences on growth rates over a succession of sub-periods.

A further problem with Rodrik's analysis is that the settler-mortality instrument might be just as powerful in identifying some other current variable that is also a predictor of current levels of development. Glaeser *et al.* (2004) suggest that human capital is such a variable. We confirm Glaeser's conjecture by replicating Rodrik's levels specification, then substituting current years of schooling (averaged across the adult population) for the Rule of Law.

The results of this experiment are reported in Table 1. Model 1 is based on Rodrik's, where we observe in an OLS regression that Rule of Law has a positive and strongly significant coefficient. We note, as does Rodrik, that the variable is endogenous – the null of exogeneity is rejected at the 0.1% level on the Hausman test using Rodrik's set of instruments – and the subsequent 2SLS estimation results in an even higher positive coefficient on Rule of Law with the trade and geography variables reduced to statistical insignificance. So far, so Rodrik.

Addressing the criticism that the instrumental variables may not identify Rule of Law uniquely, we confirm the Glaeser finding that the human capital variable, Years of Schooling, is strongly correlated with Settler Mortality and the other instruments – see Panel B of Table 1. In Panel A, we show that Rodrik's 2SLS result works just as well with Years of Schooling in place of Rule of Law.

Table 1: Testing between Levels and Growth Specifications

Dependent variable	***Log Per Capita Income in 2000***					
Estimation Method and Sample Size	Model (1)		Model (2)		Model (3)	Model (4)
	OLS obs=111	2SLS obs=65	OLS obs=89	2SLS obs=53	OLS obs=109	OLS obs=33
Panel A: OLS and Second Stage 2SLS Results						
Log Initial Income (1980)					0.852*** (0.0461)	
Log Initial Income (1900)						0.501*** (0.171)
Rule of Law (2001)	0.802*** (0.092)	1.45*** (0.238)			0.258*** (0.059)	0.278** (0.138)
Total Years of Schooling (2000)			0.271*** (0.0923)	0.329*** (0.0257)		
Average Log Trade Share	-0.003 (0.119)	-0.487 (0.276)	0.067 (0.093)	0.078 (0.156)	-0.013 (0.055)	-0.115 (0.167)
Latitude	0.013** (0.0055)	-0.01 (0.0132)	0.017*** (0.0037)	0.012** (0.0058)	0.003 (0.0026)	0.012* (0.0072)
R^2	0.7313		0.8261		0.9317	0.8043
Hausman test for exogeneity (p-value)	0.000		0.019		0.136	0.508

Panel B: First Stage Regressions

Dependent variable	Rule of Law (2001) obs=68	Average Log Trade Share obs=68	Total Years of Schooling (2000) obs=55
Log Settler Mortality	-0.36*** (0.078)	-0.13** (0.064)	-1.32*** (0.215)
ENGFRAC	0.81** (0.313)	0.29 (0.257)	1.98** (0.801)
EURFRAC	0.014 (0.215)	-0.37** (0.176)	1.50** (0.566)
Latitude	0.016** (0.0078)	0.005 (0.0064)	0.019 (0.0210)
R^2	0.5843	0.4488	0.7384

Notes: ***, **, and * indicates significance level of 1%, 5%, and 10% respectively against a one sided alternative. Figures in the parentheses are the respective standard errors. The standard errors are heteroskedasticity robust. All the regressions reported above are carried out with an intercept. The instruments used for the Hausman test are Log Settler Mortality, ENGFRAC, EURFRAC and CONST – see Table 2.

In the final columns of Table 1 we report the omitted variable test of the null hypothesis that economies in 2000 were in steady-state, hence that the addition of log income from a previous period should have no additional explanatory power. This hypothesis is strongly rejected in Model 3 where log income from 1980 has been added (with a t-statistic of 18) and in Model 4 where log income from 1900 has been added (with a t-statistic of 2.9). These findings are in line with those of Bhattacharyya (2004).

We find strongly in favour of the growth framework over the levels framework. The growth approach has the additional virtue of making sense. A change in current institutions relating to the Rule of Law is seen to have an impact on growth rates of a magnitude that appears feasible. Taking the coefficient estimates from Model 3, which estimates the growth rate 1980-2000, Bangladesh raising its Rule of Law by one unit is predicted to raise real income in 2000 by 29% ($e^{0.258} = 1.29$), corresponding to an increase of 1.3 percentage points in the annual growth rate since 1980.

By way of contrast, the coefficient of 1.45 in the levels specification in Model 1 suggests that a unit rise in Rule of Law would quadruple real income in 2000.[3] A change in the Rule of Law from its minimum value, -2.5, to its maximum value, 2.5, is predicted to increase real income more than one-thousand-fold.

An interesting point that arises in our estimation of the growth specification is that we fail to reject the hypothesis that the Rule of Law is exogenous, whereas in the levels specification the hypothesis is rejected strongly – see the Hausman test statistics reported in the bottom row of Panel A in Table 1. Even when we use 1900 as our measure of initial income, the Hausman test fails to reject the hypothesis of exogeneity – see model 4.

Dollar and Kraay (2003) identify two problems with the levels approach, both problems relating to endogeneity through reverse causality and through omitted variable bias. It appears from our results that it is the omission of the initial income variable, rather than reverse causation, that leads to the statistical rejection of exogeneity in the levels specification.

[3] Rodrik *et al.* (2004) report a coefficient of 1.78 in their preferred specification (3) in their Table 3, which suggests that a unit rise in Rule of Law would increase real income sixfold.

The recent flurry of empirical papers estimating the fundamental causes of long-run development, as captured by current levels of real income, is admirably ambitious. We would like to identify the factors that lead to Switzerland being so rich and Bangladesh being so poor. It appears, however, that ambition has outstretched capability. On both theoretical and statistical grounds we find that the levels framework is inadequate for the task. Variations in current measures of institutional quality cannot explain in any sensible manner the centuries of development that have led to the current global distribution of income levels.

In turning to analysis of growth rates we recognise that we are reducing substantially the scope of our inquiry. Lack of historical data, particularly data on institutional quality, restricts our analysis to growth over the past twenty years. But we are able to come up with reasonable estimates of the relative impact of trade and institutions, and of their interaction, which have meaningful policy implications.

2. Interactions between institutions and trade

Rather than treating institutions and trade as competing explanations for economic development, we turn to some recent papers which suggest that they may be complementary factors.

A recent paper by Acemoglu, Johnson and Robinson (2005) describes the interactive role of trade and institutional development in stimulating economic growth in certain Western European countries from the 1500s onwards. They assert that political institutions placing limits and constraints on state power are essential for the incentives to undertake investments and for sustained economic growth, and that in early modern Europe such political institutions were favoured by commercial interests (i.e. economically powerful groups) but not by the monarchies. Their key hypothesis is that in countries with 'non-absolutist' initial political institutions (most notably Britain and the Netherlands), Atlantic trade and colonial activity enriched and strengthened commercial interests groups, which then demanded and obtained institutional reforms to protect their property rights, which enabled them to trade and invest more, triggering a circular and cumulative pattern of economic growth.

Two studies suggest that the impact of trade on recent growth is characterised by non-linearities and interaction with other economic variables. Dowrick and Golley

(2004) found that the impact of trade shares (exports plus imports divided by GDP) on growth varied with income. In particular, during the period 1980-2000, trade was found to generate substantially greater benefits for the more advanced economies. A subsequent paper by DeJong and Ripoll (2005) investigates the relationship between trade barriers and growth, finding that it is contingent on income, with richer countries benefiting more from tariff reductions than poorer countries. To the extent that tariff reductions bring about trade expansion, this result is consistent with Dowrick and Golley in suggesting that the benefits of expansion in international trade over the past twenty years have accrued disproportionately to the world's richer economies.

These findings raise the question of what it is about high levels of *per capita* income that enable richer countries to take better advantage of international trade? Does a higher level of income imply a higher technological capacity, enabling richer countries to benefit more from the technological transfers embodied in modern manufacturing trade? Is a higher level of human capital or physical infrastructure required in order for countries to benefit from international trade? Or does a higher level of income go hand-in-hand with 'higher' quality institutions, and are these institutions essential for trade to impact positively on economic growth?

Through the use of interactive terms in the econometric analysis, the analysis below attempts to provide some insight into these questions.

3. Estimating complementarity between institutions and trade

The baseline equation for the analysis in this section is given by:

$$100 * \ln(\frac{y_1}{y_0}) / 20 = \alpha_1 + \alpha_2 \ln y_0 + \alpha_3 INS + \alpha_4 \ln TR + \alpha_5 YS_0 + \alpha_6 LAT + \varepsilon \qquad (4)$$

where the dependent variable is average annual percentage rate of growth of *per capita* real GDP between 1980 and 2000. *INS* is one of four institutional variables: investment profile, law and order, corruption and democratic accountability. Each variable is averaged over the period, starting at 1985 which is the earliest year for which the data is available. *TR* is the ratio of trade to GDP, averaged between 1980 and 2000. Following the example of many papers by Robert Barro, our human capital variable, *YS*, is the average years of schooling amongst the adult population at the

beginning of the period. *LAT* is the absolute value of latitude.[4] Table 2 provides the summary statistics for these variables. Data sources are given in the Appendix.

We use period averages of the institutional variables in order to capture their average impact over the two decades. This procedure has the advantage of smoothing out the sometimes substantial fluctuations that have occurred over the period, which imply that initial or end values are unlikely to be representative. For example, the correlation between the investment profile in 1985 and subsequent years is 0.69 for 1990, 0.44 for 1995, and 0.38 for 2000. The correlation between democratic accountability in 1985 and subsequent time periods falls from 0.94 in 1990 to 0.57 in 2000. In contrast, the correlation between total years of schooling in 1980 and 1985 is 0.99, in 1980 and 1990 is still 0.99 and in 1980 and 2000 remains at 0.96. This means that initial levels are a reasonable indicator of levels of schooling over the ensuing 20-year period, and the initial level of schooling is *a priori* exogenous to the subsequent rate of growth of real income.

Table 2. **Summary Statistics**

Variable	**n**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Growth of real GDP *per capita* (% p.a., 1980-200)	117	1.21	1.85	-3.34	5.89
Initial income ($1996 at PPP)	123	5,795	5,448	547	21,677
Initial Years of Schooling (years)	95	4.6	2.8	0.4	11.9
Latitude (absolute value)	123	22.8	16.2	0.23	63.9
Log Trade Share (%) (period average)	120	4.2	0.6	2.9	5.9
Institutional Variables (period averages) (INS)[1]					
Investment Profile (IP)	99	6.5	1.3	3	9.6
Law and Order (LO)	99	3.6	1.4	1.0	6
Corruption (CO)	98	3.4	1.3	0.3	6
Democratic Accountability (DA)	99	3.8	1.3	1.1	6

1. The institutional variables are taken from the International Country Risk Guide published by PRS Group (2005).

[4] Latitude is measured in 2000, ignoring the impact of continental drift over the previous 20 years which we rashly assume to be strictly exogenous.

The Investment Profile variable provides an assessment of factors affecting risks to investment comprising three subcomponents: contract variability/ expropriation, profit repatriation, payment delays. This captures important elements of both contract enforcement and the protection of property rights. The Law and Order variable comprises two subcomponents: the Law subcomponent is an assessment of the strength and impartiality of the legal system and the Order subcomponent is an assessment of popular observance of the law. The Corruption variable is an assessment of corruption of the political system. The Democratic Accountability variable is an assessment of the responsiveness of government is to its citizens.

Two points about the ICRG data are worth noting. First, as pointed out by Dollar and Kraay (2003), institutional measures may be subject to 'halo' effects, meaning that countries with higher income are deemed by assessors to have 'better' institutions simply because they are observed to be rich. This suggests that the definition of a 'good' institution is subjective and may be biased in favour of the world's rich countries, which may in turn lead to over-estimates of the perceived benefits of 'good' institutions. Second, in accordance with Glaeser *et al.* (2004), it is worth recognising that these 'institutional' measures may in fact be better indicators of policy choices during the period of analysis, rather than persistent, 'deep' measures. This distinction between institutions and policy is probably less important in a growth framework than in the levels framework: what is relevant is how each particular variable is found to influence economic growth, and the ensuing policy implications.

Table 3 reports the key results. Column 1 presents the results for the regression using the investment profile as the institutional variable. Both the investment profile and schooling are significant at the 10% level on a one-tailed t-test with the expected positive sign. The pairwise correlation between these variables is 0.68. They are jointly significant at the 5% level, suggesting an important role for both in the growth process. The trade share is statistically insignificant. Latitude is highly significant and positive, consistent with the substantial body of evidence suggesting that tropical countries grow slower than countries in temperate zones.

The results when Law and Order is used as the institutional variable are shown in Column 2, which yields very similar result to Column 1. Law and Order has a positive impact on economic growth and, while both it and schooling are only

significant at the 10% level, they are jointly significant at the 1% level.

Table 3. **Baseline OLS Regressions**

	Dependent variable: Per capita GDP growth 1980-2000			
Explanatory Variables	(1) n=81	(2) n=81	(3) n=81	(4) n= 81
Log *per capita* GDP in 1980	-1.00 ** (0.388)	-0.980 *** (0.390)	-0.764 ** (0.397)	-0.812 ** (0.403)
Log Trade Share	-0.143 (0.347)	-0.093 (0.334)	0.084 (0.358)	-0.006 (0.344)
Years of Schooling	0.155* (0.097)	0.166 * (0.113)	0.262 ** (0.112)	0.246 ** (0.114)
Absolute Latitude	0.039 *** (0.014)	0.036 ** (0.017)	0.056 *** (0.016)	0.049 *** (0.014)
Investment Profile	0.463 * (0.279)			
Law and Order		0.336 * (0.247)		
Corruption			-0.334 * (0.241)	
Democratic Accountability				-0.149 (0.234)
R-squared	0.245	0.219	0.217	0.201
Hausman Test for exogeneity of Trade and Institutions Variables (p-value)	0.915	0.152	0.264	0.599

Notes: ***, **, and * indicates significance level of 1%, 5%, and 10% respectively against a one sided alternative. Figures in the parentheses are the heteroskedasticity robust standard errors. All regressions have an unreported intercept.

Column 3 reports the result for "corruption" as the institutional variable. The ICRG records this variable in such a way that a high score (maximum of 6) represents low levels of corruption, so the negative coefficient indicates that an increase in the level of corruption stimulates growth. However, given the high correlation between corruption and schooling (0.74), and the fact that these two variables are not jointly significant at the 5% level, this result should be treated with caution. Democratic accountability does not have a significant direct impact on economic growth (Column 4). From these results it is clear that no single conclusion can be drawn about the impact of 'institutions' on growth, but instead that different institutions have different

impacts: negative, positive or none at all.

The bottom row in Table 3 reports the p-values for Hausman test: testing the null hypothesis that the trade share and the institutions variable are exogenous. We use as instruments: Hall and Jones' (1999) fraction of European speakers in the population (EURFRAC), Acemoglu *et al.*'s (2001) log settler mortality and Frankel and Romer's (1999) constructed trade share. For each institutional variable, we fail to reject exogeneity.[5] This result contrasts sharply with the common finding of endogeneity in the levels framework. But to the extent that institutions evolve slowly over time, it is not surprising that shocks to the growth rate over twenty years have a negligible impact on the institutional measures.

To capture the idea that the impact of trade might be contingent on the level of *per capita* GDP an interactive term, $\alpha_7 \ln TR * \ln y_0$, is added to equation (4). We find that the coefficient is positive and significant at the 1% level, as reported in Model 1 of Table 4. Partially differentiating with respect to the trade share, *TR*, gives a point estimate of the impact of trade on growth equal to $(\alpha_4 + \alpha_7 \ln y_0)/TR$. The positive coefficient value of α_7 implies that the marginal impact of trade is increasing with income.[6]

The evidence of interaction between trade and income could be the result of interactions between trade and other variables that are correlated with income, such as human capital and institutional quality. To address some of these questions, we vary the interactive term. In Model 2, the trade share is interacted with the initial value of the institutions variable ($\ln TR * INS_0$). The purpose of this term is to investigate whether 'better' institutional measures – i.e. higher investment profiles, more law and order and democratic accountability, less corruption – bring about greater gains from trade ($\alpha_7 > 0$) or not ($\alpha_7 < 0$). Model 3 interacts the trade share with initial schooling ($\ln TR * YS_0$), which may shed light on whether the impact of trade on growth varies according to levels of human capital. Table 4 presents results for these alternative specifications using the Investment Profile as the measure of institutional quality.

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[5] These regressions were also run using average rather than initial total years of schooling. This means that there are three potentially endogenous variables and the Hausman test is constructed accordingly. In each case, the null hypothesis of exogeneity still cannot be rejected.

[6] Given that we estimate α_4 to be negative, there will be some levels of income ($\ln y_0 < -\alpha_4/\alpha_7$) for which the marginal impact of trade on growth is predicted to be negative. However we cannot reject the hypothesis that the marginal impact of trade is positive for all observations in our sample.

Table 4. **Trade, Investment Profile, Human Capital and Growth**

	Dependent variable: Growth 1980-2000		
	Model (1) obs=81	Model (2) obs=81	Model (3) obs= 81
Log Initial Income	-4.11 *** (1.18)	-0.948 *** (0.38)	-0.926 *** (0.38)
Investment Profile	0.479 ** (0.28)	0.157 (0.320)	0.502 ** (0.28)
Log Trade Share	-7.33 *** (2.74)	-0.571 ** (0.375)	-1.075 ** (0.61)
Latitude	0.027 *** (0.014)	0.031 *** (0.014)	0.032 ** (0.014)
Initial Years Schooling	0.132 * (0.097)	0.143 * (0.098)	-0.557 * (0.413)
Interactive terms			
Log Trade Share * Initial Income	0.836 *** (0.316)		
Log Trade Share * Initial Investment Profile		0.071 ** (0.040)	
Log Trade Share * Initial Schooling			0.176 ** (0.101)
R-squared	0.3009	0.2810	0.2661

Notes: ***, **, and * indicates significance level of 1%, 5%, and 10% respectively against a one sided alternative. Figures in parentheses are robust standard errors. All the regressions have an intercept.

In Model 2, where the trade share is interacted with the initial investment profile, the coefficient on the interactive term is positive and significant at the ten percent level. While the investment profile variable has become insignificant, it is jointly significant with the interactive term at the 5% level. These results have two implications: the benefits of trade accrue disproportionately to countries with better investment profiles, and the benefits of a good investment climate are magnified if a country engages in more international trade. It appears that trade policy and investment policy are complementary in promoting economic growth.

Model 3 interacts trade and initial schooling. The coefficient on the interactive term is positive and significant at the 5% level, implying that a higher level of education enables countries to benefit more from trade, and *vice versa*.

Table 5 summarises the coefficient estimates for the interactive terms using the

alternative institutional variables. The results for Model 1 are very similar regardless of which institutional variable is used: in all cases α_7 is positive and significant at the 1% level. In Model 3 while the interactive schooling term is positive in all cases, it is only significant in two, perhaps suggesting a lack of robustness for this result.

Table 5. **Interactions with each of the institutional variables**

	Institutional Variable			
	Investment Profile	Democratic Accountability	Law and Order	Corruption
Log Trade Share * Initial Income (Model 1)	0.836*** (0.316)	0.801*** (0.299)	0.809*** (0.305)	0.869*** (0.315)
Log Trade Share * Initial Institutions (Model 2)	0.071** (0.040)	0.143** (0.085)	-0.067 (0.085)	0.109 (0.104)
Log Trade Share* Initial Schooling (Model 3)	0.176** (0.101)	0.134 (0.101)	0.174** (0.105)	0.144 (0.104)

Note: The specifications of these regressions follow those in Table 4. Here we report only the coefficient estimate and robust standard error for the interactive terms.

Most interesting are the results for Model 2, which vary depending on the choice of institutional variable. When democratic accountability is used, the interactive term is again positive and significant, suggesting that higher democratic accountability brings greater benefits from trade. In contrast, the interactions between trade and law and order and trade and corruption are insignificant.

It is of interest to investigate the magnitude of the interactive component of the marginal impact of institutions. For the investment profile, the marginal impact on growth is $0.071 * \ln TR$. Thus, for a country with a trade share averaging 67 percent of GDP, corresponding to a log trade share of 4.2, a one point increase in the initial investment profile would increase the growth rate of *per capita* GDP by 0.30 percentage points. Likewise, the marginal impact of democratic accountability is given by $0.143 * \ln TR$, implying that a one point increase in democratic accountability in 1980 was associated with an additional 0.60 percentage points of *per capita* GDP growth. If these results are in anyway indicative of what lies ahead, the news is possibly good for many. For example, Bolivia had an investment profile in 1985 of 2.3, which had increased to 9.9 by 2000. Over that same period Chile's

increased from 3.5 to 9.6, Costa Rica's from 4.9 to 9.8, Ethiopia's from 1.3 to 8.8, Greece from 4.7 to 10.3 and even the United Kingdom from 7.8 to 11.1. Combine these kind of increases with measures to improve democratic accountability (from lows of 1.0 in Guinea Bissau and Ethiopia, for example, to the maximum value of 6 achieved by Australia, Canada, Ireland and Korea, among others) and the potential gains in terms of economic growth start to look quite sizeable.

The finding that a country's investment profile and democratic accountability are important for economic growth at least partly because of their impact via trade suggests that Acemoglu *et al.*'s (2005) hypothesis regarding trade-induced institutional development and economic growth may be just as valid in the modern context as they have found it to be historically. It could be argued that in the last twenty years, countries with weak democratic accountability – in place of relatively 'absolutist' institutions – have failed to reap the benefits of international trade because their governments have prevented the rise of economically powerful groups, which in turn has retarded institutional development and hence economic growth. In contrast, countries with high levels of democratic accountability have benefited substantially from international trade, partly because strengthened commercial groups have been able to lobby successfully for economic policies and institutional developments that protect investors' rights (as embodied in the 'investment profile, for example), thereby encouraging further trade expansion and economic growth.

4. Robustness and Sensitivity Analysis

We perform a series of sensitivity and robustness tests. First, we test the robustness of our results to changes in the sample of countries. We omit groups of countries that may have characteristics different from the rest of the sample to see if this influences our results. It may be the case that our results on interactive effects of trade are driven by a group of countries with peculiar characteristics that have nothing to do with trade or interactive effects of trade. Second, we test the impact of individual influential observations on our results by omitting them from the sample. We use the statistical procedures outlined in Belsley *et al.* (1980) to track the influential observations.

In Table 6 we report the coefficient estimates on the trade share and the trade share interacted with initial investment profile when our preferred

specification, as reported as Model 2 in Table 4, is estimated using different sub-samples. Omitting African countries from the sample yields an estimate on trade share that is marginally different in terms of magnitude but becomes statistically significant at the 5% level. No significant change is observed on the coefficient estimate of the interactive term. Eliminating Asia or the Americas from the sample makes the coefficients statistically insignificant. Omitting Neo Europe from the sample does not have significant impact on the coefficient estimates. We repeat these tests for law and order, corruption and democratic accountability (not reported here) and find that our results are robust for these variables as well.

Table6. **Robustness to sub-samples and omitted observations (OLS estimates)**. The Dependent variable is Growth 1980-2000

Omitted Continents	Trade coef. (TS)	Interaction coef. (TS*IP85)	N	R^2
None	-0.6* (-1.53)	0.1** (1.78)	81	0.28
Africa	-0.5** (-1.78)	0.1** (2.11)	61	0.46
Asia	-0.5 (-0.72)	0.02 (0.39)	64	0.34
Europe	-0.5 (-1.15)	0.1** (1.85)	62	0.29
The Americas	-0.5 (-1.12)	0.1 (1.21)	59	0.20
Neo Europe	-0.5* (-1.56)	0.1** (1.81)	77	0.29
DFITS	-0.7** (-1.96)	0.1* (1.56)	76	0.36
Cook's Distance	-0.7** (-1.77)	0.1* (1.58)	75	0.32

Notes: ***, **, and * indicates significance level of 1%, 5%, and 10% respectively against a one sided alternative. The first column reports coefficient on average log trade share and the second column reports coefficient on the interactive term with investment profile in 1985. T-ratios are reported in parentheses. In each of the sub-samples countries from Africa, Asia, Europe, the Americas, and neo European countries (Canada, US, Australia) are eliminated. The sample size (N) and R^2 in each case are also reported. Influential variables are omitted using the following standard rules. DFITS: Omit if $DFITS_i > 2(k/n)^{1/2}$ (Belsley *et al.* (1980)). Cook's distance: Omit if Cook's distance > 4/n.

We report outlier sensitivity tests using Belsley *et al.* (1980)'s distance

from fitted value measure (DFITS) and Cook's distance measure. In case of the former we omit the observation if $DFITS_i > 2(k/n)^{1/2}$ and in case of the latter omission occurs if Cook's distance > 4/n. It appears that our estimates remain robust to omissions of influential observations. This leads us to conclude that our estimates are largely robust across different sub-samples. However, we get weaker estimates (statistically insignificant) in sub-samples in case of investment profile when we leave out Asia or the Americas.

5. Concluding comments

In this paper we show that the existing research strategy used to establish institutions as the fundamental cause of economic development is flawed and suffers from serious problems of omitted variable and identification when current levels of development are regressed on current values of institutional quality.

Rodrik et al. (2004) set up a three variable model with institutions, geography and trade in order to explain the fundamental cause of differences in levels of income across world economies. They estimate this model using IV approach and find that institutions are the sole explanator of differences in income levels. They choose IV over OLS because they argue that OLS suffers from endogeneity problem and produces biased estimates largely due to the presence of reverse causality. We use the Hausman test and find that the source of bias is in fact the omitted variable log initial income and not reverse causality. This result appears to be robust to the choice of time scale. We go back as far as 1900 and observe that the endogeneity bias gets eliminated once we control for log initial income.

This leads us to two conclusions. The first is important but somewhat routine. The OLS estimates of this model when log initial income is present as a control is unbiased which confirms that the growth specification is superior to the levels model proposed by Rodrik et al. (2004) and Acemoglu et al. (2001).

The second conclusion is more interesting and has far reaching implications. Our study like others in the literature recognizes the importance of history. However, we significantly differ from the existing levels literature in our handling of history. The levels literature focuses on a much more ambitious objective of

explaining the historical process of development. They use historical variables to predict current institutions and use these predicted values to show the role of history. In contrast we focus more on more humble objective of explaining the dynamics of income in the last 20 years and we use history as an additional control incorporated in the initial income term. Even though the levels strategists claim that they have managed to establish the link between history and current development, we show that their estimates are biased. Even in the best case scenario their analysis cannot rule out the correlation between initial income and geography variables which biases the coefficients. We solve this problem by controlling for initial income, at the expense of a more restricted analysis.

The levels framework also suffers from identification problems. As Glaeser et al. (2004) reports and we confirm in our study, the instruments used for linking history with current institutions are as good predictor of current human capital as it is of current institutions. We build on Glaeser's critique and redo the Rodrik type experiment using human capital instead of institutions. Our results expose a serious weakness in the levels framework and leads us to conclude that the levels strategy fails to identify the prime role of institutions.

In our analysis we observe that 'institutions don't rule'. Rather, we find that trade, geography, human capital all combine to determine economic growth. Moreover, we find evidence of complementarity between institutions and trade.

We observe that these results depend on which measures of institutional quality are used. The institutional variables that have the most significant impact on growth are a country's Investment Profile and its Democratic Accountability (as assessed by the ICRG) and these impacts are found to be complementary with the share of trade in GDP. Our analysis of the recent growth data provides support for the hypothesis advanced by Acemoglu et al. (2003) of interactions between trade and political factors in the historical development of the Western European nations.

The policy implication of these results is that trade policies alone will bring little benefit if appropriate institutions are not put in place. Correcting institutions without adopting appropriate trade policy, on the other hand, is more likely to end up as a disappointing failure. Therefore, as a policy maker, one needs to formulate appropriate policies which can tap these complementarities. The levels literature argues that bad economic policies are only symptoms of weaknesses in longer-run institutional factors, and correcting the economic policies without correcting the

political institutions will bring little long-run benefit. In other words, they argue that economic policies should go hand in hand with political reforms. Our analysis explores further along these lines and identifies some of the areas where there is a potential for reforms. The two major policy lessons that we learn out of this exercise are as follows. First, maximum benefit can be drawn from trade liberalization if countries adopt economic policies and political structure that corrects disincentive for investments, ensures enforcement of contracts and prevents payment delays. Second, putting democratic accountability in place and making the policy makers and the law makers accountable to the population at large increases the likelihood of a fair distribution of the gains from trade making the process of trade induced growth sustainable.

We acknowledge the caveats that one should not get too carried away with a failure to reject a null or a positive coefficient estimate in cross country regressions. However, these results do give us a direction for future research if we want to look at within country variations. It also says a fair bit about the importance of political economy even when we are trying to explain across country variations. If this is a beginning of telling a story on institutions and trade then we would expect more future research devoted to exploring the interrelationship between them and economic development. This perhaps will bring back political economy at the forefront of all debates on development.

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Data Appendix

Variable name	Description	Source
Growth (1980-2000)	Calculated for 128 countries using annualised growth rate formula with GDP *per capita* PPP figures (1980-2000).	Penn World Table (PWT) 6.1 Heston et al. (2002)
Log *Per capita* GDP in 2000	Natural log of real GDP *per capita* in 2000. Real GDP figures are measured in US $ in current prices and the figures are PPP converted.	Penn World Table (PWT) 6.1 Heston et al. (2002)
Initial Income (1900)	Natural logs of *per capita* GDP (1900) in 1990 international Geary-Khamis dollars.	Maddison (2004)
Initial Income (1960)	Initial Level of *per capita* GDP (1960) in natural logs and PPP figures.	Penn World Table (PWT) 6.1 Heston et al. (2002)
Log of Trade Share	Log Trade share (period average) is the average of log trade share over the period 1980-2000. trade share is calculated by dividing the volume of trade with GDP.	Penn World Table (PWT) 6.1 Heston et al. (2002)
Years of schooling (TYR)	Average schooling years in the total population in 1980.	Barro and Lee (1993)
Latitude (LAT)	Absolute Latitude	Hall and Jones (1999)
Rule of Law	Rule of Law index of 2002 varying between -2.5 and +2.5. Higher value corresponds to better institutional quality	Kaufmann et al (2002)
IP (period average)	This is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents, each with a maximum score of 4 and a minimum score of 0 points: contract variability/ expropriation, profit repatriation, payment delays. A score of 4 equates to a very low risk and a score of 0 equates to a very high risk.	PRS Group (2005) ICRG
LO (period average)	Law and Order are assessed separately. The Law subcomponent is an assessment of the strength and impartiality of the legal system and the Order subcomponent is an assessment of popular observance of the law. The assessment is made on a six point scale with a high score implying better law and order.	PRS Group (2005) ICRG
CO (period average)	This is an assessment of corruption within the political system. The assessment is made on a six point scale with a high score implying less corruption.	PRS Group (2005) ICRG
Variable name	Description	Source
DA (period average)	This is a measure of how responsive the government is to its people. The maximum point of 6 is assigned to alternating democracies, while the minimum point of 0 is assigned to autarchies.	PRS Group (2005) ICRG
Log Settler Mortality	Natural log of estimated European Settler Mortality Rate in colonies and settlements	Acemoglu et al. (2001)
ENGFRAC	It is one of the "first" language variables, corresponding to the fraction of the population speaking English	Hall and Jones (1999)
EURFRAC	It is one of the "first" language variables, corresponding to the fraction of the population speaking one of the major languages of Western Europe: English, French, German, Portuguese, or Spanish.	Hall and Jones (1999)
Log population Density in 1500	Natural log of total population divided by total arable land in 1500 A.D. Source: McEvedy and Jones (1978) as cited in Acemoglu, et al. (2002).	McEvedy and Jones (1978)
Constructed Openness	Natural log of constructed openness calculated by filtering actual trade share from the influence of geographic factors using a bilateral trade equation which is also known as the gravity model.	Frankel and Romer (1999)