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### Trust and Growth Revisited

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#### Abstract

The paper extends Breggren et al. (2008, EE) on ‘trust and growth: a shaky relationship’ by incorporating recent developments in the trust-growth literature and using a robust methodological underpinning that accounts for the presence of outliers. The empirical evidence is based on 63 countries. Two main findings are established. First, the substantially documented positive trust-growth nexus is broadly confirmed. Second, when initial levels of growth come into play in determining the relationship, only the 25th quartile and 90th decile confirm the positive nexus. The results suggest that the trust-growth nexus cannot be generalized for all countries as some previous studies have concluded. Accordingly, trust-growth policies should be contingent on existing levels of development and tailored differently across rich and poor countries.

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## 1. Introduction

Over the past decades, a substantial body of work has covered the nexus between trust and economic growth (e.g. Knack & Keefer, 1997; La Porta *et al.*, 1997; Glaeser *et al.*, 2000; Zak & Knack, 2001; Beugelsdijk *et al.*, 2004; Berggren *et al.*, 2008; Cahuc, 2013). Accordingly, most studies that have investigated the nexus have established a positive trust-growth nexus. The debate has recently shifted from the sign of the nexus to the robustness of the nexus (Beugelsdijk *et al.*, 2004; Berggren *et al.*, 2008). While Beugelsdijk *et al.* (2004) have concluded that the relationship between trust and economic growth in terms of statistical significance is reasonably robust in terms of size of the estimated effect, Berggren *et al.* (2008) have examined the conclusions of previous literature by taking the robustness further and investigating the stability of previous findings and exposing them to systematic empirical scrutiny. Whereas Berggren *et al.* (2008) have concluded on a robust and shaky nexus, the conclusions of recent literature provide a motivating background for the assessment of a robust and conditional relationship.

The emergence of a recent strand of interesting threshold literature on the trust-growth nexus has focused on how initial trust levels matter in the trust-growth relationship (Uslaner, 2008; Tabellini, 2008; Roth, 2009; Algan & Cahuc, 2010). Uslaner (2008) has concluded that generalized trust is stable value that is transmitted from parents to children by assessing how ethnic background matters in the relationship. Tabellini (2008) in explaining the range of situations in which individuals cooperate has studied a theoretical model where individuals respond to incentives but are also influenced by norms of good conduct inherited from earlier generations. Accordingly, there is an underlying assumption that parents rationally choose what values to transmit to their offspring and this choice is influenced by the quality of external enforcement and the pattern of likely future transactions. In the same vein, Algan & Cahuc (2010) have recently developed a new method to uncover the causal effect of trust on economic growth by focusing on the inherited component of trust and time variation. They show that inherited trust of descendants is influenced by country of origin and the timing of arrival of their forebears: a strategy that allows them to identify the sizeable causal impact of inherited trust on worldwide growth during the twentieth century. Deviating from ‘inherited initial levels of trust, Roth (2009) has also concluded that from a policy point of view, an increase in trust is crucial for countries with low levels of trust, but can likely be neglected by countries with sufficient levels of trust and may even hamper economic performance in countries with high levels of trust.

This paper contributes to existing literature along two main axes: complementing existing literature and extending Berggren *et al.* (2008). Firstly, it complements recent literature in a twofold manner by: focusing on ‘growth thresholds’ instead of ‘trust thresholds’ and; investigating the Roth (2009) hypothesis: “*The common knowledge which has governed the nature of discussions in social science and economics of the last ten years, that trust is generally positively related to economic performance, must be seriously questioned*” (p. 124). Accordingly, the use of the quantile regression estimation technique enables us to assess how growth thresholds matter in the Roth hypothesis. Secondly, we extend Berggren *et al.* (2008) by using a methodology that is robust in the presence of outliers. The extension of Berggren *et al.* (2008) has a twofold motivation. (1) By using quantile regression, we are able to assess the robustness of the findings from another methodology underpinning. Hence, we also complement a strand of the literature on the relevance of a robust trust-growth nexus. (2) While the trust-growth relationship may be shaky, establishing how it is conditioned on initial growth levels could have substantial policy implications. Hence, if the trust-growth nexus is heterogeneous across growth distributions then, blanket policies may not be effective unless they are contingent on initial growth levels and tailored differently across high-growth and low-growth countries.

As far as we have reviewed, the only study closest to the present paper in the literature in terms of methodological underpinning is Peiró-Palomino & Tortosa-Ausina (2013). The present paper steers clear of theirs from three standpoints. Firstly, while they employ the quantile regression technique, their scope and positioning is on short-run and long-run development outcomes. Secondly, their study does not control for the plethora of cultural and social unobserved heterogeneity recently documented in the trust-growth literature (Uslaner, 2008; Tabellini, 2008; Algan & Cahuc 2010). Thirdly, the dataset used is significantly different from the Berggren *et al.* (2008) dataset which we intend to use.

Consistent with Peiró-Palomino & Tortosa-Ausina (2013) on the motivation for employing quantile regression, another aspect on which no consensus has yet been reached relates to determining if social capital effects are stronger in poorer or richer countries. Previous findings on the concern are based on average effects, mainly from Ordinary Least Squares (OLS) which suffers from several limitations. On the one hand in big samples outlying observations are common. Hence, estimated coefficients heavily affected by outliers may be biased. On the other hand, when the outliers are controlled for, the trust-growth nexus could depend on initial levels of growth. This argument which has become a challenging issue in social capital studies highlighted by Knack & Keefer (1997) has been integrated in recent studies (Roth, 2009)<sup>1</sup>.

The rest of the paper is organized as follows. Measurement and methodology issues are discussed in Section 2. Empirical analysis is covered in Section 3. We conclude with Section 4.

## 2. Data and Methodology

### 2.1 Data

We examine a sample of 63 countries (which are disclosed in Panel B of Appendix 2) using the same dataset as in Berggren *et al.* (2008) for the period 1990-2000. Hence, using the same dataset is logical, since this paper steers clear of the Berggren study in terms of methodological underpinnings. Literature sources from which the dataset is constituted include: Inglehart *et al.* (2000) and Inglehart *et al.* (2004). Consistent with the motivation of the paper, instead of focusing on a small sample in order to mitigate concerns about outliers, we focus on the large sample. This is essentially because the estimated technique to be adopted is tailored to handle concerns about outliers. The sample is partitioned into four groups, in accordance with the study motivating this paper. This partitioning includes: the outcome indicators, the independent variable of interest, switching control variables and fixed control variables. It is important to note that switching variables vary across specifications while fixed control variables are integrated into all regressions.

The outcome variable is real GDP annual growth rate (Growth) while the main independent variable is *Trust*, measured as the percentage of people trusting others (from the World Value Survey - WVS). In the context of this study, we do not consider the probable problems related to the composition of this trust variable (e.g. bias due to translation). The primary purpose of the study is to replicate Berggren *et al.* (2008) using a different estimation approach. Fixed variables include: *Schooling* (the average number of years in school, 1990), *Openness* (exports plus imports divided by real GDP per capita, in current prices, 1990), *Investment-good price* (the price level of investment) and *Real GDP per capita*, (in thousands of USD, 1990). There are twelve switching variables that are employed in pairs of three, consisting of four distinct specifications. These include: United Kingdom Colony, Religious fractionalization, Language fractionalization, Buddhists, sub-Saharan Africa, Orthodox, Muslims,

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<sup>1</sup> Knack & Keefer (1997) included a regression term ‘trust × initial income’ and concluded that the trust-growth nexus was stronger in poorer countries because the estimated value of the term was negative. Roth (2009) has split the sample into two sub-samples on the 25 (poorest) and 75 (richest) percentiles.

Jewish, Hindus, Urbanization, Area and the European Language. These variables have also been used by Berggren *et al.* (2008).

Details about variable definitions (with descriptive statistics) and correlation analysis (showing the relationships between key variables used in the paper) with presentation of countries are found in the appendices. The ‘summary statistics’ of the variables used in the regressions shows that there is quite some variation in the data utilized so that one should be confident that reasonable estimated nexuses would emerge (Appendix 1). The purpose of the correlation matrix (Panel A of Appendix 2) is to address issues resulting from multicollinearity. Based on a preliminary assessment of the correlation coefficients, there does not appear to be any serious concerns in terms of the relationships to be estimated.

## **2.2 Methodology**

### *2.2.1 Issue of outliers and robustness*

It has been substantially documented that OLS estimates are sensitive to outliers (Berggren *et al.*, 2008; Billger & Goel, 2009; Okada & Samreth, 2012; Asongu, 2013a, b; Boateng *et al.*, 2017). This means observations that deviate from the linear pattern formed by the majority of the data. Outliers frequently occur in datasets because of measurement errors as some observations may be drawn from a different population with a different type of nexus between them and the variable of interest or due to exceptional events (e.g. earthquakes). Accordingly, OLS on such a dataset contaminated by outliers may result in severely biased estimates. In the extreme case for instance, one single outlier can result in an infinite bias of OLS estimates. Using the Hadi (1992) outlier detection procedure, we found Australia, Brazil, USA and Canada that are outliers. Notwithstanding the Hadi approach to identifying outliers, the small dataset (without outliers) consists of 41 countries while the large dataset (with outliers) consists of 63 countries. Hence, by adopting the large dataset, we have taken into account the outliers that can be handled by the quantile regression estimation technique. Accordingly, in order to deal with the problem, robust regression methods are required. As far as we have reviewed, quantile regressions are the most widely used regression methods that are robust to outliers.

Another issue in the trust-growth nexus literature that has been substantially debated is robustness (Berggren *et al.*, 2008). In fact, the results may be fragile as the size of the estimated coefficient change with variation in control variables. This issue is addressed in this study by using four different sets of switching control variables that control for the unobserved heterogeneity and hence, assess the sensitivity of the trust-growth nexus to changes in socio-economic and cultural environments documented in recent literature (Uslaner, 2008; Tabellini, 2008; Algan & Cahuc 2010; Cahuc, 2013; Kodila-Tedika & Agbor, 2016).

### *2.2.2 Estimation technique*

Consistent with recent literature (Billger & Goel, 2009; Okada & Samreth, 2012; Asongu, 2013a, b), to determine whether existing levels of per capita economic prosperity affect how trust comes into play, we use quantile regression. This approach enables us to assess if the nexus between trust and growth differs throughout the distributions of growth (Koenker & Hallock, 2001). Hence, based on this estimation technique we are able to carefully examine the incidence of trust throughout the conditional distribution with particular emphasis on countries with the highest and lowest growth levels. Quantile regression (hence QR) yields parameters estimated at multiple points in the conditional distribution of the dependent variable (Koenker & Bassett, 1978). Accordingly, the  $\theta$ th quantile estimator of the endogenous variable is obtained by solving for the following optimization problem.

$$\min_{\beta \in R^k} \left[ \sum_{i \in \{i: y_i \geq x_i \beta\}} \theta |y_i - x_i \beta| + \sum_{i \in \{i: y_i < x_i \beta\}} (1 - \theta) |y_i - x_i \beta| \right], \quad (1)$$

where  $\theta$  is in the '0 and 1' interval. Contrary to OLS that is based on minimizing the sum of squared residuals, with QR we minimize the weighted sum of absolute deviations. For example the 10<sup>th</sup> decile or 75<sup>th</sup> quartile (with  $\theta=0.10$  or  $0.75$  respectively) by approximately weighing the residuals. The conditional quantile of  $y_i$  given  $x_i$  is:

$$Q_y(\theta / x_i) = x_i \beta_\theta, \quad (2)$$

where unique slope parameters are derived for each  $\theta^{\text{th}}$  quantile of interest. This formulation is analogous to  $E(y / x) = x_i \beta$  in the OLS slope though parameters are estimated only at the mean of the conditional distribution of the endogenous variable. For the model in Eq. (2) the dependent variable  $y_i$  is the GDP per capita growth rate while  $x_i$  contains a constant term, trust and control variables. Consistent with Berggren *et al.* (2008) we also provide a baseline estimation of mean effects. The employment of four sets of switch variables in different specifications for further robustness is consistent with recent quantile regression literature (Billger & Goel, 2009; Okada & Samreth, 2012; Asongu *et al.*, 2017; Tchamyoun & Asongu, 2017).

### 3. Empirical analysis

The results presented in Tables 2 include OLS and QR estimates. OLS estimates provide a baseline of mean effects and we compare these to estimates of separate quantiles in the conditional distributions of the growth dependent variable. In the interpretation of estimated coefficients, it is worth noting that smaller values (in conditional distributions) of the dependent variables denote less growth.

Table 1 below summarizes the trust-growth effects of Table 2. The motivation for this summary is to synthesize the potential incidence of trust on growth when initial growth levels matter. Based on the summary of the results, two main conclusions could be drawn. Firstly, the substantially documented positive trust-growth nexus is broadly confirmed. Secondly, when initial levels of growth come into play in determining the relationship, only 25<sup>th</sup> quartile and 90<sup>th</sup> decile confirm the positive nexus. These findings are consistent across specifications.

Most of the significant control variables have the expected signs. Firstly, the negative value of the initial growth coefficient confirms the presence of convergence in per capita income growth. This implies poorer countries (within full dataset and in some specific quantiles) are catching-up with their richer counterparts in terms of per capita income growth. Secondly, there is broadly a positive relationship between 'investment-good price and growth'. This nexus is not significantly positive in Berggren *et al.* (2008) because of specification differences. Thirdly, the positive effect of the *Hindu* dummy on growth in low income countries is broadly driven by the recent economic success of India in the sample.

While the emergence of a recent strand of interesting threshold literature on the trust-growth nexus has focused on how initial levels of trust matter in the relationship (Uslaner, 2008; Tabellini, 2008; Roth, 2009; Algan & Cahuc, 2010), we have shown that initial levels of growth could also matter in this relationship. In fact the present study has complemented Berggren *et al.* (2008) by establishing that, while the trust-growth nexus is shaky, it is also conditional on initial growth levels. From the available weight of empirical evidence, the Roth (2009) hypothesis that

cautions the generalization of the positive role of trust in economic performance is confirmed<sup>2</sup>. Hence, the trust benefits of economic growth could be contingent on initial levels of growth such that blanket trust-growth policies may not succeed unless they are tailored differently across low-income and high-income countries.

**Table 1: Summary of results**

|                 | OLS                        | Q 0.1            | Q 0.25                    | Q 0.50           | Q 0.75           | Q 0.90                     |
|-----------------|----------------------------|------------------|---------------------------|------------------|------------------|----------------------------|
| Specification 1 | <b>0.063***</b><br>(0.002) | 0.028<br>(0.532) | <b>0.073*</b><br>(0.078)  | 0.034<br>(0.276) | 0.038<br>(0.168) | <b>0.082**</b><br>(0.042)  |
| Specification 2 | <b>0.063***</b><br>(0.001) | 0.007<br>(0.928) | <b>0.073**</b><br>(0.033) | 0.036<br>(0.258) | 0.045<br>(0.264) | <b>0.060*</b><br>(0.056)   |
| Specification 3 | <b>0.055***</b><br>(0.006) | 0.038<br>(0.200) | <b>0.042*</b><br>(0.097)  | 0.032<br>(0.241) | 0.069<br>(0.288) | <b>0.094**</b><br>(0.030)  |
| Specification 4 | <b>0.062***</b><br>(0.003) | 0.035<br>(0.477) | <b>0.072*</b><br>(0.062)  | 0.040<br>(0.155) | 0.054<br>(0.109) | <b>0.099***</b><br>(0.003) |

\*, \*\*, \*\*\*, denote significance levels of 10%, 5% and 1% respectively. Lower quantiles (e.g., Q 0.1) signify nations where GDP per capita growth is least. OLS: Ordinary Least Squares.

**Table 2: Conditional estimations**

|                             | OLS                        | Q 0.1             | Q 0.25                   | Q 0.50                 | Q 0.75                     | Q 0.90                     |
|-----------------------------|----------------------------|-------------------|--------------------------|------------------------|----------------------------|----------------------------|
|                             |                            |                   |                          | <b>Specification 1</b> |                            |                            |
| Constant                    | -0.294<br>(0.809)          | 0.231<br>(0.912)  | 0.245<br>(0.887)         | 0.007<br>(0.996)       | 1.478<br>(0.313)           | 0.969<br>(0.685)           |
| Trust                       | <b>0.063***</b><br>(0.002) | 0.028<br>(0.532)  | <b>0.073*</b><br>(0.078) | 0.034<br>(0.276)       | 0.038<br>(0.168)           | <b>0.082**</b><br>(0.042)  |
| RGDP                        | <b>-0.159**</b><br>(0.026) | 0.111<br>(0.407)  | 0.015<br>(0.886)         | -0.080<br>(0.452)      | <b>-0.195**</b><br>(0.047) | <b>-0.284**</b><br>(0.035) |
| IGP                         | 0.014<br>(0.153)           | -0.001<br>(0.942) | -0.001<br>(0.927)        | 0.008<br>(0.530)       | 0.009<br>(0.607)           | 0.018<br>(0.587)           |
| Fixed Control Variables     | Schooling<br>(0.504)       | -0.054<br>(0.809) | -0.238<br>(0.365)        | 0.120<br>(0.648)       | 0.134<br>(0.529)           | 0.248<br>(0.377)           |
|                             | Openness<br>(0.728)        | -0.002<br>(0.516) | -0.002<br>(0.859)        | -0.003<br>(0.790)      | 0.001<br>(0.920)           | 0.008<br>(0.475)           |
| Switching Control Variables | UK_Colony<br>(0.894)       | 1.691<br>(0.393)  | 0.719<br>(0.483)         | -0.325<br>(0.773)      | -0.273<br>(0.865)          | 0.798<br>(0.454)           |
|                             | LanguageF.<br>(0.301)      | 0.561<br>(0.763)  | -1.800<br>(0.423)        | 0.390<br>(0.815)       | -1.128<br>(0.562)          | <b>-2.910**</b><br>(0.024) |
|                             | Religious F.<br>(0.569)    | -3.468<br>(0.318) | 0.416<br>(0.859)         | 0.005<br>(0.998)       | 1.920<br>(0.376)           | 0.663<br>(0.811)           |
| Pseudo R <sup>2</sup>       | 0.249                      | 0.282             | 0.163                    | 0.078                  | 0.151                      | 0.411                      |
| Observations                | 63                         | 63                | 63                       | 63                     | 63                         | 63                         |

|          | OLS                         | Q 0.1             | Q 0.25                    | Q 0.50                 | Q 0.75                    | Q 0.90                     |
|----------|-----------------------------|-------------------|---------------------------|------------------------|---------------------------|----------------------------|
|          |                             |                   |                           | <b>Specification 2</b> |                           |                            |
| Constant | -0.602<br>(0.573)           | -2.921<br>(0.361) | -0.436<br>(0.774)         | 1.067<br>(0.469)       | 2.235<br>(0.178)          | <b>2.798*</b><br>(0.067)   |
| Trust    | <b>0.063***</b><br>(0.001)  | 0.007<br>(0.928)  | <b>0.073**</b><br>(0.033) | 0.036<br>(0.258)       | 0.045<br>(0.264)          | <b>0.060*</b><br>(0.056)   |
| RGDP     | <b>-0.191***</b><br>(0.005) | -0.157<br>(0.273) | -0.151<br>(0.203)         | -0.093<br>(0.300)      | <b>-0.144*</b><br>(0.085) | <b>-0.249**</b><br>(0.012) |
| IGP      | <b>0.017*</b>               | 0.026             | 0.011                     | 0.010                  | 0.004                     | -0.002                     |

<sup>2</sup> “The common knowledge which has governed the nature of discussions in social science and economics of the last ten years, that trust is generally positively related to economic performance, must be seriously questioned” (Roth, 2009, p. 124).

|                             |                       |                                    |                             |                             |                             |                             |                                  |
|-----------------------------|-----------------------|------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------------|
| Fixed Control Variables     | Schooling             | <b>(0.071)</b><br>0.205<br>(0.229) | (0.454)<br>0.543<br>(0.189) | (0.275)<br>0.221<br>(0.484) | (0.355)<br>0.018<br>(0.943) | (0.724)<br>0.060<br>(0.806) | (0.872)<br>0.251<br>(0.425)      |
|                             | Openness              | -0.003<br>(0.627)                  | -0.031<br>(0.407)           | -0.033<br>(0.307)           | -0.002<br>(0.776)           | -0.0004<br>(0.971)          | 0.008<br>(0.449)                 |
| Switching Control Variables | Orthodox              | <b>-0.028*</b><br><b>(0.057)</b>   | -0.031<br>(0.266)           | -0.028<br>(0.345)           | -0.034<br>(0.308)           | -0.017<br>(0.363)           | <b>-0.031*</b><br><b>(0.076)</b> |
|                             | Muslims               | -0.005<br>(0.567)                  | 0.007<br>(0.809)            | -0.0001<br>(0.989)          | -0.009<br>(0.457)           | -0.006<br>(0.611)           | -0.013<br>(0.231)                |
|                             | Buddhists             | 0.024<br>(0.417)                   | -0.005<br>(0.853)           | -0.017<br>(0.568)           | -0.014<br>(0.675)           | 0.101<br>(0.385)            | 0.027<br>(0.824)                 |
|                             | Pseudo R <sup>2</sup> | 0.296                              | 0.312                       | 0.170                       | 0.090                       | 0.219                       | 0.403                            |
|                             | Observations          | 63                                 | 63                          | 63                          | 63                          | 63                          | 63                               |

|                             | OLS                               | Q 0.1                             | Q 0.25                          | Q 0.50                            | Q 0.75            | Q 0.90                           |
|-----------------------------|-----------------------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------|----------------------------------|
|                             | Specification 3                   |                                   |                                 |                                   |                   |                                  |
| Constant                    | -0.588<br>(0.599)                 | 0.006<br>(0.996)                  | -0.959<br>(0.425)               | -0.177<br>(0.909)                 | -0.211<br>(0.933) | 0.717<br>(0.865)                 |
| Trust                       | <b>0.055***</b><br><b>(0.006)</b> | 0.038<br>(0.200)                  | <b>0.042*</b><br><b>(0.097)</b> | 0.032<br>(0.241)                  | 0.069<br>(0.288)  | <b>0.094**</b><br><b>(0.030)</b> |
| Fixed Control Variables     | RGDP                              | <b>-0.170**</b><br><b>(0.014)</b> | 0.002<br>(0.977)                | 0.004<br>(0.952)                  | -0.147<br>(0.246) | <b>-0.292*</b><br><b>(0.090)</b> |
|                             | IGP                               | <b>0.019*</b><br><b>(0.055)</b>   | 0.009<br>(0.400)                | 0.012<br>(0.216)                  | 0.025<br>(0.276)  | 0.030<br>(0.370)                 |
|                             | Schooling                         | 0.143<br>(0.380)                  | -0.132<br>(0.522)               | -0.148<br>(0.419)                 | 0.040<br>(0.866)  | 0.208<br>(0.486)                 |
|                             | Openness                          | -0.002<br>(0.772)                 | -0.024<br>(0.428)               | 0.005<br>(0.530)                  | 0.001<br>(0.867)  | 0.003<br>(0.743)                 |
| Switching Control Variables | Hindus                            | 0.019<br>(0.407)                  | <b>0.038*</b><br><b>(0.066)</b> | <b>0.041***</b><br><b>(0.008)</b> | 0.022<br>(0.321)  | -0.001<br>(0.970)                |
|                             | Jews                              | 0.300<br>(0.520)                  | 0.513<br>(0.146)                | 0.381<br>(0.239)                  | 0.669<br>(0.452)  | 0.668<br>(0.476)                 |
|                             | SSA                               | -1.292<br>(0.200)                 | -0.864<br>(0.333)               | -1.339<br>(0.212)                 | -1.308<br>(0.335) | -1.553<br>(0.615)                |
|                             | Pseudo R <sup>2</sup>             | 0.267                             | 0.335                           | 0.210                             | 0.114             | 0.173                            |
|                             | Observations                      | 63                                | 63                              | 63                                | 63                | 63                               |

|                             | OLS                               | Q 0.1                              | Q 0.25                          | Q 0.50            | Q 0.75            | Q 0.90                            |
|-----------------------------|-----------------------------------|------------------------------------|---------------------------------|-------------------|-------------------|-----------------------------------|
|                             | Specification 4                   |                                    |                                 |                   |                   |                                   |
| Constant                    | -1.397<br>(0.252)                 | -2.057<br>(0.436)                  | -2.011<br>(0.422)               | -0.362<br>(0.827) | 1.152<br>(0.560)  | -0.552<br>(0.797)                 |
| Trust                       | <b>0.062***</b><br><b>(0.003)</b> | 0.035<br>(0.477)                   | <b>0.072*</b><br><b>(0.062)</b> | 0.040<br>(0.155)  | 0.054<br>(0.109)  | <b>0.099***</b><br><b>(0.003)</b> |
| Fixed Control Variables     | RGDP                              | <b>-0.182***</b><br><b>(0.007)</b> | -0.058<br>(0.530)               | -0.081<br>(0.462) | -0.098<br>(0.322) | <b>-0.185*</b><br><b>(0.075)</b>  |
|                             | IGP                               | <b>0.017*</b><br><b>(0.064)</b>    | 0.019<br>(0.199)                | 0.012<br>(0.302)  | 0.017<br>(0.180)  | 0.011<br>(0.559)                  |
|                             | Schooling                         | 0.159<br>(0.334)                   | -0.002<br>(0.992)               | -0.164<br>(0.506) | 0.063<br>(0.782)  | 0.021<br>(0.930)                  |
|                             | Openness                          | 0.001<br>(0.889)                   | -0.021<br>(0.535)               | -0.024<br>(0.568) | 0.005<br>(0.603)  | 0.006<br>(0.563)                  |
| Switching Control Variables | Urban                             | -0.0003<br>(0.986)                 | 0.010<br>(0.741)                | 0.037<br>(0.325)  | -0.013<br>(0.613) | 0.0008<br>(0.969)                 |
|                             | EuroL                             | 0.929<br>(0.1387)                  | 0.479<br>(0.590)                | 0.219<br>(0.826)  | 0.729<br>(0.413)  | 0.703<br>(0.367)                  |
|                             | Area                              | -0.000<br>(0.151)                  | -0.000<br>(0.177)               | -0.000<br>(0.624) | -0.000<br>(0.401) | -0.000<br>(0.394)                 |
|                             | Pseudo R <sup>2</sup>             | 0.302                              | 0.328                           | 0.189             | 0.117             | 0.179                             |
|                             | Observations                      | 63                                 | 63                              | 63                | 63                | 63                                |

Notes. The dependent variables is the GDP per capita growth rate. \*\*\*, \*\*, \*, denote significance levels of 10%, 5% and 1% respectively. Lower quantiles (e.g., Q 0.1) signify nations GDP per capita growth is least. P-values in brackets. FDI: Foreign Direct Investment. RGDP: Real GDP per capita in 1996 constant prices (1990). IGP: Investment Good Price. LanguageF: Language fractionalization. Religious F: Religious fractionalization. SSA: Sub-Saharan Africa. EuroL: European Language. OLS: Ordinary Least Squares.

#### 4. Conclusion

The paper has extended Berggren *et al.* (2008) on “trust and growth: a shaky relationship” by incorporating recent developments in the trust-growth literature and using a robust methodological underpinning that accounts for the presence of outliers. The empirical evidence is based on 63 countries. Two main findings have been established. First, the substantially documented positive trust-growth nexus is broadly confirmed. Second, when initial levels of growth come into play in determining the relationship, only the 25<sup>th</sup> quartile and 90<sup>th</sup> decile confirm the positive nexus. This implies that trust increases growth exclusively at certain thresholds of the growth distribution, notably: in countries experiencing average below-median growth levels (i.e. 25<sup>th</sup> quartile) and in countries experiencing the highest above-median growth (i.e. 90<sup>th</sup> decile).

The results suggest that the trust-growth nexus cannot be generalized for all countries as some previous studies have concluded. Accordingly, blanket trust-growth policies may not succeed unless they are contingent on existing levels of development and tailored differently across rich and poor countries.

In the light of the above, the findings of the study contribute to the existing literature by establishing that the positive trust-growth relationship depends on certain levels of economic growth. This directly contributes to the extant literature that is closest to this study, namely: Berggren *et al.* (2008) and Peir´o-Palomino and Tortosa-Ausina (2013). Accordingly, Berggren *et al.* (2008) have estimated the same regression model with the same dataset and focused on testing the robustness of the trust-growth relationship to outlying observations. The authors have found that outliers (notably Ireland and China) have a substantial effect on the investigated nexus. Using quantile regression, Peir´o-Palomino and Tortosa-Ausina (2013) have estimated the effect of trust on GDP per capita (contrary to GDP growth used in this study). They authors establish that the nexus between trust and GDP per capita does not hold throughout the entire distribution of the outcome indicator. In the introduction, we have clarified how the positioning of this note steers clear of these two main studies.

As a caveat, some researchers may find GDP growth to be odd as a dependent variable. This is essentially because trust is acknowledged as a determinant of growth in the long term. Hence, GDP per capita seems to be a natural dependent variable because the growth-enhancing impact of trust is more likely to be captured by GDP per capita than by GDP growth.



## Appendices

### Appendix 1: Variable specifications and descriptive statistics (1990-2000)

| Variables                   | Definitions  | Obs | Mean   | S.D   | Min   | Max    | Sources  |
|-----------------------------|--|-----|--------|-------|-------|--------|--|
| Growth                      | Annual growth rate in percent of real GDP (chain) per capita, 1990-2000: $100 * [(Real\ GDP\ per\ capita_{2000} / Real\ GDP\ per\ capita_{1990})^{1/10} - 1]$<br>Taiwan: 1990–1998 | 63  | 1.751  | 1.934 | -2.58 | 7.688  | Heston <i>et al.</i> (2002)  |
| Trust                       | First value of trust 1990–2000, i.e., the share that agrees with the statement “most people can be trusted”  | 63  | 30.46  | 15.71 | 5.000 | 66.10  | Inglehart <i>et al.</i> (2000); Zak and Knack (2001) and Inglehart <i>et al.</i> (2004)  |
| Schooling                   | Average years of schooling, 1990   | 63  | 6.698  | 2.624 | 2.190 | 12.00  | Barro and Lee (2001)   |
| Real GDP per capita         | Real GDP (chain) per capita, thousands of USD in 1996 constant prices, 1990  | 63  | 10.244 | 7.606 | 0.686 | 26.45  | Heston <i>et al.</i> (2002)  |
| Investment-good price       | The PPP of investment divided by the exchange rate times 100, 1990   | 63  | 78.960 | 33.50 | 12.46 | 177.6  | Heston <i>et al.</i> (2002)  |
| Openness                    | Exports plus imports divided by real GDP per capita, in current prices, 1990   | 63  | 57.362 | 28.98 | 14.99 | 154.65 | Heston <i>et al.</i> (2002)  |
| UK colony                   | Dummy with value 1 if former UK colony and 0 otherwise   | 63  | 0.190  | 0.395 | 0.000 | 1.000  | Persson and Tabellini (2003); <a href="http://www.britishempire.co.uk">http://www.britishempire.co.uk</a> ; Encyclopaedia Britannica; <i>Nationalencyklopedin</i> [Swedish <i>National Encyclopedia</i> ]  |
| Language fractionalization  | One minus the Herfindal index of linguistic group shares, 2001   | 62  | 0.269  | 0.257 | 0.002 | 0.922  | Alesina <i>et al.</i> (2003)   |
| Religious fractionalization | One minus the Herfindal index of religious group shares, 2001  | 63  | 0.390  | 0.232 | 0.004 | 0.860  | Alesina <i>et al.</i> (2003)   |
| Orthodox                    | Share of population that is Orthodox Christian, 2000   | 63  | 3.881  | 15.96 | 0.000 | 93.76  | World Christian Database, <a href="http://www.worldchristiandatabase.org/wcd/">http://www.worldchristiandatabase.org/wcd/</a> ; population from Heston <i>et al.</i> (2002), for Taiwan from <a href="http://www.census.gov/ipc/www/idbsum.html">http://www.census.gov/ipc/www/idbsum.html</a> |
| Muslim                      | Share of population that is Muslim, 2000   | 63  | 11.52  | 28.03 | 0.000 | 98.11  | Ditto  |
| Buddhist                    | Share of population that is Buddhist, 2000   | 63  | 1.888  | 7.711 | 0.000 | 55.72  | Ditto  |
| Hindu                       | Share of population that is Hindu, 2000  | 63  | 1.703  | 10.14 | 0.000 | 79.76  | Ditto  |
| Jewish                      | Share of population that is Jewish, 2000   | 62  | 0.259  | 0.546 | 0.000 | 3.065  | Ditto  |
| Sub-Sahara                  | Dummy with value 1 if African country is located to the south of the Sahara and 0 otherwise  | 63  | 0.063  | 0.245 | 0.000 | 1.000  |  |
| Urban                       | Share of population in urban areas, 1990   | 62  | 60.65  | 19.10 | 11.2  | 96.40  | United Nations (2003)  |
| European Language           | Fraction of a country's population that speaks English, French, German, Portuguese or Spanish  | 63  | 0.401  | 0.433 | 0.00  | 1.00   | Hall and Jones (1999); <a href="http://www.ethnologue.com">http://www.ethnologue.com</a>   |
| Area                        | Million square kilometres  | 63  | 1.18   | 2.40  | 0.00  | 10.0   | Central Intelligence Agency (2004)   |

Obs: Observations. S.D: Standard Deviation. Min: Minimum. Max: Maximum.

## Appendix 2: Correlation Matrix and Presentation of Countries

Panel A: Correlation Matrix

| Educ. | RGDP  | IGP   | Open  | UKcol  | Lanfrac | Relifrac | Ortho  | Muslim | Budd.  | Hindu  | Jewish | SSA    | Urban  | EuroL  | Area   | Trust  | Growth |          |
|-------|-------|-------|-------|--------|---------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|
| 1.000 | 0.789 | 0.276 | 0.216 | -0.155 | -0.205  | 0.307    | 0.146  | -0.457 | 0.163  | -0.188 | 0.271  | -0.291 | 0.640  | 0.049  | 0.099  | 0.537  | 0.045  | Educ.    |
|       | 1.000 | 0.604 | 0.169 | -0.147 | -0.167  | 0.279    | -0.035 | -0.326 | 0.186  | -0.168 | 0.252  | -0.245 | 0.603  | 0.135  | 0.116  | 0.624  | 0.008  | RGDP     |
|       |       | 1.000 | 0.067 | -0.110 | -0.125  | 0.035    | -0.041 | 0.012  | 0.132  | -0.127 | -0.002 | 0.022  | 0.233  | 0.013  | -0.058 | 0.479  | 0.184  | IGP      |
|       |       |       | 1.000 | -0.026 | -0.064  | -0.144   | -0.047 | -0.021 | -0.121 | -0.210 | -0.211 | -0.161 | 0.198  | -0.097 | -0.397 | 0.088  | -0.059 | Open     |
|       |       |       |       | 1.000  | 0.380   | 0.316    | -0.061 | 0.272  | -0.089 | 0.268  | -0.040 | 0.536  | -0.274 | -0.113 | 0.183  | 0.032  | 0.064  | UKcol    |
|       |       |       |       |        | 1.000   | 0.323    | -0.110 | 0.102  | -0.108 | 0.283  | -0.086 | 0.471  | -0.394 | -0.310 | 0.070  | -0.091 | -0.126 | Lanfrac  |
|       |       |       |       |        |         | 1.000    | -0.139 | -0.336 | 0.208  | -0.035 | 0.154  | 0.414  | 0.055  | 0.076  | 0.339  | 0.182  | 0.014  | Relifrac |
|       |       |       |       |        |         |          | 1.000  | -0.031 | -0.058 | -0.038 | -0.052 | -0.062 | -0.026 | -0.188 | -0.067 | 0.041  | -0.158 | Ortho    |
|       |       |       |       |        |         |          |        | 1.000  | -0.086 | 0.072  | -0.152 | -0.041 | -0.317 | -0.339 | -0.030 | -0.110 | -0.010 | Muslim   |
|       |       |       |       |        |         |          |        |        | 1.000  | -0.025 | -0.084 | -0.063 | 0.016  | -0.184 | 0.014  | 0.180  | 0.161  | Budd.    |
|       |       |       |       |        |         |          |        |        |        | 1.000  | -0.066 | -0.020 | -0.292 | -0.142 | 0.109  | 0.031  | 0.157  | Hindu    |
|       |       |       |       |        |         |          |        |        |        |        | 1.000  | -0.062 | 0.387  | 0.390  | 0.396  | 0.121  | 0.035  | Jewish   |
|       |       |       |       |        |         |          |        |        |        |        |        | 1.000  | -0.405 | -0.218 | -0.071 | -0.213 | -0.147 | SSA      |
|       |       |       |       |        |         |          |        |        |        |        |        |        | 1.000  | 0.426  | 0.068  | 0.189  | -0.027 | Urban    |
|       |       |       |       |        |         |          |        |        |        |        |        |        |        | 1.000  | 0.221  | -0.177 | 0.049  | EuroL.   |
|       |       |       |       |        |         |          |        |        |        |        |        |        |        |        | 1.000  | 0.206  | 0.244  | Area     |
|       |       |       |       |        |         |          |        |        |        |        |        |        |        |        |        | 1.000  | 0.346  | Trust    |
|       |       |       |       |        |         |          |        |        |        |        |        |        |        |        |        |        | 1.000  | Growth   |

Panel B: Presentation of Countries (63)

Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Bolivia, Brazil, Canada, Chile, China, Colombia, Costa Rica, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Finland, France, Germany, Ghana, Guatemala, Honduras, Greece, Iceland, India, Indonesia, Ireland, Italy, Japan, Jordan, Korea, Latvia, Mexico, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, Uganda, United Kingdom, Uruguay, USA, Venezuela, Zimbabwe.

Educ: Schooling. RGDP: Real GDP per capita in 1996 constant prices (1990). IGP: Investment Good Price. Open: Openness. UKcol: UK Colony. Lanfrac: Language fractionalization. Relifrac: Religious fractionalization. Ortho: Orthodox. Budd: Buddhist. SSA: Sub-Saharan Africa. EuroL: European Language.

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