Trade, Scale, or Social Capital? Technological Progress in Poor and Rich Countries*

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Abstract: Endogenous growth theory suggests scale and trade as determinants technological progress, while the literature on social capital suggests societal levels of trust and participation affect the degree of cooperation and innovation. While there is evidence on the role of trade growth, and sparse evidence on the role of social capital and scale, previous empirical studies have omitted two out of the three factors in question, used small sample sizes, and rarely used measures of technological progress. Our study addresses these shortcomings. We find robust evidence of the role of trade in fostering technological progress which is invariant to proxies of Total Factor Productivity (TFP) growth and thus not vulnerable to the debate on measures of TFP. In addition, we find there is no clear role for scale in fostering TFP growth., while the latter seems to increase the most the more the country trades with dynamic economies that are comlementary to itself. We uncover a positive effect of social capital, which is more significant in richer countries, suggesting that other characteristics, such as institutional quality, may be complementary to social capital. The paperôs results are robust to different specification and estimation methods.

JEL Codes: Z13, O11, O47.
Keywords: trust, growth accounting, model selection, endogeneity.

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1. Introduction

This paper conducts a systematic empirical investigation of the determinants of technological progress in light of endogenous growth theory.[1] The literature on endogenous growth has identified three important candidates to explain technological progress across countries and over time, namely trade, scale and social capital. Country scale can affect the rate of innovation when ideas are associated with a large fixed cost and are non-rival when used as inputs to production. Though ubiquitously present in endogenous growth theory, scale has generally been shown to be irrelevant to TFP growth in previous empirical studies. International trade may affect the rate of technological absorption since imported products embody innovative ideas and processes that tend to be imitated locally. There is substantial evidence that trade matters for economic growth and for technological progress,[2] though doubts have arisen as to the robustness of this fact.[3] Finally, social capital, understood as the potential for diverse groups in society to cooperate and thus reap larger economic returns, has recently been proposed as a possible explanation of the diverse growth experiences[4].

Our contribution to the literature is manifold. We attempt a first joint examination of the determinants of technological progress, whereas previous studies tend to look at one of its determinants only, and ignored the others. In particular, we want to assess whether the effect of trade on TFP growth found in previous studies is robust to the inclusion of scale and social capital indicators.[5] The joint consideration of all determinants of TFP allows us to assess the relative contributions of trade, scale and social capital to technological progress. To this end we make use of growth accounting techniques and construct several measures of TFP, under different underlying assumptions. Moreover, we build different social capital proxies by means of regression and factor analysis. A second contribution is the partition of the study into poor and rich countries so that differential effects of trade, scale and social capital can be identified. This is important, as economic theory suggests that the effects of trade and social capital may differ in poor and rich countries. As a country becomes richer it may move from imitating technology possibly through trade to producing technology. At the same time, social capital may be a substitute for or a complement to formal

[1] Unless explicitly stated, we measure technological progress as the rate of growth of Total Factor Productivity ï hereafter TFP.
[2] As in Edwards (1998).
[3] See Rodriguez and Rodrik (1999).
[4] As in Knack and Keefer (1997) and Temple and Johnson (1998), discussed below.
[5] Even if a strong prior is available for the effect of trade on TFP growth, this effect should be investigated jointly with the effect of scale or social capital. Since rich countries tend to have both higher levels of social capital as measured by international surveys on trust and large countries are less open to trade, one expects the three variables to be correlated. In light of this and the teachings of endogenous growth theory, the exclusion of any of the three leads to specification error.

institutions, which, on average, display higher quality in rich countries. Third, we tackle the issue of endogeneity better than in cross-country growth analysis, as the feedbacks from technology to the different explanatory factors are not as direct as with economic growth. Finally, we use a new and more complete data-set, allowing a test of the robustness of our results through a number of sensitivity exercises based on different definitions of our variables of interest and the inclusion of additional regressors.

Our results confirm that trade is important for TFP growth. Its effect is robust to joint consideration of the effects of scale and social capital. We do find that social capital enhances TFP growth in the wider country sample, whereas scale does not seem to matter. The partition of the sample into rich and poor countries yields relevant insights. While trade matters for both rich and poor countries´ technological progress, there is evidence that poor countries benefit most from trade with the OECD while rich countries benefit the most from trade with non-OECD countries. In a sense, trading with countries that are the most different from oneself seems to impact TFP growth the most. Social capital matters more in richer countries, which suggests that other characteristics present in richer economies ï such as good institutions ï may be complementary to social capital for it to an impact technological progress. Finally, there is evidence that scale does matter much. This is in line with micro-studies of the impact of scale on patent creation and country growth, which have concentrated on rich countries and have found no effect of scale.

The remainder of the paper is organized as follows: Section 2 discusses the relationship between trade, scale, social capital and economic growth. We also provide a brief discussion of the concept of social capital. In Section 3 we describe our main data. In Section 4 we present and discuss the empirical results. Section 5 concludes.

2. Trade, Scale and Social Capital

2.1 Trade

The existence of a positive relationship between trade openness and economic growth remains one of the most widely held priors held by economists, if not also by policymakers. Frankel and Romer (1999) have provided evidence that openness as determined by policy-choices increases a country´s rate of economic growth.[6] However, Rodriguez and Rodrik (1999) have raised doubts as to the robustness of the empirical finding of a positive relationship between trade and growth. These

[6] Helliwell (1996) found that the role of openness in explaining East Asian growth differences is, if anything, greater than for larger samples, such as those used in Frankel and Romer (1999).

authors also doubt the appropriateness of the openness indicators used, as they tend to be highly correlated with factors likely to cause poor economic performance independently of trade openness.

As to the relationship between trade and productivity growth specifically, a consensus is slowly emerging. Countries which are more open, the argument goes, should be more able to absorb (or imitate) technological advances produced in leading countries.[7] Edwards (1998) has explored a large sample of countries and used nine different openness indicators, uncovering a robust relationship between openness and total factor productivity growth.[8] A shortcoming of the existing studies is the lack of consideration of the role of other determinants of technological progress, which we address later in this paper.

2.2 Scale

Scale is the factor that has been most systematically associated with technological progress at the theoretical level.[9] As recognized by Jones (1999), the endogenous growth literature developed models where changes in the size of the economy result in either permanently higher growth or a higher long-run level of income. In spite of the clear theoretical insight, econometric estimates did not find support for the idea that scale matters for economic growth. Backus et al. (1992) investigated the link between country scale and the growth of manufacturing but found no clear correlation between the two. Jones (1995, 1997) analyzes directly the relationship between input in R&D and economic growth in OECD countries. Even if research inputs have increased tremendously in the past decades, economic growth has slowed down.

We should highlight two important characteristics of the empirical studies on scale and technological progress. First, since the existing literature has frequently relied on patent data, which are not available for poorer economies, its sample has been heavily biased towards the experience of rich industrialized countries. Second, there is little or no work on the relationship between scale and TFP growth. We address both issues in the current study.

2.3 Social Capital

The concept of social capital is as diffuse as it is potentially important. Authors have referred to social capital as relations of trust, consensual allocation of rights or generically as a network of ties

[7] See Romer (1992).
[8] Wacziarg (2001) examines the channels by which trade openness impacts economic growth and finds that technological transmission is second in importance only to capital accumulation.
[9] Scale effects have been successively associated with the amount of physical capital (Romer, 1986)), human capital (Romer, 1990)) or population (Jones, 1997)). Young (1995) calls scale effects "one of the most consistent implications of endogenous innovation".

across social groups. Coleman (1988) is credited with the term, which he defines as a public good but other authors have characterized it as a private good fraught with externalities.[10] Fukuyama (2000) defines social capital as "*an (é) informal norm that promotes cooperation between two or more individuals*".[11] We define social capital as a non-physical economic resource, produced jointly by a family, a group or society as a whole, which raises the productivity of private enterprise. Unlike physical capital, which involves financial payments for its production, social capital implies the exchange of non-financial resources, now or in the future, and the building of common resources.[12]

Social capital is relevant in transactions that entail complex negotiations or monitoring and involve difficult litigation or enforcement. Social capital is potentially extremely important, as most economic transactions are undertaken in a framework of incomplete contracts, where it is impossible to predict and stipulate for every possible contingency. These contractual difficulties may arise because transactions take place over time, across diverse groups (religious, ethnic or linguistic) or involve a player with overwhelming force (such as the state). Thus, any transaction in a setting of low mutual confidence between economic actors can be facilitated by social capital.

As with any other asset, the issue of "ownership" is important for social capital. In several traditional societies there is a high level of trust and social capital between members of a specific group - familial, ethnic or geographic -, but low levels of trust with any person outside the group. This, according to several authors, may not benefit society as a whole if trust within the group is "acquired" at the expense of distrust towards outsiders. As smaller and more closed groups tend to be excessively homogeneous and repress individuality, they may discourage innovation. Groups with "weak ties" to the outside maintain channels for new ideas and information.[13]

How does social capital affect economic growth? First, by expanding the number of possible players and the horizon over which exchange takes place, social capital increases the absolute number of economic transactions. Second, social capital is an input to well-functioning large organizations

[10] See Knack and Keefer (1997) for the historical genesis of the term and what the authors dub as the ñelasticityò of its meaning. See also Dasgupta (2000).

[11] This author proposes a conceptual measure of social capital which would be positively related to the number and membership size of groups in a given society, as well as the "radius of trust" for each group, including the people outside the group that are trusted by group members. A negative attitude of the group towards people outside the "radius of trust" would lower social capital.

[12] An alternative to this aggregate view of social capital is an individual-level definition of social capital. Social capital in a country would be the aggregate of individual social capital of its inhabitants, after all interactions are taken into account. Glaeser et al. (2000) make the case for this approach, defining social capital as the "individual's social characteristics ï including charisma, status and access to networks ï that enable that person to extract private returns from interactions with others". Glaeser et al. (2002) adapts traditional models of investment to the issue of investing in social capital.

[13] See Fukuyama (2000), who mentions the concept of "circles of trust". Putnam et al. (1993), in their study of Italian regions, also refer to the wider groups that are trusted in the prosperous North, versus the intense cooperation in the South, from which only closer persons benefit.

and efficient governments.[14] Third, societies with higher levels of trust and social capital develop better formal institutions. Where social capital is greater, government policies are more credible, property rights are enforced, public goods are adequately provided and the risk of expropriation by the state is minimal.[15] Or, alternatively, social capital leads to the emergence of informal institutions that work as good substitutes for more formal mechanisms.

The study of the relationship between social capital and aggregate economic growth is recent. Knack and Keefer (1997) have studied the impact of trust and norms of civic cooperation on economic performance for 29 market economies and found it to be significant. The effect of social capital on performance may be greater in poorer countries, where formal institutions are not available. These authors test the hypothesis that group participation has a negative impact on economic growth - as proposed in the classical argument on interest groups by Olson (1982) ï versus the Putnam et al. (1993) hypothesis that group participation impacts growth positively. Both types of group participation affect investment negatively but the evidence on aggregate growth is less clear. Knack and Keefer (1997) suggest that accumulation rather than increases in total factor productivity is the main channel between social capital and economic performance.[16] Temple and Johnson (1998) have shown that an indicator of ñsocial capabilityò compiled in the early 1960s predicts the varying growth performance of countries in the following decades. Zak and Knack (2001) found empirical support for their model prediction that social homogeneity and institutions further investment and growth. Rodrik (1998) analyses the small sample of East Asian nations and finds evidence that a substantial fraction of growth differences across countries is accounted for by the varying quality of institutions. In contrast, in Helliwell´s (1996) analysis of the role of East Asian institutions and social capital on the growth process does not support the view that social capital is important.

Previous studies of the relationship between social capital and aggregate economic performance have been characterized by the analysis of small samples, generally biased towards richer, market oriented economies. In the current paper we use a larger study sample to better assess how social capital impacts technological progress and also how this process differs between rich and poor countries.

[14] As in La Porta et al. (1997), who assess the importance of trust to the emergence and functioning of large business organizations.
[15] For instance, Knack and Keefer (1997) mention that a deficient enforcement of property rights distorts the investment horizon and discourages innovation, potentially affecting technological progress. Zak and Knack (2000) develop a general equilibrium model of transactions with moral hazard where there is an incentive to verify truthfulness of claims made by other players. Trust plays a role: in low trust environments, investment and growth are smaller; the level of trust itself increases with individual homogeneity and is higher where legal and social mechanisms (institutions) constrain opportunism.
[16] Temple and Johnson (1998) find that one social indicator, related to the density of mass communications, has a direct and robust effect on TFP growth, but in general most of the impact of social indicators is on factor accumulation.

3. Data

We investigate the relationship between total factor productivity, trade, scale and social capital in a sample of 59 countries over the 1970-2007 period. The dataset excludes countries with poor data collection, as in this case measurement error is likely to be large. Data are averaged for each five-year period from 1970-75 to 2005-2010.[17] The dataset was collected from several sources.[18] As for other controls most come from either the WDI or the IMFôs IFS, but the reader should refer to Appendix 2 for further details.

We construct a new dataset for TFP, for a set of 59 developed and developing countries in the period 1970-2007.[19] National income and product account data and labour force data are obtained from the latest version 6.3 of the Penn World Table (PWT) of Heston et al. (2009). We gathered "*GDPpw*" (real GDP per worker) and constructed "*I/Y*" (physical capital to output ratio). To construct the labour quality index of human capital (H), we took average years of schooling in the population over 25 years old from the international data on educational attainment (*E*) by Barro and Lee (2010). Annual data on years of schooling from 1970 up to 2000 were retrieved from Klenow and Rodriguez-Clare (2005) dataset and then complemented with information up to 2007 using the Barro and Lee (2010) dataset by means of linear interpolation.

We end up with seven different TFP proxies (to be used alternatively for robustness purposes) that vary with two underlying parameters: the capital-income share and the return to education. Our main TFP measure ï *TFP1* ï uses the average capital income share of 33 percent and the average labor income share of 66 percent, widely used in the literature,[20] and a return to education that may vary between 6.8% and 13.4%. See Appendix 1 which details the construction of the TFP measure.

We proxy for technological spillovers using the country trade share of GDP and the growth of the countryôs trade partners weighted by the bilateral trade share. While higher trade intensity may be associated with more technological spillovers, it is likely that trade partners that are growing fast will be those providing the most beneficial spillovers. We also decompose each of these measures into OECD and non-OECD. We expect that OECD countries are those at the technological frontier and poor countriesôs technology benefits most from imitation of innovations flowing in through trade with their OECD partners. On the other hand, trade with countries not at the technological frontier

[17] With the exception of real per capita GDP, measured at the beginning of each period. Naturally, the last period corresponds to a 3 year average between 2005 and 2007. All variables are in logs with the exception of shares and growth rates.
[18] A summary table with definitions, acronyms and sources is presented in Appendix 2.
[19] The full list of countries can be found in Appendix 3.
[20] See, e.g., Barro and Sala-i-Martin (1995).

may also be an important source of technological progress if for some reason these technologies are more appropriate for use by the importing country.

Our indicators of country scale capture different factors that have been associated with technological progress in the endogenous growth literature: aggregate output (real GDP), the total capital stock, land area, population, and the number of workers or labour force.

Our indicator of social capital is first and foremost composed of a measure of trust assembled in the World values Survey, hereafter ñTrust (WVS)ò, also used reported in Knack and Keefer (1997).[21] To assess the level of trust in a given society the question used in the WVS is: ñGenerally speaking, would you say that most people can be trusted, or that you canôt be too careful in dealing with people?ò. This indicator is available in several waves for our sample of 59 countries. Overall, the WVS has been enlarged to include more and more countries and the trust indicator now covers 88 countries.[22]

To assess the effect of social capital on technological progress we rely on different variablesô definitions for robustness purposes. The first approach is the use of alternative proxies for social capital, variables associated in the literature with the level of trust, participation and institutional development. Measures such as ethnic, linguistic and religious fractionalization, and civil liberties, are generally available for wider samples. Fractionalization measures give the probability that two individuals randomly selected from the population do not belong to the same ethnicity, share the same language, or the same religion.[23] Civil liberties are assessed using the Freedom House indicator, keep the extent to which freedom of association and of expression are available. We see these variables proxying trust and cooperation at the family, group and state levels. We also use country latitude as a proxy for social capital, following on results by Acemoglu et al. (2001), who show that different physical conditions related to latitude have led to very different varieties of colonization and, thus, of institutions.

The second approach is to construct an indicator of trust using the predicted value of the regression of Trust on the proxies above, a variable which we call *SC1*. [24] The correlation between Trust and computed Trust (*SC1*) is 0.64. Alternatively, we can use the same exact proxies and rely on

[21]Researchers attempt to quantify social capital in two ways: through surveys that measure how much individuals trust others; through group participation data. Glaeser et al. (2000) have shown that trust is related to the probability of repeated interaction, i.e., whether the players belong to the same ethnic group, have friends in common, or how long they have known each other.

[22] This set of 88 countries will be used in the descriptive statistics section later. Due to data availability on the construction of our TFP proxies constrained us to use at most 59 countries in our final sample.

[23] Alesina, Baqir and Hoxby (1999) have found that public policies are less efficient in heterogeneous localities in the United States and La Porta et al. (1999) and Glaeser et al. (2000) suggest that trust and same group membership are associated with low quality of government with heterogeneous communities.

[24] Changing the composition of included regressors, by dropping variables, or including the legal system dummies does not substantially alter predicted values.

factor analysis to extract, via Principal Component Analysis (hereafter PCA), the first common factor ï which we call *SC2*. The first principal component is normalized in such a way that high values indicate higher social capital.[25] The first principal component explains 99.1% of the total variance in the standardized data.[26]

Thirdly, the strength of norms of civic cooperation is assessed from WVSôs responses on whether each of the following behaviour ñcan always be justified, never be justified, or something in betweenò: a) claiming government benefits which you are not entitled (wvs114); b) avoiding a fare of public transport (wvs115); c) cheating on taxes (wevs116); d) someone accepting a bribe (wvs117). Respondents chose from 1 (never justifiable) to 10 (always justifiable). We reversed these scales, so that larger values indicate greater cooperation and summed values over the four items to create *CIVIC* with a 40-point maximum.[27]

Our final measure of social capital ï *SC3* ï also makes use of factor analysis to combine the previous set of social capital-related variables and then taking the first common factor. In this case, the sampling technique is unfortunately restricted by the fact that cross country coverage is limited and varies widely across different data sources. This limitation creates an incomplete data issue and poses a problem for the PCA that we wish to employ.[28] In this case, imputation is required prior to extracting the first principal component.[29] The Expectation-Maximization Algorithm (EMA) as suggested by Dempster et al. (1977) is used to fill in missing data. [30] As before, the first principal component is normalized in such a way that high values indicate higher social capital. In this case, the first principal component explains 72.2% of the total variance in the standardized data.[31]

All in all, the correlation coefficient between the WVS measure of trust and the remaining proxies for social capital varies between 0.19 and 0.54 (and is statistically significant at usual levels).

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[25] Our standardized index, *SC2*, can be written as: $SC2 = 0.46cl + 0.84ethnic + 0.74linguist + 0.22relig + 0.65lat$. A likelihood ratio test was used to examine the ñsphericityò case, allowing for sampling variability in the correlations. This test comfortably rejects sphericity at the 1% level with a Kaiser-Meyer-Olkin measure of sampling adequacy equal to 0.745.

[26] Given that the PCA is based on the classical covariance matrix, which is sensitive to outliers, we take one further step by basing it on a robust estimation of the covariance (correlation) matrix. A well suited method is the Minimum Covariance Determinant (MCD) - we implement Rousseeuw and Van Driessen's (1999) algorithm. After re-computing the same measure with the MCD version we obtain similar results, meaning that outliers are not driving our factor analysis (the correlation coefficient between the two equals 93.09%, statistically significant at 1% level).

[27] The mean value for CIVIC is 9.11 with a standard deviation of 2.32.

[28] Moreover, the lack of data also increases the degree of uncertainty and influences the ability of draw accurate conclusions. Indeed, PCA is based on an initial reduction of the data to the sample mean vector and sample covariance matrix of the variables, and this cannot be estimated from datasets with a large proportion of missing values (Little and Rubin, 1987).

[29] The varimax rotation method, which is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a factor on all variables in a factor matrix, is chosen.

[30] Our standardized index, *SC3*, can be written as: $SC3 = 0.67wvs114 + 0.84wvs115 + 0.74wvs116 + 0.78wvs117$. A likelihood ratio test was used to examine the ñsphericityò case, allowing for sampling variability in the correlations. This test comfortably rejects sphericity at the 1% level with a Kaiser-Meyer-Olkin measure of sampling adequacy equal to 0.775.

[31] Again, using the MCD approach, the resulting measure has a correlation coefficient with SC3 of 90.38%, statistically significant at 1% level).

Our benchmark specification uses initial income per capita as well as an indicator of human capital as a basic set of controls. Income per capita is meant to capture any "convergence-like" effects whereby countries that are poorer may display faster technological progress. This can result from the fact that the cost of imitating is lower than the cost of innovating, as the fixed cost of developing a new idea is not incurred when imitating.[32] Human capital and social capital may have related impacts on TFP growth, and controlling for the former is key. Goldin and Katz (1999), for example, have argued that social capital in the United States Midwest facilitated the rise of the high school. Knack and Keefer (1997), Edwards (1998) and Rodrik (1998) have all used human capital controls in previous studies. In this paper we rely on measures of human capital rather than primary or secondary school enrollment, which are flows and are imperfectly related to human capital. We use the average years of primary and secondary schooling of the population over 25 years old, as well as the percentage of primary and secondary school completed from Barro and Lee (2010), and the literacy rate, in percentage of adult population from Vanhanen (2003).

4. Evidence

4.1 Descriptive Statistics

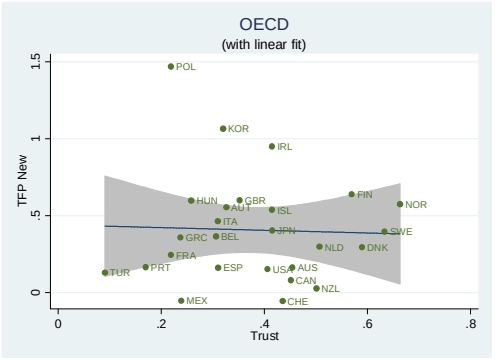
Tables A.4.1 and A.4.2 in Appendix 4 show summary statistics and correlation coefficients for our different measures of social capital. Plotting the correlation between Trust and CIVIC (not shown) we get a positive slope, suggesting a positive correlation.[33] Similarly, we get positive correlation if we plot trust with either GDP per capita growth or investment-to-GDP ratio or human capital (proxied by secondary schooling; corresponding to the one with the highest correlation with Trust, 0.51). No statistically significant relation is found in the case of trade openness.

Turning to our main variable of interest, TFP growth, plotting it against Trust (and not controlling for any other variable) for the full sample we get a slightly positive slope (Figure 1.a) and this relationship seems to be stronger in emerging and developing countries (Figure 1.c) and in OECD countries, where nearly no effect can be extracted (Figure 1.b).[34] Table A.4.3 in Appendix 4 corroborates the graphical findings.

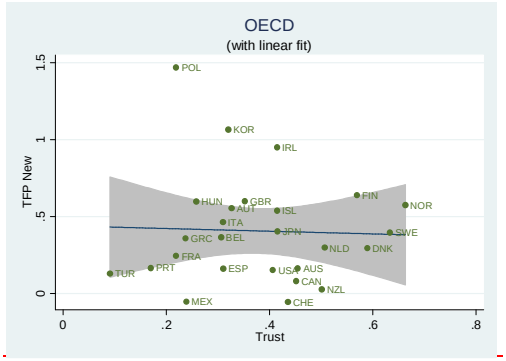
[32] This mechanism is modeled in Barro and Sala-i-Martin (1995, Chap. 3).
[33] Knack and Keefer (1997) suggest trust and CIVIL are mirror images of each other. The simple correlation is 0.36; the partial correlation (controlling for GDP per capita) is 0.31. Evidence is slightly stronger in the case of OECD countries (0.4).
[34] Figures with alternative TFP measures, other than ñ*TFPnew*ò convey a similar message and are available upon request

Figure 1: WVS Trust and TFP growth

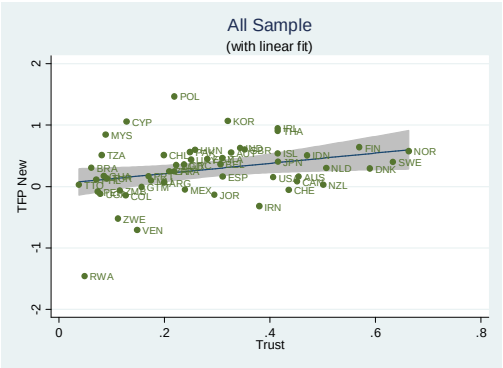
(a)



(b)



(c)

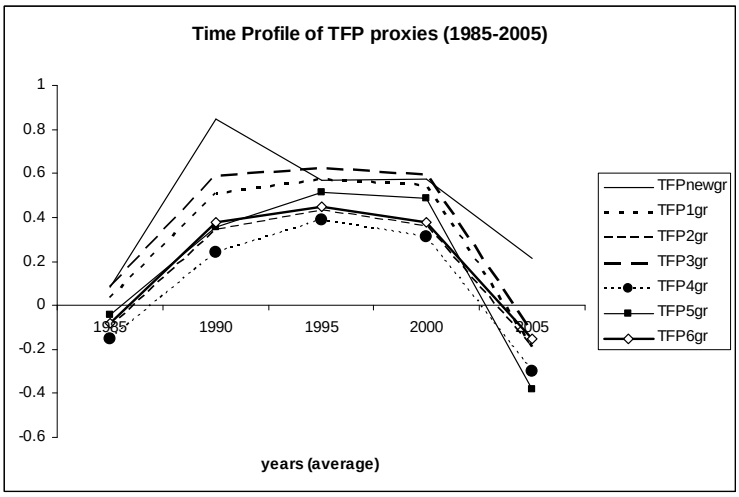


(c)

Note: authorsô calculations. **Source:** WVS and PWT.

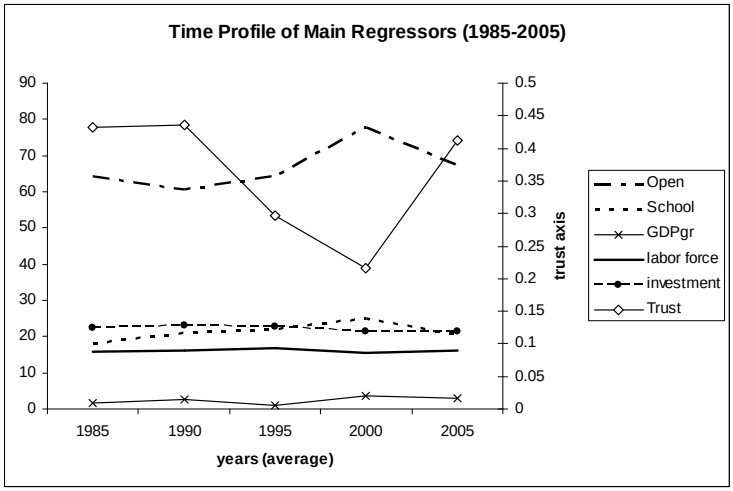
Finally, as we have our panel in terms of 5 year-averages we can plot the time profile of our main dependent and independent variables. It seems that TFP growth increased between the 1980s and the 1990s but it then experienced poor growth during the 2000s ï Figure 2.a. On the other hand, the degree of overall trust reduced during the 1990s but it then revived in the 2000s - Figure 2.b.

Figure 2.a: Time Profile of TFP growth



Note: authorsô calculations.

Figure 2.b: Time Profile of Trade, Schooling, GDP growth, Scale, Investment and Trust (1985-2005)



Note: authorsô calculations.

4.2 Empirical Results

4.2.1 Model Selection

It is well known that the inclusion of particular control variables in a regression can wipe out (or change the signs of) any given bivariate relationship.[35] The motivation for using techniques dealing with model uncertainty rests on concerns over the robustness of the candidate variables in cross-section regressions explaining different patterns of real income growth. With these constraints in mind, we follow Leamerôs (1983) extreme bounds analysis (EBA) and Levine and Reneltôs (1992) empirical application of this test. Adapted to our context, this implies the estimation of regressions of the form:

$$Y = a_j + b_{yj} y + b_{zj} z + b_{xj} x_j + \varepsilon, \qquad (2)$$

where *y* is a vector of fixed variables that always appear in the regressions (initial level of income per capita, initial price of investment and a measure of educational attainment), *z* denotes the variable of interest (our different measures of social capital), and x_j is a vector of three variables taken from the pool of *X* additional plausible control variables. The regression model has to be estimated for the *M* possible combinations of $x_j \in X$. If the lower extreme bound is negative and the upper extreme bound is positive, the variable is considered not to be robust (Sala-i-Martin, 1997). As alluded before in Section 3, our dataset is further extended by a range of variables that can reasonably be argued to be exogenous to trust (instead of identifying all potentially relevant explanatory factors for growth (see, Durlauf and Quah, 1999). The reason for this restriction, similarly to Beugelsdijk et al. (2004) is that if one expects that a certain variable of interest (such as trust) influences productivity growth through the variable to test robustness, then a reduction in the significance of this variable does not necessarily result in a valid conclusion about robustness, but instead confirms the underlying hypothesis of multicollinearity. To limit that this problem affects the conclusion too strongly, we decided to select conditioning variables that have a correlation coefficient with trust of less than 0.25 (in absolute value). This leaves us with 25 switch variables implying ${}^{25}C_3 = 2300$ possible combinations of $x_j \in X$. Vector X is composed of the following variables[36]: *freedom of speech, executive constraints, government expenditure, openness, population, exchange rate, area, central government debt, exports, FDI, imports, inflation, real interest rate, total debt service, terms of*

[35] See Easterly and Rebelo, 1993

[36] Definitions and sources in the Appendix 2.

trade, unemployment, British legal origin, German legal origin, population density, years in office, labor force, central bank assets, bank credit, liquid liabilities, size of government.

Table A.4.4 presents our EBA results for each of our 7 dependent TFP growth variables where we just report the lower and upper bounds for our social capital proxies for reasons of parsimony. We confirm the positive influence, statistically significant at usual levels, of all social capital measures on TFP growth (or the negative in the case of ethnic, linguistic or religion fractionalization).

An important question is to whether the size of the trust coefficient is influenced by the inclusion of specific conditioning variables. In order to test for this, we have computed the conditional mean effect size of (WVS) trust, i.e., the mean effect size conditional on the inclusion of a specific variable of the set of 25 switch variables that were previously selected. Figure A.4.1 graphically illustrates the results of our analysis for the (conditional) mean effect sizes.

In order to provide some quantitative intuition for the observed variation, we have determined what the minimum and maximum average estimated coefficient implies in terms of the predicted productivity growth differential. We compare a hypothetical country that is characterized by a value of trust that exceeds the average of all countries in the sample by one standard deviation and a hypothetical country with a value of trust that is one standard deviation less than the average of all countries in the sample. The trust variable in our dataset has a mean value of 0.29 and a standard deviation of 0.16. We thus compute the predicted productivity growth differential between a countries with a score on trust equal to 0.13 (close to, e.g., Algeria or Zambia) and a country with a score equal to 0.45 (close to, e.g., Australia or Canada). If we take the highest conditional average, the predicted productivity growth differential equals 0.49%, whereas if we take the lowest conditional average, it equals 0.23%.

4.2.2 Regression Analysis

We now turn to the regression analysis and Tables 3 and 4 present our preliminary set of results. In Table 1 we successively add alternative indicators of social capital, openness and scale to our basic equation, defined as:

$$TFPgr^{\,j}{}_{it} = \alpha_{it} + \beta_0 y_{io} + \beta_1 H_{it} + \beta_2 Open_{it} + \beta_3 Scale_{it} + \gamma SC_{it} + \beta_4 x^{\,j}{}_{it} + \varepsilon_{it}, t = 1,...,T; i = 1,..,N \quad (1)$$

where $TFPgr^{\,j}{}_{it}$ represents the growth rate of TFP with j varying between ñ*TFPnew*ò and ñ*TFP1*ò through ñ*TFP6*ò; y_{i0} is the initial value of the real GDP per capita; H_{it} is a proxy for human capital given by secondary school years; $Open_{it}$ refers to trade openness; $Scale_{it}$ is captured by the number

of workers[37]; SC_{it} stands for a social capital measure; and x_{it} is a vector of control variables. ε_{it} is some unobserved zero mean white noise-type column vector satisfying the standard assumptions. $\alpha, \beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ and γ are the unknown parameters to be estimated. Variables of interest change across countries and over time, with the obvious exception of initial GDPpc.

In Table 3 we successively add alternative indicators of openness, scale and social capital to our basic equation (1) where we initially impose the restrictions $\beta_2 = \beta_3 = \beta_4 = \gamma = 0$. We report ordinary least squares estimates and heteroskedastic-consistent standard errors.

Focus on the panel with ñ*TFPnew*ò in Table 1. The proxies for social capital come out with the expected sign, with more ethnic, linguistic or religious fractionalization and lower levels of civil liberties decreasing TFP growth.[38] The coefficient on civil liberties, however, is not significant, suggesting that social capital at the family and group level may be more important than social capital at the level of government functioning. Latitude also comes out as significant, and higher latitudes, meaning higher distance from the equator correlate with higher TFP growth. Notice, however, the small R-square, indicating the small fraction of explained variability in TFP that is explained by these variables. The introduction of trade indicators increases the explanatory power of the regression. The weighted growth rate of a countryôs trade partners comes out as very strongly significant and increases the equation R-square from 0.03 to 0.08.[39] The introduction of any of the four scale indicators shows that scale does not (substantially) affect technological progress for the overall sample (apart from output growth or real GDP growth). The coefficients on the number of workers and the capital stock come out insignificant. Other panels in Table 1 ï for alternative TFP proxies - convey a similar message, which suggests again the relevance of the uncovered relationships. Finally, a higher human capital stock leads to faster technological progress while higher GDP per capita is associated with lower TFP growth. These results are in line with the most frequent priors in the literature.

[Insert Table 1 about here]

Table 2 estimates equation (1) with ethnic fractionalization as our ñ*SC*ò measure, using both OLS and Random Effects estimators. In column (2) we add Year and Region Dummies to the OLS

[37] For reasons that will become apparent, we keep the number of workers in the coming specifications. The coefficent estimates and significance on the other variables do not change with the choice of the scale variable.

[38] Curiously, and robustely, religious fractionalization does not impact TFP growth in the same manner (throughout the different panels) as Ethnic or Linguistic fractionalization. It also does not correlate with the measure of Trust in the same way. Alesina and LaFerrara (2000) show that ethnic heterogeneity and unequal income distribution decrease a community's social capital, but that religious beliefs and ethnic origins per se do not significantly affect trust.

[39] Since the raw trade share, though mildly significant, does not explain TFP growth variability as much, hereinafter we report results for the Growth of Trade Partners only. Results for the trade share are available on request, and are entirely in line with those reported for trade share.

specification and find that most results from Table 1 stand the test. Interestingly the proxy for social capital sees its effect reduced when year dummies are added. When we use the Random Effects estimator (specifications 3 to 9), which optimally chooses from the within and between variability to estimate the coefficients, and different definitions of TFP growth, all results from Table 3 hold: trade and social capital matter for TFP growth (and to some extend education) but scale does not. Recall that our different TFP growth proxies use different capital and labor income shares ï between 0.33 and 0.66 for capital ï as well as different weights attributed to the role of human capital in the underlying aggregated production function. One can verify how results barely change. Our regressions explain a substantial fraction, between 16 and 32 percent, of the between variation.

[Insert Table 2 about here]

4.2.3 Rich vs. Poor Countries

In Table 3.a and 3.b we investigate whether the determinants of TFP growth differ in poor and rich countries.[40] We use membership of the OECD to classify countries as emerging and developing. Our results are clear: the determinants of technological progress in rich and in poor countries do not tell us much about technological progress are different.

[Tables 3.a and 3.b here]

Trade emerges as one of the most important determinant of technological progress in poor and rich countries alike. A 1 percent higher growth of their trade partners significantly raises the growth of rich countries by 0.25 and that of poor countries by 0.39. The breakdown of the trade partners into OECD and non-OECD reveals a subtle but important difference: a country rate of TFP growth seems to increase the most the more the country trades with dynamic economies that are more different from its own. In other words, for poor countries, it is trade with the OECD that delivers the higher growth rates in TFP, while for rich countries the benefit derive mostly from trade with non-OECD countries. The results on scale show there is no significant impact particularly on rich countries and if any it can even be negative in poorer countries. These results are robust for different definitions of scale and suggest that the emphasis on the importance of scale for the production of ideas in the endogenous growth literature may be overstated. Lastly, the results on social capital ï again, similarly to Table 2, proxied by ethnic fractionalization - point to robust similarities between poor and rich

[40] This issue is alluded to in Knack and Keefer (1997), but the sample of the World Values Survey used in that paper and later in this paper is biased towards rich market economies and does not deliver conclusive results.

countries. Social capital benefits both rich and poor countries.[41] A 10 percent increase in Ethnic fractionalization decreases yearly TFP growth in rich countries by 0.69 to 1.32 annually; and in poor countries by 0.93 to 1.17 annually.

As an additional check of robustness we assess the importance of the different social capital proxies including the (WVS) Trust variable from Knack and Keefer (1997) as determinants of TFP growth. In Table 4 we re-estimate the equation presented in Tables 3.a-3.b for different measures of social capital. For reasons of parsimony we only report the coefficients for this variable of interest for both rich and poor countries and for each of the 7 TFP growth proxies. In the sample that uses the actual variable, in line (1) of Table 4, we verify that social capital does not significantly affect TFP growth.[42] In this smaller sample (due to data availability) the original Trust variable comes out as non-significant even when only the basic controls are used. We have reasons to believe the results in this sample do not provide reasonable estimates of the effect of the regressors on TFP growth. In lines (2) through (10) we use our alternative social capital measures as described in Section 3.

[Table 4 here]

The most influential social capital proxies are ethnic fractionalization (as previously attested), linguistic fractionalization, latitude, *SC1* and *SC2*. There are four cases in which higher religious fractionalization decreases TFP growth in rich countries; and one case of higher *CIVIC* increasing TFP growth in poor countries. Given the larger sample and greater explanatory power attributed to *SC1* we shall focus most of our attention in this proxy for the remainder of the paper. The fact that social capital matters, more so in richer countries (higher statistical significance in Table 3.b relative to Table 3.a), suggests that other characteristics, such as sound institutional quality, may be complementary to social capital. This evidence is in line with Baliamoune-Lutz (2011) who suggests that social capital enhances the contribution of institutions.[43]

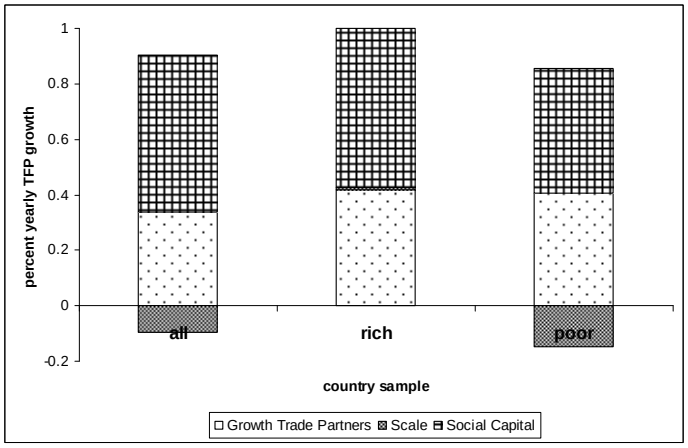
Figure 3 below is a graphic display of our results. We use the coefficients on the regressors in line 7 of Table 4 for the *SC1* proxy, their standard deviations, to display the relative importance of each factor to TFP growth. The product of the coefficient by the standard deviation of the regressor tells us the potential the variable has to change the rate of technological progress.

[41] This is in contrast to Knack and Keefer (1997), who present suggestive evidence that the effect of trust on income per capita growth is more pronounced for poor countries.

[42] Even for this smaller sample, the sign of the correlation between Trust and other social capital proxies is as expected: negative with Ethnic and Linguistic fractionalization and positive with latitude. Religious fractionalization is actually positively related with Trust. Recall Table A4.2 in Appendix 4.

[43] Some studies have even focused on the role of social capital, in the form of cooperative behaviour, norms and values in a society, in enhancing trust among individuals and facilitating transaction by reducing (or eliminating) information and monitoring costs, which are associated with institutional development (Coleman, 1990; Putnam, 1993; Knack and Keefer, 1997; Ostrom, 2000; Woolcock and Narayan, 2000).

Figure 3: Determinants of TFP growth in Rich and Poor Countries



Note: authorsô calculations.

From the graph we can read off the effect of each regressor, its sign and the sum total of effects.[44] The first salient fact is the importance of trade to TFP growth. The growth of trade partners impacts own TFP growth in the whole sample and for rich and poor countries so that a one standard deviation in growth of trade partners leads to a 0.25 percent increase in TFP growth. As previous tables have shown, scale has a residual impact on TFP growth. Finally, social capital also has an impact of the same order of magnitude as trade.

4.3 Robustness Exercises

4.3.1 Sensitivity Regressions

The results in the previous tables are fairly insensitive to modifications in equation specification. However, influential outliers could play an important role in cross-section analysis. The sample sensitivity of some cross-country empirical studies is well known. With this in mind, one additional advance in this paper is the use of two robust estimators, the Method of Moments (MM)[45] and the Least Absolute Deviation (LAD).[46] These procedures help exclude the most damaging outliers, including some that would not be ruled out by more conventional diagnostics.

[44] Note that a negative sign for the impact of a variable on TFP growth means that a lower level of that attribute is associated with more innovation.

[45] This fits the efficient high breakdown estimator proposed by Yohai (1987) which on the first stage takes the S estimator applied to the residual scale and derives starting values for the coefficient vectors, and on the second stage applies the Huber-type bisquare M-estimator using iteratively re-weighted least squares (IRWLS) to obtain the final coefficient estimates.

[46] This minimizes the sum of squares over half the observations. One way of thinking about this informally is that the estimator seeks out part of the data for which the model has greatest explanatory power (as measured by the coefficient of determination) and then bases the parameter estimates on just that portion of the data. We then exclude any observations for which the LAD residual is more

Table 5, similarly to Table 6, only reports the estimated coefficients on the social capital proxy under scrutiny. Lines 1 and 2 use the two methods for excluding the relevant outliers. The table groups similar variables under a specific heading, *Education*, *Scale* and *Open*, each replacing the ones in the basic regression (1) one at the time. We estimate *SC1* using 7 different TFP growth proxies as the dependent variable.

[Table 5 here]

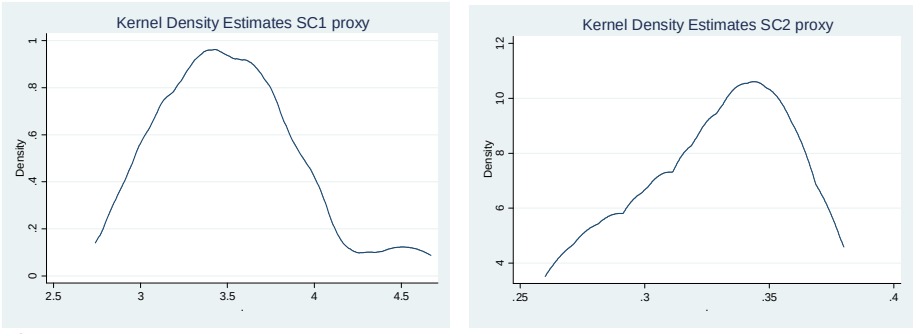
A first note is the fact that *SC1* remains statistically significant irrespectively of the variable changed, or the outlier(s) excluded or the TFP indicator used. Now going back to our benchmark equation (1) we assess how coefficient estimates for social capital proxies vary with the inclusion of one additional regressor one at a time in x_{it}. Table 6 presents our results and it is organized similarly to Table 5. Adding regressors does not alter the sign or the statistical significance of *SC1*.

[Table 6 here]

There are yet other (policy) variables that can affect social capital or trust estimates to a somewhat greater extent. Some of them are particularly sensitive to social polarization, such as measures of inequality ï the Gini coefficient -, a source of polarization that has been linked to unstable macro policy and to uncertain property rights. There are theoretical reasons to expect inequality to lower trust and weaken civic norms (data availability on the Gini coefficient constrained its use for regression purposes).

One can summarize the distribution of all the coefficient estimates presented in Table 6 by plotting its kernel density ï see Figure 4.

Figure 4: Kernel Density Estimates for the coefficient estimate on SC1 (from Table 6) and SC2 (not shown) (All Sample)



Note: authorsô calculations.

than two standard deviations from the mean residual, before re-estimating the model. When the two sets of estimates are very different, then it may be previous coefficient estimates are driven by a few outliers.

4.3.3 Reversed Causality and Endogeneity

It is important to tackle the issue of causality. It is a possibility that it is higher levels of prosperity that further social capital, so that causation is reversed.[47] [48] One first way to address causality is that we are working with TFP growth rather than economic growth in itself, and it is harder to conceive reasonable stories for reverse causation. Moreover, some of the proxies for social capital employed in this paper, including, e.g., measures of fractionalization and latitude, can be argued to be exogenous to technological progress. In any case, we can attempt to instrument for social capital using its exogenous determinants. What are those? Social capital may stem from value systems handed down by certain religious or legal systems,[49] created by shared historical experience and facilitated by the sharing of ethnic, religious or linguistic characteristics by a wide population. The paradigmatic case is the argument by Max Weber (1958) that protestantism made capitalism feasible by extending the virtues of honesty and reciprocity beyond the closed family and religious circle to society at large. Alesina and La Ferrara (2000) argue that social and cultural attitudes, as well as legal institutions, may affect trust. Also, measures of ethno-linguistic fractionalization have been used as an instrument for trust, e.g. in Knack and Keefer (1997). Another possible instrument would be geography, as in Acemoglu et al. (2001), who use latitude, and colonial origin as possible instruments for national institutions.

With the above considerations in mind, we have re-estimated our regressions using the bias-corrected least-squares dummy variable (LSDV-C) estimator by Bruno (2005). Furthermore, we have complemented it by estimating our main equation (1) using a panel Instrumental Variable-Generalized Least Squares (IV-GLS) approach and Generalized Methods of Moments (GMM). We rely on the system-GMM (SYS-GMM) which jointly estimates the equations in first differences, using as instruments lagged levels of the dependent and independent variables, and in levels, using as instruments the first differences of the regressors. In the present case, the choice of lags was directed by checking the validity of different sets of instruments and we rely on comparisons of first stage R-squares.[50]

[Table 7 here]

[47] As mentioned in Fukuyama (2000), Adam Smith recognized that the frequency and intensity of interactions in a commercial society builds social virtues such as honesty, an element of social capital.

[48] An empirical study by Miguel et al. (2001) has uncovered a relationship between industrialization and higher density of community organizations across Indonesian districts.

[49] Social capital may be seen as a substitute for or a complement to a well-functioning legal system, as mentioned in Glaeser et al. (2002).

[50] Intuitively, the system GMM estimator does not rely exclusively on the first-differenced equations, but exploits also information contained in the original equations in levels.

In Table 7 we present our LSDV-C, IV-GLS and SYS-GMM results with a selection of four different social capital proxies, namely, Civil Liberties (*CL*), (WVS) Trust, *CIVIC*, ethnic fractionalization (*ethnic*) and *SC1*. Empirical findings confirm previous conclusions as far as the negative effect of initial income and the positive effect of human capital and trade on TFP growth are concerned. Social capital seems to matter for TFP growth even after accounting for possible endogeneity problems, in particular results in specifications (2), (3) (9) and (12).

5. Conclusion

This paper analyzes how trade, scale and social capital affect a countryôs rate of technological progress. Endogenous growth theory and the recent literature on social capital have suggested these as the main determinants of technological progress. In a panel dataset of developing and developed countries we find that higher trade intensity (particularly with fast growing countries), and higher levels of social capital all increase the rate of Total Factor Productivity growth. However, these results are robust to different specification and estimation methods.

When trade is decomposed into trade with OECD or non-OECD partners we find that technological progress in poor countries increases the most the more the country trades with OECD countries, while for rich countries it is trade with the non-OECD countries that delivers the fastest technological progress. Even after controlling for additional determinants of technological progress, our paper adds novel evidence that the effects of trade are different for poor and rich countries. We interpret this evidence as suggesting that imitation of developed countries´ technologies is the fastest avenue for technological progress in poor countries.

The fact that social capital matters, and more so in richer countries, suggests that other characteristics that are present in these group of economies ï such as good institutions ï are complements, rather than substitutes for social capital.

The policy implications of the paper become clear as scale is not a policy variable in a meaningful sense, and social capital is not easily created through deliberate public policy.[51] The origin and composition of trade, on the other hand, may be affected by purposive economic policy; and if it is confirmed that trade matters because it facilitates the import of new technologies, any policy that facilitates this transfer can affect domestic technological progress. In addition, because higher levels of trade openness increase the effective scale of the domestic market and foster the accumulation of

[51] As argued by Fukuyama (2000).

social capital through new values and ideas, this paper confirms the importance of trade to technological progress.

The non-existence of an impact of scale in rich economies confirms the empirical literature using data on patent registrations, which has consistently found no effect of scale on technological progress. One implication is that the endogenous growth literature has over-emphasized the role of scale in the production of new ideas directly, and may want to give more attention to the role of scale for the import and imitation of existing technology.

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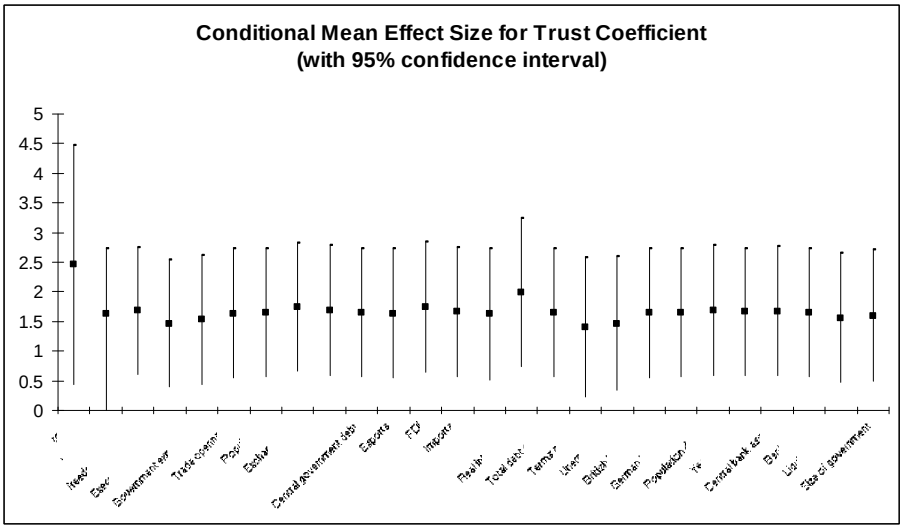
Figure A.4.1: Conditional Mean Effect Size for (WVS) Trust Coefficient (All Sample)



Note: authorsô calculations.

The vertical bars in the figure represent the 90% confidence bands around the average (conditional) estimated trust coefficient (indicated by the bold circles). The 25 conditioning variables indicated on the horizontal axis are organized as they were included in the EBA exercise. The conditional mean effect size ranges from 1.402 in the case of Terms of Trade to 1.989 in the case of real interest rate. However, Figure A.4.3 also shows that all confidence intervals overlap, suggesting no statistical significant effect of the choice of conditioning variables on the size of the relationship between trust and TFP growth (the ñ*TFPnew*ò in Table A.4.4).

Appendix 1: Growth Accounting ï TFP

For human capital (*H*), we follow Hall and Jones (1999) and Klenow and Rodriguez-Clare (2005) in giving a larger weight to more educated workers:

$$H = \exp(\phi(E)) \qquad \text{(A1)}$$

where *E* is the average years of schooling; and the function $\phi(E)$ is piece linear with slope of 0.134 for $E \le 4$, 0.101 for $4 < E \le 8$ and 0.068 for $8 < E$. The wage of a worker with *E* years of education is proportional to her human capital. Since the wage-schooling relationship is widely believed to be log-linear, this would imply that *H* and *E* would have a log-linear relation as well, such as $H = \exp(\phi * E)$. International data on education-wage profiles (Psacharopoulos, 2004) suggests that in Sub-Saharan Africa the return to one extra year of education is about 13.4%, the world average is 10.1% and the OECD average is 6.8%. We estimate the capital stock, *Ky*, using the perpetual inventory method:

$$Ky_t = I_t + (1-\delta)Ky_{t-1} \qquad \text{(A2)}$$

where I_t is the investment and δ is the depreciation rate. Data on I_t are from PWT 6.3 as real aggregate investment in PPP. We estimate the initial value of the capital stock (Ky_0), in year 1950 as $I_{1950}/(g+\delta)$ where *g* is the average compound growth rate between 1950 and 1960, and δ is the depreciation rate (set to 8% for all countries and years).

TFP was then based on a Cobb-Douglas aggregate production function of the type $Y = AK^{\alpha}(HL)^{1-\alpha}$, following the neoclassical tradition, where α =capital-income share, *K*=physical capital, *H*=human capital, *L*=labour input and *A*=TFP. After some mathematical manipulations (dividing both sides by *L*, taking logs and time derivatives and rearranging) TFP is computed according to the equation below:

$$TFP_{it} = GDPpw_{it} / [(I / Y_{it} * GDPpw_{it})^{\alpha}.\exp(\varphi * H_{it})^{(1-\alpha)}]. \qquad \text{(A3)}$$

We construct seven different measures of TFP. The first one, our benchmark proxy *TFPnew*, takes a capital-income share $\alpha = 1/3$ [52] and the return on education, $\phi(E)$, varying between three alternative slopes (previously defined) depending on the countryôs educational stage at a certain point in time. Our second proxy, *TFP1*, keeps $\alpha = 1/3$ but fixes $\phi(E)$=0.085 (which corresponds to the average value-this is Klenow and Rodriguez-Clare equivalent measure). Proxies 2 to 6 alter the combinations between the capital-income share and the return on education as follows: *TFP2*, *TFP3*, *TFP4*, *TFP5* and *TFP6* take $\alpha = 2/3$, $\alpha = 1/3$, $\alpha = 2/3$, $\alpha = 1/3$ and $\alpha = 2/3$, respectively, together with $\phi(E)$=0.085, $\phi(E)$=0.068, $\phi(E)$=0.134, $\phi(E)$=0.134, $\phi(E)$=0.068, respectively.

[52] Since consistent data of factor income shares are difficult to obtain for individual countries, most empirical papers assume that income shares are identical across time and space. Gollin (2002) provides strong evidence supporting this assumption, which is also consistent with the Cobb-Douglas function approach. Moreover, Bernanke and Gürkaynak (2001) find no systematic tendency for labour shares to vary with real GDP per capita or the capital-labour ratio nor a systematic tendency to rise or fall over time, and most estimated labour income shares lie between 0.6 and 0.8. For our own purposes we take it to be equal to 2/3.

Appendix 2: Variables, sources and definitions

Variable	Definition/Description	Acronym	Source
Initial GDP per capita	Initial value for each 5 year average period of real GDP per capita	*Initial income*	World Bankõs Word Development Indicators (WDI)
Literacy rate (%)	Literates as a percentage of adult population. Note that comparisons across time and space must be interpreted with caution as the concept of literacy has changed over time and to some extent varies from country to country.	*Literacy rate*	Vanhanen (2003)
Lpc		*Lpc*	
Secondary School	Average secondary schooling years in the total population aged 25 and over.	*Secondary school*	Barro and Lee (2010)
Primary school	Average primary schooling years in the total population aged 25 and over.	*Primary school*	Barro and Lee (2010)
population	Number of inhabitants.	*population*	WDI
Land area		*Land area*	
Trade Openness	Openness to trade	*PWT openness*	PWT
Terms of Trade	Terms of trade (goods and services)	*WDI ToT*	WDI
Financial Openness		*Chinn-Ito FO*	Chinn and Ito (2006)
Ethnic fractionalization	Reflects probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group. The higher the number, the more fractionalized society. The definition of ethnicity involves a combination of racial and linguistic characteristics. The result is a higher degree of fractionalization than the commonly used ELF-index in for example Latin America, where people of many races speak the same language.	*Ethnic frac*	
Linguistic fractionalization	Reflects probability that two randomly selected people from a given country will not belong to the same linguistic group. The higher the number, the more fractionalized society.	*Lang frac*	
Religious fractionalization	Reflects probability that two randomly selected people from a given country will not belong to the same religious group. The higher the number, the more fractionalized society.	*Religious frac*	
Civil Liberties	Civil liberties include freedom of speech, expression and the press; freedom of religion; freedom of assembly and association; and the right to due judicial process.	*cl*	Freedom House
latitude	The absolute value of the latitude of the capital city, divided by 90 (to take values between 0 and 1).	*latitude*	La Porta et al. (1999)
freedom of speech	Government censorship and/or ownership of the media (including radio, TV, Internet, and domestic news agencies) is: (0) Complete; (1) Some; (2) None		
executive constraints	According to Eckstein and Gurr, decision rules are defined in the following manner: "Super-ordinate structures in action make decisions concerning the direction of social units. Making such decisions requires that supers and subs be able to recognize when decision-processes have been concluded, especially "properly" concluded. An indispensable ingredient of the processes, therefore, is the existence of Decision Rules that provide basic criteria under which decisions are considered to have been taken." (Eckstein and Gurr 1975, p.121) Operationally, this variable refers to the extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. Such limitations may be imposed by any "accountability groups". In Western democracies these are usually legislatures. Other kinds of accountability groups are the ruling party in a one-party state; councils of nobles or powerful advisors in monarchies; the military in coup-prone polities; and in many states a strong, independent judiciary. The concern is therefore with the checks and balances between the various parts of the decision-making process. A seven category scale is used.		
government expenditure	Total government expenditure as a percentage of GDP.		WDI, IMF IFS, Easterly (2001)
Real effective exchange rate	The amount of local currency units per US dollar.	*reef*	PWT
area	Land area	*area*	WDI
central government debt		*Gov debt*	IMF (Abas et al., 2010)
exports	Exports of goods and services as a percentage of GDP.		
FDI	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of the voting stock) in an enterprise operating in an economy other than that of the investor. This series shows the net inflows in the reporting economy.		WDI
imports	Imports of goods and services as a percentage of GDP.		
inflation	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.		WDI
Real interest rate	Real interest rate, percent.		Global Development

			Finance; World Development Indicators, Easterly et al 1994.
total debt service	Total debt service is the sum of principal repayments and interest actually paid in foreign currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments (repurchases and charges) to the IMF, as a percentage of exports of goods services and income.		WDI
unemployment	Total number of unemployed people in percentage of working population or labour force		WDI
British legal origin	Identifies the legal origin of the Company Law or Commercial code of each country.		La Porta et al. (1999)
German legal origin	Identifies the legal origin of the Company Law or Commercial code of each country.		La Porta et al. (1999)
population density	Total population divided by land area		
years in office	Regime durability: the number of years since the most recent regime change (defined by a three point change in the Polity score over a period of three years or less) or the end of transition period defined by the lack of stable political institutions (denoted by a standardized authority score).	*Durable*	Marshall and Jaeggerôs Polityô 4 database
labor force	Number of workers		
central bank assets			
bank credit			
liquid liabilities			
size of government	Composite variable (*govsize*). This variable includes government consumption expenditures (as percentage of total consumption), transfers and subsidies (as percentage of GDP), the underlying tax system (proxied by top marginal tax rates) and the number of government enterprises.	*govsize*	Gwartney and Lawson (2008)
Growth of trade partners			
Black market premium		*Black market premium*	
Quality of government	ICRG indicator of Quality of Government : The mean value of the ICRG variables ñCorruptionò, ñLaw and Orderò and ñBureaucracy Qualityò, scaled 0-1. Higher values indicate higher quality of government.	*Quality fov.*	
Colonial origin	This is a tenfold classification of the former colonial ruler of the country. Following Bernard et al (2004), we have excluded the British settler colonies (the US, Canada, Australia, Israel and New Zeeland), and exclusively focused on "Western overseas" colonialism. This implies that only Western colonizers (e.g. excluding Japanese colonialism), and only countries located in the non-Western hemisphere "overseas" (e.g. excluding Ireland & Malta), have been coded. Each country that has been colonized since 1700 is coded. In cases of several colonial powers, the last one is counted, if it lasted for 10 years or longer.	*Colonial origin*	Teorell and Hadenius (2005)
Index of globalization	The overall index of globalization is the weighted average of the following variables: economic globalization, social globalization and political globalization. Most weight has been given to economic followed by social globalization.	*Index global*	Dreher 2006; Dreher et al 2008
mortality	Under-5 mortality rate is the probability that a newborn baby will die before reaching age five, if subject to current age-specific mortality rates. The probability is expressed as a rate per 1,000. Harmonized estimates of the World Health Organization.	*Mortality*	WDI
Life expectancy	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	*Life exp*	WDI
Urban population	Urban population as a percentage of total population. Note that comparisons across time and space must be interpreted with caution as the concept of urbanity has changed over time and to some extent varies from country to country.	*Urban pop*	Vanhanen (2003)
Unemployment		*Unemployment*	
Price of investment		*Price investment*	PWT
Economic freedom of the world	The index is founded upon objective components that reflect the presence (or absence) of economic freedom. The index comprises 21 components designed to identify the consistency of institutional arrangements and policies with economic freedom in five major areas: size of government, legal structure and security of property rights, access to sound money, freedom to trade internationally, regulation of credit, labor and business	*Econ. Freedom world*	Gwartney and Lawson (2006)
Government budget surplus or deficit (% of GDP)	The government budget surplus or deficit as a percentage of GDP.	*Fiscal balance*	WDI, IMF IFS, Easterly (2001)

Appendix 3: List of Countries

Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, Chile, China, Colombia, Cyprus, Denmark, Dominican Republic, Egypt, El Salvador, Finland, France, Germany, Ghana, Greece, Guatemala, Hungary, Iceland, India, Indonesia, Iran, Ireland, Italy, Japan, Jordan, South Korea, Malaysia, Mali, Mexico, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Rwanda, South Africa, Spain, Sweden, Switzerland, Tanzania, Thailand, Trinidad and Tobago, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Zambia, Zimbabwe.

Appendix 4:

Table A.4.1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
WVS trust	152	0.32	0.17	0.03	0.74
Civil liberties	469	3.99	1.77	0	6
Ethnic fractionalization	472	-0.36	0.25	-0.93	-0.012
Linguistic fractionalization	456	-0.32	0.29	-0.92	-0.002
Religious fractionalization	472	-0.40	0.24	-0.86	-0.005
Latitude	472	0.34	0.19	0.01	0.72
SC1	453	0.27	0.09	0.08	0.44
SC2	453	0.06	0.86	-1.98	1.24
CIVIC	140	31.21	2.13	24.31	35.40
SC3	140	0.11	0.68	-1.74	1.51

Table A.4.2 Correlation of WVS Trust with other social capital proxies

Variable	Correlation with (WVS) trust
Civil liberties	0.325***
Ethnic fractionalization	-0.367***
Linguistic fractionalization	-0.141***
Religious fractionalization	-0.097
Latitude	0.647***
SC1	0.636***
SC2	0.273***
CIVIC	0.389***
SC3	0.307***

Note: *, **, *** denote statistical significance at 10, 5 and 1% levels, respectively.

Table A.4.3 Correlation of main regressors with WVS Trust

Variable	Correlation with WVS trust		
	Full Sample	**Rich**	**Poor**
Trade Openness	-0.11	0.03	-0.07
Scale	0.08	-0.28	0.41***
TFP growth	0.17**	0.06	0.26*

Note: *, **, *** denote statistical significance at 10, 5 and 1% levels, respectively.

Table A.4.4: Extreme Bounds Analysis

Sample	All													
TFP growth Measure	TFPnew		TFP1		TFP2		TFP3		TFP4		TFP5		TFP6	
Variables	LB	UB	LB	UB	LB	UB	LB	UB	LB	UB	LB	UB	LB	UB
Trust (WVS)	1.142**	3.783***	0.907**	4.563***	0.943**	4.331***	0.875**	4.572***	1.010**	4.596***	1.018**	5.005***	0.914**	4.250***
	(1.990)	(2.605)	(1.976)	(3.129)	(2.035)	(3.021)	(1.983)	(3.138)	(2.031)	(3.129)	(1.989)	(3.209)	(1.999)	(2.771)
Civil liberties	0.117**	0.631***	0.101**	0.412***	0.101**	0.374***	0.101**	0.415***	0.101**	0.378**	0.111**	0.424***	0.100**	0.372***
	(1.975)	(3.687)	(2.021)	(3.160)	(1.998)	(2.688)	(2.014)	(3.232)	(1.974)	(2.627)	(1.966)	(2.951)	(2.000)	(2.702)
Ethnic Fract	-0.563**	-0.967***	-0.487**	-1.140**	-0.499**	-0.519**	-0.481**	-1.160**	-0.497**	-0.497**	-0.523**	-1.288**	-0.500**	-0.559**
	(-1.971)	(-3.076)	(-1.966)	(-2.402)	(-1.967)	(-2.020)	(-1.989)	(-2.439)	(-1.969)	(-1.969)	(-1.968)	(-2.551)	(-2.052)	(-1.978)
Linguistic Fract	-0.892**	-0.797**	-0.572**	-0.643**	-0.565**	-0.698**	-0.545**	-0.701**	-0.587**	-0.587**	-0.552**	-0.608**	-0.557**	-0.730**
	(-2.182)	(-2.041)	(-2.045)	(-2.204)	(-2.000)	(-2.389)	(-1.987)	(-2.474)	(-1.984)	(-1.984)	(-1.854)	(-2.103)	(-1.998)	(-2.545)
Religious Fract	-0.631**	-1.237***	-0.520**	-1.278***	-0.572**	-1.044**	-0.551**	-1.341***	-0.988**	-0.988**	-0.593**	-1.209***	-0.561**	-1.063**
	(-1.982)	(-2.380)	(-1.970)	(-3.035)	(-1.971)	(-2.408)	(-1.994)	(-3.263)	(-2.169)	(-2.169)	(-1.976)	(-2.526)	(-1.983)	(-2.488)
Latitude	0.881**	4.609***	0.779**	4.048***	0.775**	3.781**	0.769**	3.890***	0.809**	4.096***	0.853**	4.633***	0.771**	3.671**
	(1.975)	(2.447)	(1.967)	(2.916)	(1.966)	(2.630)	(1.970)	(2.811)	(1.966)	(2.790)	(1.996)	(3.118)	(1.971)	(2.566)
SC1	1.758**	6.847***	1.624**	4.821***	1.447**	4.444**	1.586**	4.840***	1.516**	5.011**	1.810**	5.633***	1.457**	4.247**
	(1.983)	(2.296)	(2.046)	(2.777)	(1.966)	(2.314)	(2.004)	(2.759)	(1.967)	(2.519)	(2.032)	(3.045)	(1.970)	(2.231)
SC2	0.169**	0.312***	0.145**	0.261*	0.207**	0.221**	0.144**	0.283***	0.187**	0.271***	0.165**	1.973**	0.189**	0.228**
	(1.971)	(2.495)	(1.976)	(2.641)	(2.064)	(2.241)	(2.006)	(2.962)	(1.999)	(2.502)	(1.973)	(2.530)	(2.023)	(2.352)
CIVIC	0.085**	0.209***	0.064**	0.226*	0.070**	0.193***	0.062**	0.224**	0.076**	0.204***	0.071**	0.250**	0.069**	0.189***
	(1.993)	(2.335)	(1.991)	(2.800)	(1.986)	(2.951)	(1.975)	(2.729)	(1.989)	(2.844)	(1.987)	(2.675)	(1.987)	(2.974)
SC3	0.264**	0.343***	0.211**	0.623***	0.263**	0.565***	0.215**	0.611**	0.295**	0.600***	0.242**	0.690***	0.261**	0.553***
	(1.998)	(2.323)	(2.030)	(2.479)	(2.029)	(2.871)	(2.576)	(2.137)	(2.095)	(2.777)	(1.990)	(2.382)	(2.055)	(2.890)

Note: t-ratios in parenthesis. *,**,*** denote significance levels at 10, 5 and 1%, respectively.

Table 1 ï Determinants of TFP Growth
Whole Sample: Ordinary Least Squares (pooled)

Spec.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
TFPnew									
Initial Income	-0.097	-0.099	-0.097	-0.091	-0.107	-0.093	-0.204**	-0.187**	-0.215***
	(0.070)	(0.070)	(0.072)	(0.070)	(0.079)	(0.080)	(0.091)	(0.081)	(0.081)
Secondary Schooling	0.100***	0.092**	0.092**	0.085**	0.106**	0.101***	0.077*	0.098**	0.083*
	(0.038)	(0.039)	(0.040)	(0.039)	(0.042)	(0.038)	(0.041)	(0.039)	(0.043)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.004*	0.286***	0.010*	-0.008	-0.015	-6.026**	-1.164***	1.557***
		(0.002)	(0.087)	(0.005)	(0.052)	(0.135)	(2.551)	(0.273)	(0.456)
Workers								-0.019	-0.002
								(0.050)	(0.051)
Observations	308	308	296	308	260	260	308	260	260
R Squared	0.031	0.044	0.075	0.053	0.030	0.073	0.032	0.088	0.068
TFP1									
Initial Income	-0.125*	-0.127*	-0.128*	-0.121*	-0.138*	-0.115	-0.244***	-0.201***	-0.235***
	(0.065)	(0.065)	(0.066)	(0.065)	(0.072)	(0.074)	(0.085)	(0.075)	(0.075)
Secondary Schooling	0.091***	0.084**	0.084**	0.080**	0.102***	0.093***	0.077**	0.097***	0.080**
	(0.035)	(0.035)	(0.036)	(0.036)	(0.038)	(0.035)	(0.037)	(0.036)	(0.039)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.004**	0.230***	0.009*	0.009	-0.039	-6.035**	-0.951***	1.416***
		(0.002)	(0.077)	(0.005)	(0.045)	(0.123)	(2.458)	(0.254)	(0.428)
Workers								0.003	0.011
								(0.043)	(0.044)
Observations	327	327	315	327	277	327	277	277	277
R Squared	0.023	0.041	0.059	0.042	0.027	0.023	0.075	0.071	0.062
TFP2									
Initial Income	-0.174***	-0.176***	-0.186***	-0.172***	-0.173**	-0.209***	-0.239***	-0.220***	-0.267***
	(0.064)	(0.064)	(0.066)	(0.064)	(0.072)	(0.072)	(0.088)	(0.078)	(0.075)
Secondary Schooling	0.116***	0.110***	0.111***	0.110***	0.113***	0.109***	0.086**	0.109***	0.091**
	(0.034)	(0.034)	(0.035)	(0.035)	(0.038)	(0.034)	(0.036)	(0.037)	(0.039)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.003*	0.123	0.005	-0.035	0.152	-4.872**	-0.705***	1.364***
		(0.002)	(0.079)	(0.004)	(0.043)	(0.125)	(2.348)	(0.259)	(0.409)
Workers								-0.040	-0.033
Observations	327	327	315	327	277	327	277	277	277
R Squared	0.038	0.049	0.050	0.045	0.033	0.043	0.063	0.058	0.067
TFP3									
Initial Income	-0.120*	-0.123*	-0.122*	-0.117*	-0.133*	-0.105	-0.240***	-0.199***	-0.231***
	(0.065)	(0.066)	(0.066)	(0.066)	(0.072)	(0.075)	(0.085)	(0.075)	(0.075)
Secondary Schooling	0.089**	0.081**	0.081**	0.077**	0.100***	0.092***	0.076**	0.095***	0.078**
	(0.035)	(0.036)	(0.036)	(0.036)	(0.038)	(0.035)	(0.037)	(0.036)	(0.039)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.004**	0.252***	0.010*	0.015	-0.064	-5.979**	-0.987***	1.435***
		(0.002)	(0.077)	(0.005)	(0.045)	(0.124)	(2.469)	(0.254)	(0.431)
Workers								0.009	0.017
								(0.044)	(0.045)
Observations	327	327	315	327	277	327	277	277	277
R Squared	0.022	0.040	0.064	0.043	0.027	0.023	0.073	0.073	0.062

(cont.)

TFP4									
Initial Income	-0.171***	-0.174***	-0.184***	-0.169***	-0.174**	-0.207***	-0.245***	-0.220***	-0.266***
	(0.064)	(0.064)	(0.067)	(0.065)	(0.073)	(0.072)	(0.088)	(0.079)	(0.077)
Secondary Schooling	0.115***	0.109***	0.110***	0.108***	0.114***	0.107***	0.085**	0.110***	0.093**
	(0.034)	(0.035)	(0.036)	(0.035)	(0.039)	(0.034)	(0.037)	(0.037)	(0.039)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.003*	0.110	0.005	-0.035	0.154	-5.203**	-0.696***	1.344***
		(0.002)	(0.081)	(0.005)	(0.044)	(0.127)	(2.370)	(0.264)	(0.416)
Workers								-0.040	-0.034
								(0.043)	(0.043)
Observations	327	327	315	327	277	327	277	277	277
R Squared	0.036	0.047	0.046	0.042	0.032	0.040	0.066	0.056	0.064
TFP5									
Initial Income	-0.114*	-0.116*	-0.117*	-0.110	-0.134*	-0.100	-0.255***	-0.199**	-0.230***
	(0.068)	(0.068)	(0.069)	(0.068)	(0.075)	(0.077)	(0.087)	(0.078)	(0.080)
Secondary Schooling	0.085**	0.077**	0.079**	0.073*	0.103**	0.088**	0.074*	0.097**	0.081**
	(0.037)	(0.037)	(0.038)	(0.038)	(0.040)	(0.037)	(0.039)	(0.038)	(0.040)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.004**	0.220***	0.009*	0.015	-0.061	-6.758***	-0.966***	1.387***
		(0.002)	(0.081)	(0.005)	(0.046)	(0.131)	(2.543)	(0.268)	(0.453)
Workers								0.009	0.017
								(0.045)	(0.045)
Observations	327	327	315	327	277	327	277	277	277
R Squared	0.018	0.036	0.048	0.036	0.025	0.019	0.080	0.066	0.056
TFP6									
Initial Income	-0.175***	-0.177***	-0.187***	-0.173***	-0.173**	-0.210***	-0.237***	-0.220***	-0.267***
	(0.063)	(0.064)	(0.065)	(0.064)	(0.072)	(0.072)	(0.087)	(0.078)	(0.075)
Secondary Schooling	0.117***	0.111***	0.112***	0.110***	0.112***	0.109***	0.086**	0.109***	0.091**
	(0.034)	(0.034)	(0.035)	(0.035)	(0.038)	(0.034)	(0.036)	(0.037)	(0.039)
Add. Variable	-	*Openness*	*Grw Trade Partners*	*Imp.Intensity*	*Workers*	*Capital Stock*	*Pop.Gr*	*Ethnic Frac.*	*Latitude*
		0.003*	0.128	0.006	-0.035	0.152	-4.758**	-0.709***	1.371***
		(0.002)	(0.079)	(0.004)	(0.043)	(0.125)	(2.342)	(0.258)	(0.408)
Workers								-0.040	-0.033
								(0.042)	(0.043)
Observations	327	327	315	327	277	327	277	277	277
R Squared	0.039	0.050	0.052	0.046	0.033	0.043	0.062	0.058	0.067

Note: All specifications include the estimate of a constant coefficient, not presented in this table for reasons of parsimony Heteroskedastic-consistent standard errors are in parentheses, ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels.

Table 2 ï Determinants of TFP Growth
Whole Sample: Ordinary Least Squares and Random Effects Estimates

Estimation	Ordinary Least Squares (pooled)		Random Effects						
Spec.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
TFP measure	**TFPnew**	**TFPnew**	**TFPnew**	**TFP1**	**TFP2**	**TFP3**	**TFP4**	**TFP5**	**TFP6**
Initial Income	-0.178**	-0.139	-0.178**	-0.199**	-0.225***	-0.198**	-0.227***	-0.196**	-0.225***
	(0.085)	(0.092)	(0.082)	(0.083)	(0.081)	(0.085)	(0.082)	(0.086)	(0.081)
Secondary Schooling	0.073*	0.055	0.073*	0.078*	0.090**	0.077*	0.093**	0.080*	0.089**
	(0.042)	(0.048)	(0.041)	(0.042)	(0.040)	(0.043)	(0.040)	(0.042)	(0.040)
Growth Trade Partners	0.325***	0.314***	0.325***	0.267***	0.208**	0.287***	0.189*	0.241**	0.214**
	(0.101)	(0.093)	(0.112)	(0.099)	(0.099)	(0.099)	(0.101)	(0.104)	(0.099)
Workers	-0.049	-0.079	-0.049	-0.020	-0.064	-0.016	-0.062	-0.011	-0.064
	(0.049)	(0.052)	(0.049)	(0.044)	(0.043)	(0.045)	(0.043)	(0.043)	(0.044)
Ethnic Fractionalization	-1.265***	-0.926***	-1.265***	-1.049***	-0.825***	-1.086***	-0.814***	-1.057***	-0.829***
	(0.274)	(0.350)	(0.260)	(0.244)	(0.247)	(0.252)	(0.251)	(0.255)	(0.245)
Region Dummies	-	Yes	-	-	-	-	-	-	-
Americas		0.380							
		(0.303)							
Africa		-0.391*							
		(0.225)							
Asia		-0.295							
		(0.354)							
Year Dummies		YES							
Observations	252	252	252	269	269	269	269	269	269
R squared	0.149	0.173	0.149	0.083	0.093	0.127	0.085	0.103	0.096
Within			0.095	0.119	0.104	0.088	0.093	0.060	0.108
Between			0.316	0.236	0.164	0.239	0.166	0.236	0.163

Note: All specifications include the estimate of a constant coefficient, not presented in this table for reasons of parsimony. Heteroskedastic-consistent standard errors are in parentheses, ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels. In the case of random effects specifications R squared refers to R squared overall and the Within and Between R squared are also presented.

Table 3.a ï Determinants of TFP Growth
Poor Countries: Random Effects Estimates

Sub-Sample	Poor							
Spec.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
TFP measure	**TFPnew**	**TFPnew**	**TFP1**	**TFP2**	**TFP3**	**TFP4**	**TFP5**	**TFP6**
Initial Income	-0.223	-0.213	-0.238	-0.329**	-0.226	-0.330**	-0.230	-0.328**
	(0.148)	(0.150)	(0.144)	(0.148)	(0.143)	(0.151)	(0.153)	(0.147)
Secondary Schooling	0.088	0.072	0.064	0.100	0.061	0.098	0.057	0.101
	(0.086)	(0.088)	(0.077)	(0.079)	(0.077)	(0.080)	(0.081)	(0.078)
Growth Trade Partners	0.387**							
	(0.154)							
OECD		0.182***	0.194***	0.161***	0.201***	0.157***	0.191***	0.163***
		(0.066)	(0.061)	(0.057)	(0.062)	(0.058)	(0.064)	(0.057)
Non-OECD		0.039	-0.102	-0.139	-0.092	-0.148	-0.114	-0.135
		(0.186)	(0.162)	(0.149)	(0.164)	(0.151)	(0.174)	(0.148)
Workers	-0.071	-0.081	-0.072	-0.124*	-0.067	-0.122*	-0.063	-0.124*
	(0.086)	(0.087)	(0.077)	(0.073)	(0.078)	(0.074)	(0.079)	(0.073)
Ethnic Fractionalization	-1.106**	-1.174**	-1.097**	-0.934**	-1.122***	-0.926**	-1.102**	-0.937**
	(0.499)	(0.505)	(0.426)	(0.432)	(0.426)	(0.439)	(0.448)	(0.430)
Observations	129	129	144	144	144	144	144	144
R squared	0.125	0.124	0.131	0.119	0.135	0.113	0.117	0.121
Within	0.097	0.103	0.127	0.156	0.128	0.146	0.106	0.159
Between	0.227	0.203	0.158	0.118	0.162	0.118	0.154	0.118

Note: All specifications include the estimate of a constant coefficient, not presented in this table for reasons of parsimony. Heteroskedastic-consistent standard errors are in parentheses, ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels. In each specification, R squared refers to R squared overall and the Within and Between R squared are also presented.

Table 3.b ï Determinants of TFP Growth
Rich Countries: Random Effects Estimates

Sub-Sample	Rich							
Spec.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TFP measure	TFPnew	TFPnew	TFP1	TFP2	TFP3	TFP4	TFP5	TFP6
Initial Income	-0.246**	-0.238**	-0.178	-0.049	-0.202*	-0.036	-0.171	-0.053
	(0.123)	(0.119)	(0.109)	(0.131)	(0.106)	(0.134)	(0.111)	(0.130)
Secondary Schooling	0.071*	0.089**	0.087**	0.074*	0.086**	0.079*	0.098**	0.073*
	(0.042)	(0.043)	(0.038)	(0.042)	(0.037)	(0.043)	(0.040)	(0.042)
Growth Trade Partners	0.249**							
	(0.103)							
OECD		0.008	-0.030	-0.034	-0.025	-0.041	-0.043	-0.031
		(0.039)	(0.033)	(0.035)	(0.033)	(0.036)	(0.034)	(0.035)
Non-OECD		0.227**	0.213**	0.196**	0.229**	0.173*	0.175*	0.204**
		(0.112)	(0.090)	(0.087)	(0.089)	(0.091)	(0.102)	(0.085)
Workers	-0.031	-0.025	0.007	-0.033	0.012	-0.032	0.014	-0.034
	(0.049)	(0.050)	(0.038)	(0.036)	(0.038)	(0.037)	(0.042)	(0.035)
Ethnic Fractionalization	-1.322***	-1.310***	-1.013***	-0.694**	-1.057***	-0.687**	-1.041***	-0.696***
	(0.317)	(0.314)	(0.273)	(0.265)	(0.269)	(0.278)	(0.310)	(0.262)
Observations	123	122	124	124	124	124	124	124
R squared	0.183	0.171	0.158	0.127	0.174	0.117	0.130	0.131
Within	0.108	0.171	0.085	0.266	0.099	0.065	0.054	0.086
Between	0.376	0.401	0.376	0.080	0.382	0.274	0.378	0.262

Note: All specifications include the estimate of a constant coefficient, not presented in this table for reasons of parsimony. Heteroskedastic-consistent standard errors are in parentheses. ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels. In each specification, R squared refers to R squared overall and the Within and Between R squared are also presented.

Table 4 ï Social Capital and TFP Growth (Robustness to different proxies)
Rich and Poor Countries: Random Effects Estimates

Sub-Sample	Poor							Rich						
TFP measure	TFPnew	TFP1	TFP2	TFP3	TFP4	TFP5	TFP6	TFPnew	TFP1	TFP2	TFP3	TFP4	TFP5	TFP6
Spec.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Panel A							Panel B						
Trust (WVS)	0.282	1.351	1.348	1.399	1.269	1.212	1.376	-0.573	-1.038	-0.667	-0.944	-0.897	-1.487*	-0.591
	(1.194)	(0.889)	(0.859)	(0.905)	(0.847)	(0.889)	(0.865)	(0.782)	(0.685)	(0.572)	(0.668)	(0.637)	(0.835)	(0.554)
Civil liberties	0.064	0.051	0.070	0.045	0.073	0.053	0.069	0.103	0.124	0.154	0.110	0.169*	0.148	0.148
	(0.070)	(0.060)	(0.066)	(0.062)	(0.066)	(0.061)	(0.067)	(0.114)	(0.089)	(0.095)	(0.089)	(0.096)	(0.090)	(0.094)
Ethnic Fract	-1.101*	1.003**	-0.861*	1.023**	-0.854*	1.008**	-0.863*	1.322**	1.025**	0.708**	1.068**	0.705**	1.058**	0.708**
	(0.573)	(0.471)	(0.463)	(0.483)	(0.465)	(0.485)	(0.462)	(0.259)	(0.230)	(0.238)	(0.242)	(0.249)	(0.240)	(0.236)
Linguistic Fract	-0.322	0.488**	-0.409	0.506**	-0.400	-0.476*	-0.413	1.074**	0.834**	0.520**	0.886**	-0.497*	0.833**	0.528**
	(0.234)	(0.246)	(0.295)	(0.248)	(0.300)	(0.255)	(0.293)	(0.334)	(0.231)	(0.249)	(0.235)	(0.259)	(0.251)	(0.246)
Religious Fract	-0.005	-0.076	-0.296	-0.137	-0.320	-0.079	-0.288	-0.718	-0.689*	-0.699*	-0.744*	-0.624	-0.531	-0.725*
	(0.337)	(0.340)	(0.351)	(0.350)	(0.353)	(0.358)	(0.351)	(0.500)	(0.398)	(0.383)	(0.400)	(0.399)	(0.421)	(0.379)
Latitude	2.278**	2.323**	2.297**	2.358**	2.251**	2.246**	2.313**	1.439	1.144	0.890	1.250	0.770	0.957	0.932
	(0.956)	(0.902)	(0.831)	(0.928)	(0.841)	(0.949)	(0.828)	(0.888)	(0.772)	(0.715)	(0.780)	(0.730)	(0.811)	(0.711)
SC1	4.944**	4.807**	4.860**	4.790**	4.822**	4.720**	4.873**	4.857**	3.672**	2.508**	3.837**	2.454**	3.737**	2.527**
	(2.021)	(1.747)	(1.461)	(1.812)	(1.480)	(1.868)	(1.455)	(1.266)	(1.168)	(1.083)	(1.229)	(1.105)	(1.196)	(1.080)
SC2	0.257**	0.299**	0.240**	0.310**	0.236**	0.298**	0.241**	0.427**	0.335**	0.235**	0.353**	0.228**	0.333**	0.237**
	(0.116)	(0.099)	(0.116)	(0.101)	(0.117)	(0.103)	(0.115)	(0.090)	(0.082)	(0.081)	(0.086)	(0.083)	(0.085)	(0.080)
CIVIC	0.011	0.097	0.097	0.103*	0.103	0.094	0.095	0.078	0.068	0.031	0.069	0.037	0.083	0.029
	(0.085)	(0.060)	(0.066)	(0.060)	(0.068)	(0.060)	(0.066)	(0.084)	(0.065)	(0.050)	(0.066)	(0.053)	(0.073)	(0.049)
SC3	0.167	0.241	0.273	0.226	0.291	0.268	0.267	0.312	0.212	0.079	0.219	0.090	0.247	0.076
	(0.270)	(0.180)	(0.192)	(0.180)	(0.196)	(0.187)	(0.191)	(0.250)	(0.207)	(0.164)	(0.210)	(0.173)	(0.231)	(0.162)

Note: Regressions are based on equation (1) in the main text. Only coefficients on social capital are reported for reasons of parsimony ï full results available upon request. Heteroskedastic-consistent standard errors are in parentheses. ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels.

Table 5 ï Social Capital and TFP Growth (Sensitivity Analysis with different proxies)
Whole Sample: Random Effects Estimates

Sub-Sample	All						
TFP Measure	TFP1	TFP2	TFP3	TFP4	TFP5	TFP6	TFPnew
Spec. change				SC1			
Spec.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Infl.obs del. (LAD)	3.46***	3.33***	3.71***	3.31***	3.68***	3.33***	3.88***
	(0.726)	(0.552)	(0.715)	(0.566)	(0.766)	(0.549)	(0.769)
Infl.obs del. (LTS)	3.66***	3.26***	3.68***	3.28***	3.63***	3.25***	4.14***
	(0.826)	(0.759)	(0.821)	(0.788)	(0.836)	(0.771)	(0.799)
Education							
Literacy rate (%)	3.56***	3.51***	3.57***	3.49***	3.53***	3.51***	4.70***
	(0.884)	(0.791)	(0.898)	(0.816)	(0.966)	(0.784)	(0.953)
Lpc	3.78***	3.73***	3.79***	3.75***	3.82***	3.72***	4.22***
	(0.798)	(0.612)	(0.833)	(0.620)	(0.879)	(0.610)	(0.823)
Total Years School	3.67***	3.61***	3.69***	3.62***	3.70***	3.60***	4.15***
	(0.778)	(0.614)	(0.811)	(0.625)	(0.855)	(0.611)	(0.803)
Primary School (yrs)	3.69***	3.64***	3.70***	3.66***	3.73***	3.63***	4.15***
	(0.777)	(0.599)	(0.811)	(0.608)	(0.854)	(0.597)	(0.804)
Scale							
Population	3.16***	2.86***	3.21***	2.85***	3.18***	2.86***	3.74***
	(0.795)	(0.610)	(0.833)	(0.628)	(0.881)	(0.605)	(0.820)
GDP	3.09***	2.59***	3.16***	2.60***	3.17***	2.59***	3.60***
	(0.763)	(0.543)	(0.804)	(0.559)	(0.843)	(0.538)	(0.791)
Land area	3.02***	2.55***	3.07***	2.56***	3.09***	2.55***	3.52***
	(0.747)	(0.523)	(0.787)	(0.538)	(0.829)	(0.519)	(0.759)
Open							
PWT Openness	3.78***	3.33***	3.85***	3.34***	3.85***	3.33***	4.29***
	(0.767)	(0.613)	(0.796)	(0.629)	(0.842)	(0.608)	(0.779)
WDI ToT	3.26***	3.03***	3.29***	3.03***	3.28***	3.04***	3.75***
	(0.740)	(0.463)	(0.793)	(0.478)	(0.824)	(0.459)	(0.730)
Chinn-Ito FO	3.33***	2.93***	3.38***	2.95***	3.42***	2.92***	3.71***
	(0.864)	(0.647)	(0.906)	(0.664)	(0.946)	(0.643)	(0.901)
Mean	*3.46*	*3.20*	*3.51*	*3.20*	*3.51*	*3.19*	*3.99*
S.D.	*0.27*	*0.40*	*0.27*	*0.40*	*0.27*	*0.40*	*0.34*

Note: Regressions are based on equation (1) in the main text. Only coefficients on social capital are reported for reasons of parsimony ï full results available upon request. Heteroskedastic-consistent standard errors are in parentheses. ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels.

Table 6 ï Social Capital and TFP Growth (Robustness to the inclusion of additional regressors)
Whole Sample: Random Effects Estimates

Sub-Sample	All						
TFP Measure	TFP1	TFP2	TFP3	TFP4	TFP5	TFP6	TFPnew
Spec. change				SC1			
Spec.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Price Investment	3.97***	3.35***	4.03***	3.37***	4.08***	3.35***	4.49***
	(0.807)	(0.654)	(0.839)	(0.666)	(0.874)	(0.651)	(0.840)
Black Market Premium	3.69***	3.39***	3.77***	3.33***	3.64***	3.40***	4.20***
	(1.124)	(0.987)	(1.166)	(0.999)	(1.187)	(0.985)	(1.173)
Liquid Liabilities	3.55***	3.03***	3.63***	3.02***	3.60***	3.04***	4.26***
	(0.675)	(0.524)	(0.710)	(0.547)	(0.756)	(0.518)	(0.694)
REER	3.17***	3.02***	3.21***	2.97***	3.12***	3.03***	3.85***
	(0.864)	(0.638)	(0.913)	(0.634)	(0.942)	(0.641)	(0.803)
Quality gov.	2.91***	2.84***	2.96***	2.74***	2.74***	2.88***	3.67***
	(0.936)	(0.823)	(0.982)	(0.830)	(0.993)	(0.823)	(1.042)
Colonial origin	3.81***	3.79***	3.82***	3.77***	3.79***	3.79***	4.51***
	(0.915)	(0.694)	(0.959)	(0.703)	(0.999)	(0.693)	(0.944)
Index global	3.51***	3.26***	3.57***	3.23***	3.50***	3.27***	4.14***
	(0.782)	(0.638)	(0.819)	(0.651)	(0.855)	(0.635)	(0.812)
durable	3.35***	3.10***	3.37***	3.10***	3.39***	3.10***	3.87***
	(0.867)	(0.620)	(0.909)	(0.628)	(0.944)	(0.618)	(0.887)
Fiscal balance	3.94***	3.23***	4.07***	3.17***	3.92**	3.26***	4.33***
	(1.500)	(1.042)	(1.559)	(1.081)	(1.687)	(1.030)	(1.660)
Gov debt	3.86**	3.21**	3.94**	3.21**	3.94**	3.22**	4.57***
	(1.609)	(1.263)	(1.643)	(1.296)	(1.846)	(1.254)	(1.604)
Gov size	4.40***	3.85***	4.48***	3.88***	4.51***	3.84***	4.76***
	(0.956)	(0.819)	(0.997)	(0.836)	(1.026)	(0.814)	(0.979)
Mortality	3.85***	3.50***	3.90***	3.48***	3.86***	3.50***	4.42***
	(0.842)	(0.667)	(0.878)	(0.675)	(0.914)	(0.665)	(0.877)
Life expect	3.51***	3.27***	3.55***	3.26***	3.52***	3.27***	4.07***
	(0.842)	(0.663)	(0.878)	(0.673)	(0.917)	(0.660)	(0.861)
Urban pop	3.58***	3.40***	3.61***	3.40***	3.59***	3.41***	4.05***
	(0.776)	(0.615)	(0.811)	(0.629)	(0.853)	(0.611)	(0.759)
Inflation	3.51***	3.08***	3.62***	3.04***	3.49***	3.09***	4.16***
	(0.778)	(0.686)	(0.811)	(0.701)	(0.839)	(0.682)	(0.811)
Unemployment	3.57***	3.54***	3.61***	3.49***	3.49***	3.56***	3.84***

	(0.730)	(0.530)	(0.779)	(0.539)	(0.827)	(0.530)	(0.782)
Econ. Freedom World	3.78***	3.55***	3.82***	3.56***	3.81***	3.54***	4.22***
	(0.769)	(0.649)	(0.799)	(0.661)	(0.837)	(0.646)	(0.793)
Mean	*3.69*	*3.31*	*3.76*	*3.28*	*3.70*	*3.31*	*4.23*
S.D.	*0.38*	*0.27*	*0.41*	*0.29*	*0.43*	*0.26*	*0.31*

Note: Regressions are based on equation (1) in the main text. Only coefficients on social capital are reported for reasons of parsimony ï full results available upon request. Heteroskedastic-consistent standard errors are in parentheses. ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels.

Table 7: Social Capital and TFP Growth (Robustness: alternative estimation methods)

Sub-Sample					**All**							
Method	**IV-GLS**				**LSDV-C**				**SYS-GMM**			
Spec.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Initial Income	-		-	-								
	1.60***	-15.43***	8.20***	1.60***	-0.07	0.12	0.12	-0.05	-0.50**	-0.27*	-0.2	-0.38**
	(0.555)	(1.443)	(0.566)	(0.555)	(0.077)	(0.215)	(0.23(	(0.069)	(0.209)	(0.152)	(0.174)	(0.166)
Secondary					-			-				
Schooling	0.2	-0.17	1.62***	0.2	1.21***	-2.26	-2.48	1.21***	0.15	0.11	0.07	0.08
	(-0.151)	(0.177)	(0.205)	(0.151)	(0.443)	(3.139)	(4.232)	(0.424)	(0.102)	(0.079)	(0.077)	(0.077)
Growth Trade												
Partners	0.28***	1.10***	1.05***	0.28***	0.13	0.21	0.3	0.13	0.33**	0.44***	0.42***	0.31***
	(0.105)	(0.261)	(0.128)	(0.105)	(0.197)	(0.498)	(0.584)	(0.163)	(0.129)	(0.137)	(0.125)	(0.119)
Workers	0.9	24.93***	-3.5	0.9	0.29***	0.48*	0.43	0.26***	-0.2	-0.12**	-0.1	-0.16
	(0.732)	(2.794)	(2.529)	(0.732)	(0.098)	(0.27)	(0.299)	(0.098)	(0.137)	(0.06)	(0.09)	(0.122)
Trust proxy	*CL*	*Trust (WVS)*	*CIVIC*	*SC1*	*CL*	*Trust (WVS)*	*CIVIC*	*SC1*	*Ethnic*	*Trust (WVS)*	*CIVIC*	*SC1*
									-			
	0.08	9.19***	0.69***	32.77	-0.1	-1.25	0.11	-36.46	2.68***	0.1	0.04	6.26***
	(0.131)	(2.286)	(0.097)	(50.871)	(0.121)	(5.357)	(0.205)	(40.056)	(0.827)	(0.603)	(0.079)	(1.366)
Observations	197	79	79	197	251	89	81	249	252	89	81	250
R Squared	0.19	0.98	0.99	0.19								
Hansen (p-value)									0.93	0.92	0.93	1.00
AR(1)									0.00	0.46	0.38	0.00
AR(2)									0.89	0.19	0.22	0.92

Note: The models are estimated by either Instrumental Variable-Generalized Least Squares (IV-GLS), Least Squares Dummy Variable-Corrected (LSDV-C), System Generalized Method of Moments (SYS-GMM) or Panel Fixed Effects Driscoll-Kraay robust S.E.. Standard errors are reported in parenthesis below each coefficient estimate. A constant term has been estimated but it is not reported for reasons of parsimony. ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels.