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Social Divergence and Economic Performance

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Abstract

The paper introduces the concept of social divergence defined as the social barriers to communication and exchange between individuals and groups of individuals within a society. Social divergence is determined by the characteristics of a society including the distribution of income, ethnolinguistic diversity, religious diversity, educational distance, and other factors. The hypothesis is that social divergence reduces the degree of interaction between individuals that stimulates innovation and leads to the diffusion of productivity-enhancing ideas. Using a cross section of 31 developing countries, total factor productivity (TFP) is regressed on measures of social divergence. The results indicate that, separate from any effects due to factor accumulation, higher levels of social divergence result in lower levels of economic performance.

JEL classification: O4, C2, P0
Key Words: social divergence, total factor productivity

Résumé

Divergence sociale et performance économique Cette étude présente un concept de divergence sociale définie en termes de barrières sociales à la communication et à l'échange entre des individus et des groupes d'individus dans une société. La divergence sociale est déterminée en fonction de caractéristiques d'une société comprenant la répartition du revenu, la diversité ethnolinguistique, la diversité religieuse, le niveau d'éducation et d'autres facteurs. L'hypothèse est que la divergence sociale réduit le degré d'interaction entre les individus qui stimule l'innovation et mène à la diffusion d'idées qui favorisent la productivité et la mise en valeur. Avec un échantillon de 31 pays en voie de développement, on régresse la productivité factorielle totale (PFT) sur des mesures de divergence sociale. Les résultats indiquent que, séparé de tous les effets d'accumulation de facteurs, une divergence sociale élevée réduit les niveaux de performance économique.

Classification de JEL **:** O4, C2, P0
Mots clés : divergence sociale, productivité factorielle totale

> "But the economical advantages of commerce are surpassed in importance by those of its effects which are intellectual and moral. It is hardly possible to overrate the value, in the present low state of human improvement, of placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar … Such communication has always been, and is peculiarly in the present age, one of the primary sources of progress."

J.S. Mill, *Principles of Political Economy with Some of Their Applications to Social Philosophy* (1965 edition, Ch. XVII, Book III, p.594).

I. Introduction

It has long been observed that the rules of the game of society and the nature of transactions among people are major determinants of economic success. An institutional perspective of economic performance also attaches importance to transactions costs and property rights (Coase, 1937, 1960), political factors and the rules that affect exchange (Matthews, 1986; North, 1990; Olson, 1996), the rule of law (Posner, 1989), the structure of society (Mill, 1965) and the level of trust among individuals and civic engagement, characterized as "social capital" (Putnam, 1993). These approaches emphasize that economic performance is not simply a question of factor accumulation, but that economic growth is a dynamic process intricately linked to the norms of society, transactions among individuals and modes of behavior.

This paper builds upon the institutional and social capital literature to develop the notion of social divergence as an important factor in explaining variations in economic performance. Social divergence represents the social barriers to communication between individuals and groups of individuals and is determined by the characteristics of a society. In the extreme, complete social divergence exists when people face an insurmountable barrier to exchange, for example because they cannot communicate in a common language and lack an intermediary to facilitate interaction. The hypothesis is that social barriers to communication reduce the rate and quality of exchange of ideas, which, in turn, adversely affect economic performance.

Social divergence is affected by ethnic and religious diversity, culture, education, the level and distribution of income, age distribution and openness to trade. Each aspect of social divergence is likely to affect economic performance in different ways. For example, a lack of trust, which may arise from social divergence, may prevent mutually beneficial exchanges of ideas,[1] while large differences in age and education between individuals hinder the ability to communicate and thus to exchange ideas and knowledge. The greater the degree of social divergence the greater are the barriers to exchange, and the lower the level of interaction between individuals that stimulates innovation and the diffusion of productivity-enhancing ideas.

Using cross-sectional data from 31 countries for which data are available for all relevant variables, the paper explores the effects of various measures of social divergence on economic performance, as proxied by total factor productivity (TFP). This approach isolates the effects on TFP of factors characterizing social divergence from their impacts on factor accumulation. Section II describes the concept of social divergence, how it differs from social capital, and its potential effects on economic performance. Section III describes the empirical model and data used to test the hypothesis that different dimensions of social divergence affect economic performance. The empirical results are reported in Section IV and discussed more fully in Section V. Section VI concludes with suggestions for further research.

II. The Nature of Social Divergence

The emphasis in this paper on social divergence, and the social barriers to the exchange of ideas, has parallels in the literature on property rights that stress transactions costs as barriers to trade. The notion of specialization of labor, and that trade in goods and services can benefit society, has its origins in Adam Smith's *Wealth of Nations.* More recently, Cheung (1998) has suggested that the ratio of transactions costs to gains from specialization is a good predictor of economic performance, and that a small change in this ratio can have a large impact on wealth accumulation.

By contrast to the transactions costs and property rights literature, this paper emphasizes that *social* divergence creates social barriers to the exchange of ideas and knowledge that contribute to economic growth. The hypothesis is that communication barriers due to social divergence are important in determining economic performance, even for given levels of specialization or the division of labor. From this perspective, social divergence prevents individuals from transcending their knowledge set and, thus, hinders them from benefiting from the knowledge of others that lead to productivity gains. In other words, social divergence hinders the potential "…cooperation among highly specialized workers that enables advanced economies to utilize a vast amount of knowledge" (Becker and Murphy, 1992, p. 1144).

The perspective taken in this paper is that humans have a tendency to associate and communicate with persons with whom they can identify. Group identification of "like with like" occurs on multiple levels on both a social and professional level. For example, our friends often have a similar level of education, income, age and marital status. The more alike are individuals, the lower the costs or dissonance associated with interactions and, for a given level of potential gain from specialization, the greater the likelihood of mutually beneficial knowledge exchange. Such "like with like" interaction occurs at an individual, group and national level and may help explain why trade densities are so much greater within countries than across countries. For example, McCallum (1995) and Helliwell (1999) have shown that border effects reduce trade flows by up to a factor of 20 for the US and Canada, despite a free-trade agreement. Similar results have also been found for the European Union (Nitsch, 2000), and are consistent with the finding that a common language is important in significantly increasing trade densities between countries (Wei, 1996).[2]

Group identification, and the potential communication barriers between individuals of different groups, is likely inherent in our evolution. For example, brain size is strongly correlated with the group size of species and has been used to suggest that humans are "hard-wired" to identify with only a certain number of individuals (Dunbar, 1996).[3] Whatever the cause, humans have always lived in groups and natural selection would seem to have favored those persons with an aptitude to co-operate and exchange with others.[4] The notion of social divergence takes this one step further by suggesting that barriers to communication across social groupings or cohorts are a significant impediment to knowledge transfer and potential productivity gains, both at the individual level and, taking into account potential spillovers, at the aggregate level.

Many different factors may affect social divergence and, thus, productivity. Formal and informal education and training that enable individuals to learn faster and benefit from existing knowledge, and to participate more fully in the exchange and adoption of ideas, have clear benefits for labor productivity. Indeed, recognition of this fact has led to the development of institutions and policies that foster learning and knowledge exchange.[5] Income distribution is also likely to be an important determinant of social divergence as income is a proxy for differences in lifestyles, activities and groupings. Similarly, inherent ethnic, cultural and religious differences may pose further barriers to communication that, in turn, reduce the number and quality of exchanges that would otherwise increase productivity.

Related concepts, variously labeled "social diversity", "social distance' or "social polarization", have recently attracted increasing attention in the literature. For example, Zak and Knack (1998) focus on the relevance of social heterogeneity, also labeled "social distance", in generating generalized trust or, in Fukuyama's (1999) terms, "wide-radius" trust. They formulate a principal (investor) – agent (broker) model in which cheating is more likely when the social distance between randomly matched investors and brokers is greater. Transactions costs are incurred in that investors can forego resources to monitor their investments and hence check on the honesty of brokers.[6] However, their model does not capture the barriers to communication that arise due to social divergence nor do they address its importance in hindering disembodied technical change.

More closely related to our work, Lazear (1999) argues that trade is facilitated by a common culture as this increases the pool of potential trading partners. Lack of a common culture will inhibit the circle of contacts, which may leave economies of scale unexploited. Lazear focuses specifically on a common language, but his emphasis is more on opportunities to trade than communication of ideas and knowledge. Gradstein and Justman (2000) focus on the role of state schooling as a source of common socialization that can reduce social distance between individuals and hence reduce transactions costs. They cite Lazear's arguments, but also refer to the literature on social capital and on the effects of ethnic heterogeneity, as motivation for assuming that the social distance between agents affects the productivity of transactions.

A. Social Divergence and Social Capital

The social capital literature draws attention to the importance of networks, trust and civic engagement in determining economic performance. The exact mechanisms as to how social capital, defined by Putnam (1993, pp. 35-36) as the "features of social organization … that facilitate coordination and cooperation for mutual benefit", affect economic performance is not, however, well defined. Putnam argues that civic engagement encourages individuals to behave in ways that benefit others, in terms of general reciprocity, and discourages socially destructive behavior, such as violence and theft. Thus, social capital can encourage children to finish school, or individuals to undertake activities that benefit their neighbors, and for communities to be more actively engaged in the democratic process.

Empirical tests for the importance of social capital often focus upon measures of trust and civic engagement, both of which have been shown to decline with income inequality (e.g., Zak and Knack, 1998). Knack and Keefer (1997) hypothesize that increasing trust increases innovation, reduces the wasted resources associated with protecting property rights, and increases individual incentives to accumulate physical capital. By contrast, civic engagement has economic pay offs by increasing participation in government by citizens that, in turn, improves government policies. Temple and Johnson (1998) also evaluate the effects of "social capability", which they interpret more broadly than social capital, using a variety of measures. Their most robust result is the significant relationship they find between the extent of mass communications and subsequent growth in both GDP per capita and TFP.

Social capital stresses the importance of trust and civic engagement and the need to ensure beneficial institutional arrangements that generate social and economic gains. By contrast, social divergence stresses the impediments to the exchange of ideas and knowledge between individuals that lead to innovation and diffusion of productivity-enhancing methods. While related, the concepts are not mirror images; instead they place a different emphasis on the importance of the social factors that affect economic performance. Different dimensions of social divergence (ethnic diversity, income inequality, etc.) affect the level of trust and civic engagement,[7] but social divergence can have direct effects on economic performance that are unrelated to trust, civic engagement or similar empirical measures of social capital (Knack, 2000, p.8). For example, Temple and Johnson (1998) argue that a robust correlation between their index of mass communications and growth could exist because the former is a good proxy for the level of civic engagement, as measured by World Values Survey data on trust and membership in associations. From the viewpoint of the concept of social divergence, however, no indirect effect is required. Mass communications reduce the physical barriers to communications that mitigate social divergence and can, thus, promote the exchange of ideas and knowledge that lead to productivity gains.

Silicon Valley serves as a useful example of the contrast between the two concepts. Cohen and Fields (1999) argue persuasively that Silicon Valley lacks many of the attributes of civic engagement that would characterize high levels of social capital as defined by Putnam, but remains highly successful in economic terms. They hypothesize that the economic success of Silicon Valley arises from collaboration and partnerships among firms and individuals that lead to innovation. In other words, its economic performance is attributable to high levels of communication and exchange of ideas among persons with similar education.[8] Indeed, agglomeration economies that explain why firms of similar type locate near each other can simply be considered as a manifestation of the increasing returns inherent from overcoming significant barriers to the exchanging of ideas. Such exchanges that stimulate innovations and promote "adaptive efficiency" (North, 1994) are likely to be an important determinant of long-run economic growth. In sum, the effect of social divergence on economic performance recognizes that technical progress and productivity gains arise from the exchange of ideas that lead to innovation, and contribute to the diffusion of improved practices and methods. The exchange and diffusion of ideas arise within formal and informal networks between individuals and groups of individuals and, thus, social barriers that prevent meaningful exchanges across groups inhibit economic growth.

B. Competing Explanations

The difficulty in evaluating the effect of social divergence on economic performance, via social barriers to communication, is that several other competing hypotheses exist as to why educational distance, income inequality, ethnic diversity or other proxies for social divergence may affect economic growth.[9]

For example, while the level of human capital is generally regarded to be an important determinant of economic growth and levels of output per capita (see Temple, 2000 for a recent review of the literature), there are also some arguments (and tentative evidence) that educational inequality reduces growth. López, Thomas and Wang, (1998) note that non-market mechanisms, and factors such as parental income, supply constraints and location, determine the allocation of education. As a result, there are likely to be significant differences in marginal products of education across different individuals that are not explainable in terms of variation in ability. This implies that the distribution of education will affect the level of output per capita. Recent empirical work by Castelló and Doménech (2001) find that educational inequality, as measured by an educational Gini coefficient, is negatively correlated with economic growth.

Evidence exists that ethnic diversity is a predictor of potential conflict, political instability and growth–retarding institutions and policies (Easterly and Levine 1997).[10] Barro (1997, p. 72) also observes that such diversity may reduce the chances of a society becoming or remaining a democracy. Where democracy does not exist, development-impeding institutions may form a "trap" whereby exploitive institutions and severe inequities are mutually reinforced (Grafton and Rowlands, 1996). Easterly (forthcoming), however, observes that the effect of ethnic diversity on economic growth is contingent on the quality of institutions such that the poorer the institutions, the greater the adverse impact. More generally, social polarization may reduce the stability of government decision-making (Keefer and Knack, 2000); this leads to increased uncertainty, which is compensated for by investors investing in less risky enterprises.

Income inequality has been hypothesized to affect economic performance via a variety of different mechanisms: by influencing the level of savings and investment; by increasing rent-seeking activities and policies, such as high marginal tax rates, that may hinder growth (Persson and Tabellini 1994); by reducing human capital accumulation in the presence of borrowing constraints and indivisibilites in investment (Galor and Zeira, 1993); by reducing the size of markets and the ability to capture increasing returns (Murphy, Schleifer and Vishny, 1989); by leading to a lack of political consensus and break-down of democratic institutions that reduce investment and hence growth (Benhabib and Rustichini, 1996); and by reducing the security of property rights (Keefer and Knack, 2000).[11]

Many, though not all, of these hypothesized mechanisms have effects on the accumulation of factors of production (labor, physical capital and human capital). To reduce the potential overlap with mechanisms that affect factor accumulation, we focus specifically on the effects of proxies for social divergence on TFP. This approach is also motivated by the argument that spillovers of technological knowledge between agents are likely to be more important than spillovers from factor accumulation, given that "technological knowledge is inherently more non-rival and more non-excludable" (Easterly and Levine, 2000, p.30).[12] Thus, communication barriers due to social divergence, and that prevent disembodied technical change, are likely to be important impediments to technological progress.

III. The Empirical Model

The arguments developed above suggest that increased social divergence will reduce the level of total factor productivity within the economy. Empirically, we attempt to measure social divergence across the following social dimensions: ethnic diversity, educational diversity, religious diversity and income inequality.[13] The equation estimated is given by equation (1):

$$\ln TFP_i = \beta_0 + \beta_1 ETHLING_i + \beta_2 EDDIST_i + \beta_3 RELHOM_i + \beta_4 GINI_i + \boldsymbol{e}_i \qquad (1)$$

where ln*TFP* is the natural logarithm of the level of total factor productivity in country *i*, *ETHLING* is the ethnolinguistic fractionalization index, *EDDIST* is a measure of educational distance, *RELHOM* is a measure of religious homogeneity and *GINI* is the Gini coefficient for personal expenditure. Subscript *i* denotes observations for country *i* and $\boldsymbol{e}_i$ is the country-specific error term.

For *TFP* we use the estimates constructed by Hall and Jones (1999), which are available for 1988 only. The data for *TFP* for each individual country is the level of output per worker that cannot be explained by differences in physical and human capital endowments.[14]

The proxy for ethnic diversity (*ETHLING*) uses data from Mauro (1995) that measure the probability that two randomly selected individuals in a country belong to different ethnolinguistic groups. The data are for 1960 but, given that the ethnic composition of a country is likely to change only slowly over time, ethnic diversity in 1960 will be highly correlated with ethnic diversity in 1988. We expect that higher values of TFP will be associated with lower levels of this index.

The data on educational distance (*EDDIST*) are for 1990 and are constructed from the Barro and Lee (2000) data set on educational attainment. The Barro and Lee data set contains information on the proportion of the population with the following levels of education: none, incomplete primary, complete primary, incomplete secondary, complete secondary, incomplete tertiary, and complete tertiary. Following Barro and Lee (1993), we assign, for each country, a typical number of years of schooling for each of these categories, based on information contained in Appendix Table A.3 of their data set.[15] Our proxy for educational distance is the mean absolute educational distance for two randomly selected individuals. More formally, $EDDIST = \Sigma(p_i \times p_j)D_{ij}$, where p_i and p_j are, respectively, the proportions of the population with levels *i* and *j* of schooling and D_{ij} is the absolute value of the difference in years of schooling between the two groups. A high value of *EDDIST* indicates a high degree of educational diversity; thus we would expect a higher value of *EDDIST* to lead to lower levels of total factor productivity.[16]

The data on religious homogeneity (*RELHOM*) are constructed from data presented in Barrett (1982) and are for 1980. This publication provides data on the proportion of the population affiliated to different religions. From these data we construct an index that measures the probability that two randomly selected individuals will have the same religious affiliation. This is calculated by summing the squared proportions of the population accounted for by each religious group. Thus, *RELHOM* is the inverse of religious diversity such that higher values of the index are expected to increase TFP.

The *GINI* data are from the World Income Inequality Database (WIID), compiled by the United Nations University/World Institute for Development Economics Research (1999), which extends the data set of Deininger and Squire (1996). We use data for the period 1983-94. If a country has data for more than one year, then the closest year to 1988 is used. We use only data labeled as “reliable”, and which are representative of the whole population from the WIID database. We expect that higher income inequality (i.e. a higher Gini coefficient), as measured by personal expenditures, will be associated with lower levels of TFP.[17]

The *GINI* data used in this paper represent a significant improvement over sources used in much of the existing literature. Both the Deininger and Squire and WIID data sets compile data from existing surveys on the distribution of income. The data have to meet a set of criteria to be included in Deininger and Squire's "high quality" data set. Specifically, the data must be based on household surveys, rather than estimates derived from national accounts statistics; the population covered must be representative of the whole population rather than covering, for example, the urban population or wage earners only; and the measure of income or expenditure must include income from self employment, non-wage earnings, and non-monetary income. Deininger and Squire consider 2,600 observations, but only 682 qualify to be included in their "high quality" data set. By making use of the WIID data that are labelled as "reliable" and that are representative of the whole population we are effectively adopting the same high quality standards as Deininger and Squire. Many papers use income distribution data that do not meet these standards. For example, papers that use data deemed to be unreliable include Perotti (1996), Alesina and Rodrik (1994), Clarke (1995), Birdsall, Ross and Sabot (1995) and Persson and Tabellini (1994).

Another problem with the existing empirical literature is that most studies measure inequality based on income data that are not consistently measured.[18] Gini coefficients may be calculated either for the distribution of income before tax, the distribution of income after tax, or the distribution of expenditure. In addition, the unit of measurement can also be the individual or the household. It is important, however, when making cross-country comparisons that like is being compared with like. *A priori* we would expect, with a progressive tax structure, that the distribution of income before tax would be less equal than the distribution of income after tax.[19] We would also expect the distribution of expenditure to be more equal than the distribution of income, measured either before or after tax, if individuals or households smooth their expenditure over their life times.[20] Further, given that in developing countries most households contain a large number of children with zero or low incomes, we would expect the distribution of income to be more equal for households than for individuals.

Cross-country comparisons of the distribution of income/expenditure that mix different income measures together can give inappropriate estimates of the effect of income inequality on productivity and growth.[21] We are not aware of any study that both uses the high quality data from Deininger and Squire (1996), or the WIID, and also measures the distribution of income in a fully consistent manner. By contrast, we use only data labeled as “reliable” and that are representative of the whole population from the WIID data set. The data are for the distribution of expenditure by individuals. A disadvantage of this approach is that it significantly reduces the available sample of countries for which the expenditure inequality data are available.

The data for all of the variables included in the empirical work are reported in Appendix 1. This appendix provides the data for all the countries where the distribution of expenditure data are available. Our sample includes only developing countries because data on the distribution of expenditure by individual are not available for high-income countries. Summary statistics for each variable, for the main sample of 27 countries (denoted by * in the data appendix), are reported in Table 1, and the partial correlations between the explanatory variables are reported in Table 2. Surprisingly, Table 2 indicates a negative correlation between *EDDIST* and *GINI*, which is contrary to our initial expectation that educational distance would be greater in countries where the distribution of income is more unequal.

[Table 1 about here]

[Table 2 about here]

IV. Empirical Results

The empirical results obtained from estimating equation (1) are given in Table 3.[22] The first column presents the results when all the social divergence variables are included in the estimated equation. The coefficients on *GINI* and *ETHLING* both have the expected negative sign. Both coefficients are statistically significant at the 5% level of significance. *RELHOM* has the expected positive sign, but its coefficient is not statistically significant at the 10% level. However, with a p-value of 0.14, it is close to being significant at a conventional level of significance. Somewhat surprisingly, *EDDIST* has a positive coefficient, which is counter to our initial expectations, but this is not statistically significant.

[Table 3 about here]

A possible explanation for the positive coefficient on *EDDIST* may be that it is a proxy for the overall level of education of the population. This could be the case if there is a significant positive correlation between average years of schooling and *EDDIST*.[23] To test for this possibility, the average years of schooling (*AYS*) was included as an additional explanatory variable. The results are presented in column (2) of Table 3. The inclusion of *AYS* does not qualitatively affect the results, namely, the coefficient on *EDDIST* is still positive, but not statistically significant, and the coefficient on *AYS* is also not significant. In column (3), we omit the two education variables to assess the sensitivity of the estimates of the coefficients of the other variables to the inclusion of the education variables. Under this specification, the coefficient on *GINI* becomes statistically significant at the 1% level, and the coefficient on *RELHOM* becomes statistically significant at the 10% level.

The F-tests of the overall significance of the regressions lead to a rejection (at the 1% level of significance) of the null hypothesis that all coefficients (excluding the intercept) are equal to zero. The adjusted R^2 indicates that the models in columns (1) and (2) explain over half the variation in $\ln TFP$. Results from a battery of tests for the presence of heteroscedasticity are also reported in Table 3 along with RESET tests for model misspecification. For each specification, the null hypothesis of homoscedasticity is not rejected. The null hypothesis of correct model specification cannot be rejected at the 10% level. In addition, as there is no theory to guide us as to the appropriate functional form, a model with all explanatory variables in natural logarithms and a model with the dependent variable and explanatory variables in levels were estimated. Both of these specifications provided estimated coefficients with comparable signs to those reported in Table 3, but with levels of significance that vary for some of the coefficients.

The relatively low simple correlations between the different measures of social divergence, provided in Table 2, suggest that multicollinearity is unlikely to be a problem, especially when the education variables are excluded from the regressions. The correlations also suggest that it is important to consider different dimensions of social divergence, as each of the different proxies potentially contributes additional information about the extent of social barriers to communication.

Partial scatter plots showing the relationship between each explanatory variable and the dependent variable, based on the results reported in column (2) of Table 3, are presented in Appendix 2. These plots are calculated by plotting the dependent variable against the explanatory variable of interest, after controlling for the influence of all the other explanatory variables (including a constant). For example, the plot for $\ln TFP$ against $GINI$ plots the residuals obtained from regressing $\ln TFP$ on all the explanatory variables (other than $GINI$) and a constant term against the residuals from regressing $GINI$ against all the other explanatory variables plus a constant.

On examining these partial scatter plots, a small number of observations appear to be outliers (in the sense that they do not lie close to the trend line) and they may well also prove to be influential. The countries that lie the furthest from the trend line have been identified by country name. To identify potentially influential observations in a more formal manner the studentized residuals (RSTUDENT) were calculated for the results presented in Table 3. In addition, the DFBETAS statistics (Belsley, Kuh and Welsch, 1980) were calculated for each of the explanatory variables. Leverage statistics, h_i, were also calculated in order to help identify potential outliers. The following countries were identified by at least one of these tests for column (1): Mauritius, Zambia, Jamaica, Gambia and Senegal.[24] For column (2) Mauritius, Zambia, Philippines, Jamaica and Senegal were identified by at least one test, and for column (3) Mauritania, Mauritius, Zambia, Jamaica, Jordan and Senegal were identified.

Although it is not always appropriate to delete influential observations and/or outliers from the sample, it is important to check the sensitivity of the results to the omission of such observations. The results obtained when the relevant countries are omitted are reported in Table 4. The key difference between these results and those reported in Table 3 is that *RELHOM* is now unambiguously statistically significant in all three equations and the t-statistics on *GINI* and *ETHLING* have increased, as, not surprisingly, has the explanatory power of the equations. However, the RESET tests suggest that model misspecification may be affecting some of the results presented in Table 4.

V. Discussion

The empirical results support our initial hypothesis that three proxies for social divergence (income inequality, ethnic diversity and religious homogeneity) are associated with TFP for our sample of 27 countries. The positive, but not statistically significant coefficient, on educational distance is, initially, puzzling as differences in the level of education are hypothesized to be important barriers to the exchange of ideas. A possible explanation, which is supported by the existence of agglomeration economies, is that most of the productivity gains from communication and exchange of ideas occurs between people with *similar* levels of education or training. Indeed, the exchange of ideas that has contributed to the innovations and economic success in Silicon Valley has occurred between individuals with comparable, and high, levels of education. In other words, the principal productivity gains arise from within educational cohorts, and especially within groups of individuals with high levels of education. If this explanation is correct, the productivity gains from communicating with people with different levels of education are likely to be quite small and, thus, educational distance would not be a significant determinant of TFP.[25]

The magnitude of the effects of the different measures of social divergence, based on the estimates in Table 3, can be observed from Table 5. The table provides the elasticity of *TFP* (in levels) with respect to each of the explanatory variables, holding all other variables constant. The partial elasticities suggest that a 1% increase in the Gini coefficient of personal expenditure, would lead to a greater than 1% *decline* in the level of *TFP*. In all three models the partial elasticities suggest that a 1% increase in ethnic diversity would lead to about a 0.5% *decrease* in the level of *TFP* while a 1% increase in religious homogeneity would lead to approximately a 0.5% *increase* in the level of *TFP*. Thus the effects of all three of these measures of social divergence are economically significant, as well as statistically significant.

Table 6 presents the results of simulations to assess the economic significance of social divergence on the level of *TFP*. Using the estimated coefficients in model (3), the simulations predict the mean values of *TFP* in levels for lower and upper quartile countries, where the 31 countries are sorted separately in ascending order for each of the variables listed in the table. For example, in the column headed "sorted by *GINI*" in Table 6, all countries were sorted in ascending order on the basis of their Gini coefficient, where the lower and upper quartiles were defined as the bottom eight and top eight countries in terms of this variable. For the two quartiles, the predicted value of ln*TFP* was then calculated and the mean for each quartile was obtained and transformed into *TFP* in levels. The relevant ratio for all columns in Table 6 represents the difference in magnitude in the mean *TFP* in levels between the quartile with the *lowest* measure of social divergence and the quartile with the *highest* measure of social divergence.[26] For all the explanatory variables, the relevant ratio of the means of *TFP* for the two quartiles is greater than two. If the empirical model is taken at face value, the simulation results imply that countries with the highest levels of social divergence would at least double their levels of *TFP* (and hence output per worker) if they could reduce their levels of social divergence to those of the low social divergence countries. The simulations suggest that the chosen measures of social divergence have a very large effect on the level of economic performance.

In interpreting the results, it should be stressed that alternative explanations for the significance of the measures of social divergence are possible. Although we have focused on explaining TFP, which avoids some of the mechanisms by which these measures can influence the level or growth of output per head, this problem is not entirely removed. The limited sample of countries for which the widely used World Values Survey data on trust and membership of associations are available hampers a direct comparison of our results with social capital interpretations of the significance of the variables. However, Knack and Keefer (1997) report that for their sample of 29 countries, which includes both developed and developing countries, the Hall and Jones measure of TFP, which we use in this study, is not significantly related to the World Values Survey measure of trust.[27] Some explanations of the effects of ethnic diversity on economic performance, for example the effects of social polarization on property rights (Keefer and Knack, 2000), imply that adverse effects will be maximized when there are a small number of (internally homogeneous) large groupings and will be less when there are a large number of small groupings. By contrast, the social divergence explanation suggests that, for given distances between groups, the relationship will be monotonic. If the square of *ETHLING* is added to the equations in Table 3 its coefficient is not statistically significant, supporting the social divergence explanation.

It is also worth emphasizing that the results are derived from a sample of just 31 developing countries, using only crude and aggregate measures of the social barriers to communication and exchange between groups and one specific measure of TFP. Nevertheless, the fact that the estimators for the measures of social divergence are significant in a sample that includes only developing countries suggests that the results are likely to be relatively robust to sample selection.[28] Moreover, the simulations suggest that social divergence has a large effect on the level of TFP. Overall, the results suggest that the concept of social divergence as an important factor in determining the level of economic performance is worthy of further theoretical and empirical investigation.

VI. Concluding Remarks

The paper develops the concept of social divergence as an important variable in explaining economic performance. The idea is that social barriers to the exchange of ideas and knowledge, and that may be reflected in differences in income, language, ethnicity and in other social dimensions, prevent productivity gains that would otherwise occur. The need to overcome social divergence, and improve the exchange of ideas, may also help explain the existence of agglomeration economies, and the importance of a common language and borders in determining trade densities.

Using cross-sectional data for 31 countries, and with a consistent measure of income inequality, total factor productivity is regressed on income inequality, ethnic diversity, religious diversity and educational distance. The results suggest, separate from any effects due to factor accumulation, that higher levels of social divergence result in lower levels of total factor productivity. Simulations based upon the estimated coefficients suggest that the chosen measures of social divergence have a very large influence on the level of economic performance.

Much more research is required using alternative measures of social divergence over time, with different sets of countries, and with micro as well as country-level aggregate data. Should these results be supported in future studies, they could provide an important explanation for the causes, and possible remedies, of productivity differences within and across countries.

TABLE 1
SUMMARY STATISTICS FOR SOCIAL DIVERGENCE DATA

	Mean	Standard Deviation	Minimum	Maximum
ln*TFP*	7.579	0.664	6.284	8.830
GINI	43.576	8.897	31.150	62.000
ETHLING	58.037	26.845	1	93
EDDIST	4.215	0.899	2.534	5.991
AYS	4.401	1.384	1.625	7.285
RELHOM	0.704	0.223	0.329	0.988

Notes:
1. The summary statistics are for the observations included in the regressions in columns (1) and (2) of Table 3.

TABLE 2
SIMPLE CORRELATIONS BETWEEN THE EXPLANATORY VARIABLES

	GINI	*ETHLING*	*EDDIST*	*AYS*	*RELHOM*
GINI	1	0.187	–0.637	–0.344	–0.218
ETHLING		1	–0.258	–0.341	–0.448
EDDIST			1	0.612	0.344
AYS				1	0.202
RELHOM					1

Notes:
1. The simple correlation coefficients are for the observations included in the regressions in columns (1) and (2) of Table 3.

TABLE 3
THE EFFECTS OF MEASURES OF SOCIAL DIVERGENCE ON TOTAL FACTOR PRODUCTIVITY

	(1)	(2)	(3)
Constant	8.073**	8.113**	8.887**
	(7.80)	(7.71)	(13.60)
GINI	−0.026*	−0.026*	−0.035**
	(−2.12)	(−2.03)	(−3.22)
ETHLING	−0.008*	−0.009*	−0.007*
	(−2.29)	(−2.33)	(−2.03)
EDDIST	0.156	0.205	
	(1.22)	(1.33)	
AYS		−0.049	
		(−0.60)	
RELHOM	0.670	0.637	0.791†
	(1.51)	(1.41)	(1.86)
R^2	0.639	0.645	0.510
Adjusted R^2	0.573	0.560	0.455
F	9.715**	7.616**	9.353**
N	27	27	31
Diagnostics			
Heteroscedasticity			
e^2 on $\hat{Y}$	0.247	0.285	0.194
e^2 on $\hat{Y}^2$	0.299	0.341	0.169
e^2 on $\ln\hat{Y}^2$	0.198	0.231	0.219
B-P-G test	1.472	2.093	0.526
ARCH test	1.045	0.723	2.075
Harvey test	2.308	1.486	4.299
Glejser test	1.696	2.785	1.458
Specification			
RESET(2) [1, n–k–1]	1.050	0.772	0.784
RESET(3) [2, n–k–2]	0.543	0.413	0.426
RESET(4) [3, n–k–3]	0.350	0.262	0.279

Notes:
1. Dependent variable is ln*TFP*
2. *t*-statistics are given in parentheses. **, * and † indicate significance at the 1%, 5% and 10% levels respectively on the basis of two-tailed tests.
3. *F* is the *F statistic* of the null hypothesis that the coefficients, except the constant term, are jointly equal to zero.
4. The heteroscedasticity diagnostic tests are all chi-squared distributed under the null. *e* represents the residual series from the estimated regression.
5. The RESET tests are *F*-distributed under the null with (generic) degrees of freedom given in square brackets, where n–k represents degrees of freedom in the reported regression.

TABLE 4
THE EFFECTS OF MEASURES OF SOCIAL DIVERGENCE ON TOTAL FACTOR PRODUCTIVITY (WITH INFLUENTIAL OBSERVATIONS AND OR OUTLIERS OMITTED)

	(1)	(2)	(3)
Constant	8.083**	8.253**	8.466**
	(11.22)	(14.18)	(23.32)
GINI	–0.027**	–0.030**	–0.032**
	(–3.39)	(–4.42)	(–5.68)
ETHLING	–0.009**	–0.008**	–0.007**
	(–4.01)	(–3.39)	(–3.59)
EDDIST	0.141	0.094	
	(1.44)	(1.00)	
AYS		0.002	
		(0.04)	
RELHOM	0.843**	1.012**	1.236**
	(2.96)	(3.64)	(5.42)
R^2	0.889	0.904	0.852
Adjusted R^2	0.863	0.874	0.831
F	34.102	30.061	40.385
N	22	22	25
Diagnostics			
Heteroscedasticity			
e^2 on $\hat{Y}$	0.395	0.095	0.015
e^2 on $\hat{Y}^2$	0.399	0.088	0.019
e^2 on $\ln\hat{Y}^2$	0.395	0.106	0.012
B-P-G test	1.535	2.275	0.509
ARCH test	0.568	0.015	0.408
Harvey test	1.031	3.985	0.871
Glejser test	0.702	2.849	0.825
Specification			
RESET(2) [1, n–k–1]	6.098*	5.586*	3.510†
RESET(3) [2, n–k–2]	2.889†	2.621	2.159
RESET(4) [3, n–k–3]	2.139	1.800	2.184

Notes:
See notes to Table 3.

TABLE 5
PARTIAL ELASTICITIES OF TOTAL FACTOR PRODUCTIVITY (IN LEVELS) CALCULATED AT THE MEANS, BY VARIABLE AND MODEL

	GINI	*ETHLING*	*EDDIST*	*AYS*	*RELHOM*
Model (1)	–1.13	–0.46	0.66	na	0.47
Model (2)	–1.13	–0.52	0.86	–0.22	0.45
Model (3)	–1.53	–0.41	na	na	0.56

Notes:

1. na = variable not included in model specification.
2. See Table 3 for specification of Models (1), (2) and (3).

TABLE 6

PREDICTED MEAN TOTAL FACTOR PRODUCTIVITY (IN LEVELS) OF LOWER QUARTILE AND UPPER QUARTILE COUNTRIES

	Sorted by ln*TFP*	Sorted by *GINI*	Sorted by *ETHLING*	Sorted by *RELHOM*
Lower quartile	1192	2593	2989	1361
Upper quartile	3003	1049	1303	3018
Relevant Ratio	2.52	2.47	2.29	2.22

Notes:

1. Lower and upper quartile values in each column represent the mean predicted natural logarithm of *TFP* (from model (3)) transformed into levels for each quartile sorted, in ascending order, by the column variable.
2. Relevant ratio represents the mean of *TFP* (in levels) of upper quartile countries divided by the mean of *TFP* (in levels) of lower quartile countries for the columns headed ln*TFP* and *RELHOM*. For the columns headed *GINI* and *ETHLING*, the relevant ratio represents the mean of *TFP* of lower quartile countries divided by the mean of *TFP* of upper quartile countries
3. For each variable, lower quartile countries, sorted by that particular variable, have a lower level of the variable than do upper quartile countries.

Appendix 1: Data

TOTAL FACTOR PRODUCTIVITY AND SOCIAL DIVERGENCE DATA

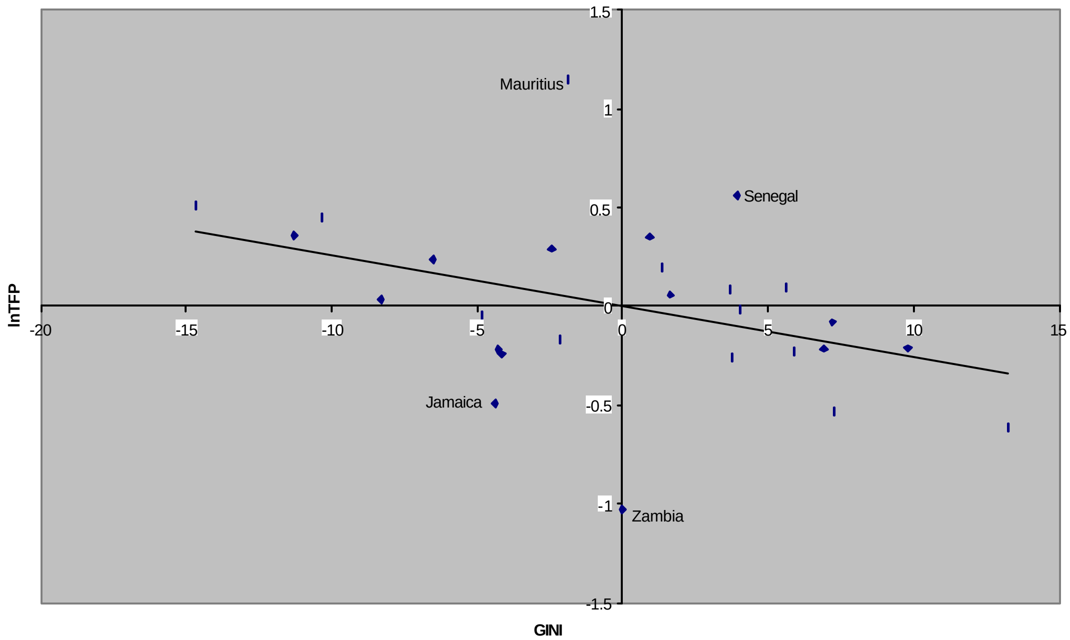
Country	ln*TFP*	*GINI*	*ETHLING*	*EDDIST*	*AYS*	*RELHOM*
Algeria*	8.566	38.73	43	5.049	4.253	0.982
Bangladesh	8.657	28.85	na	3.182	2.201	0.754
Bolivia*	7.640	42.04	68	5.093	5.023	0.9
Central African Rep*	6.990	55.00	83	3.447	2.354	0.729
Ecuador*	7.876	43.00	53	5.316	5.901	0.966
Gambia*	7.512	39.00	73	2.534	1.625	0.732
Ghana*	7.304	35.90	71	4.65	3.621	0.462
Guinea-Bissau	6.863	56.12	na	1.038	0.647	0.42
Guyana*	6.905	46.11	58	3.594	5.685	0.397
India*	7.505	31.15	89	5.475	4.103	0.637
Indonesia*	7.407	32.01	76	4.654	4.007	0.329
Jamaica*	7.367	43.16	5	3.544	4.744	0.817
Jordan*	8.825	35.35	5	5.991	5.946	0.868
Kenya*	7.026	54.39	83	3.668	3.655	0.572
Lesotho*	7.178	56.02	22	3.345	3.925	0.865
Madagascar#	7.497	43.44	6	na	na	0.481
Malawi*	6.547	62.00	62	3.288	2.714	0.478
Mali	7.198	54.00	na	1.574	0.666	0.673
Mauritania#	6.738	42.53	33	na	2.424	0.988
Mauritius*	8.576	39.63	58	4.573	5.571	0.364
Morocco#	8.186	39.20	53	na	na	0.988
Nigeria#	6.863	37.02	87	na	na	0.446
Pakistan*	8.257	31.15	64	5.107	4.149	0.938
Peru*	7.934	42.76	59	5.118	6.207	0.961
Philippines*	7.326	40.68	74	4.235	7.285	0.891
Portugal*	8.546	32.00	1	4.188	4.908	0.909
Senegal*	7.809	54.12	72	3.114	2.268	0.832
Seychelles	8.403	47.00	na	na	na	Na
Sri Lanka*	7.895	38.80	47	4.647	6.076	0.485
Tanzania*	6.697	58.01	93	2.817	2.786	0.337
Thailand*	7.830	43.81	66	4.515	5.584	0.85
Tunisia*	8.446	40.62	16	4.787	3.939	0.988
Uganda*	7.330	40.78	90	3.078	3.269	0.634
Zambia*	6.284	43.51	82	4.251	4.184	0.591
Zimbabwe*	7.053	56.83	54	3.726	5.035	0.501

Notes:

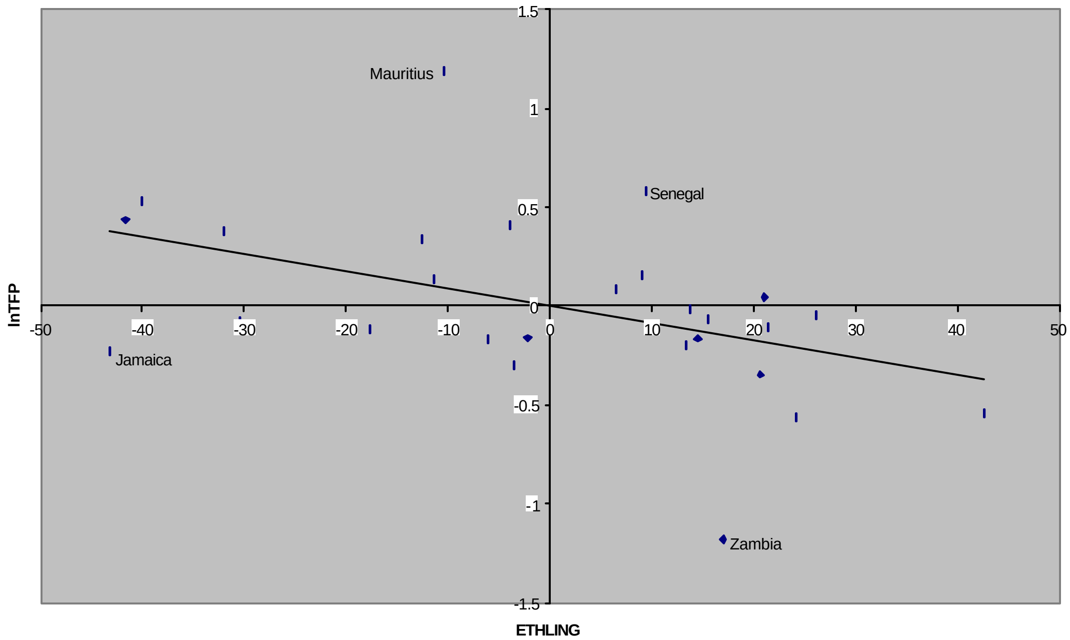
1. The table includes only those countries for which the data for *GINI*, based on personal expenditure, are available.
2. All variables are as defined in the text. "na" indicates that the data are not available.
3. Countries indicated by a "*" are included in the regressions reported in columns (1) and (2) of Table 3.
4. Countries indicated with a "#", in addition to countries indicated by "*", are included in the results reported in column (3) of Table 3.

Appendix 2: Partial Scatter Plots Showing the Partial Correlations Between Each Explanatory Variable and ln*TFP*

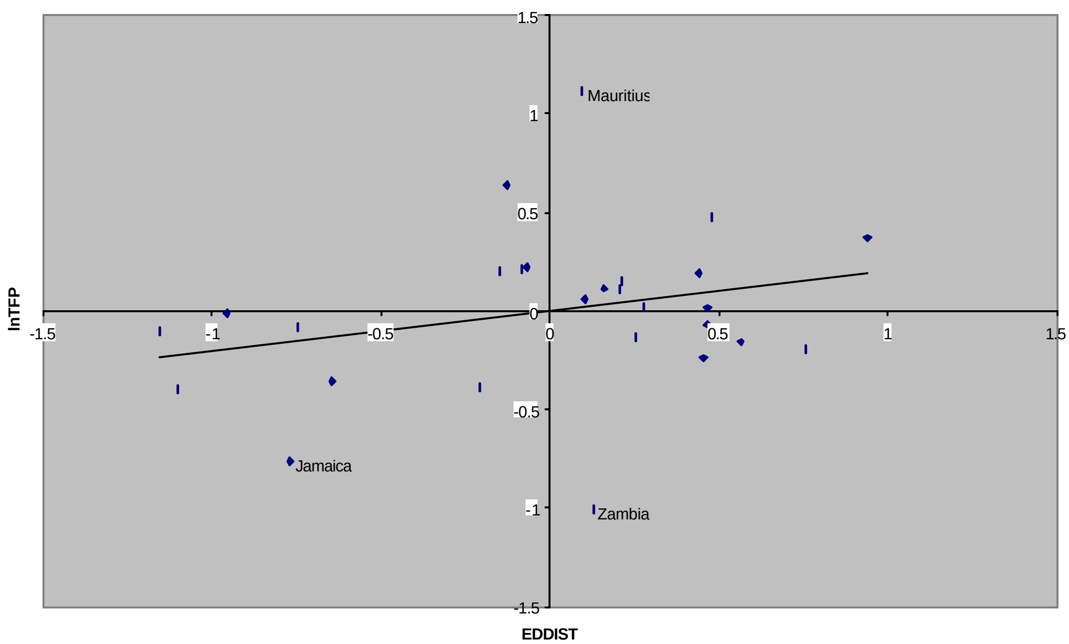
ln*TFP* against *GINI*



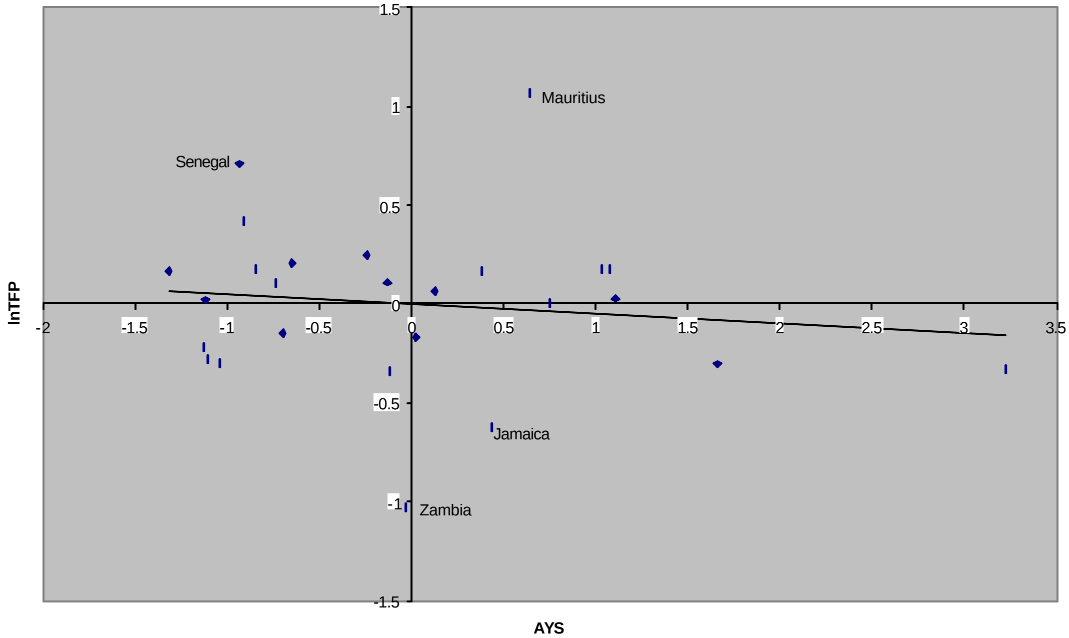
ln*TFP* against *ETHLING*



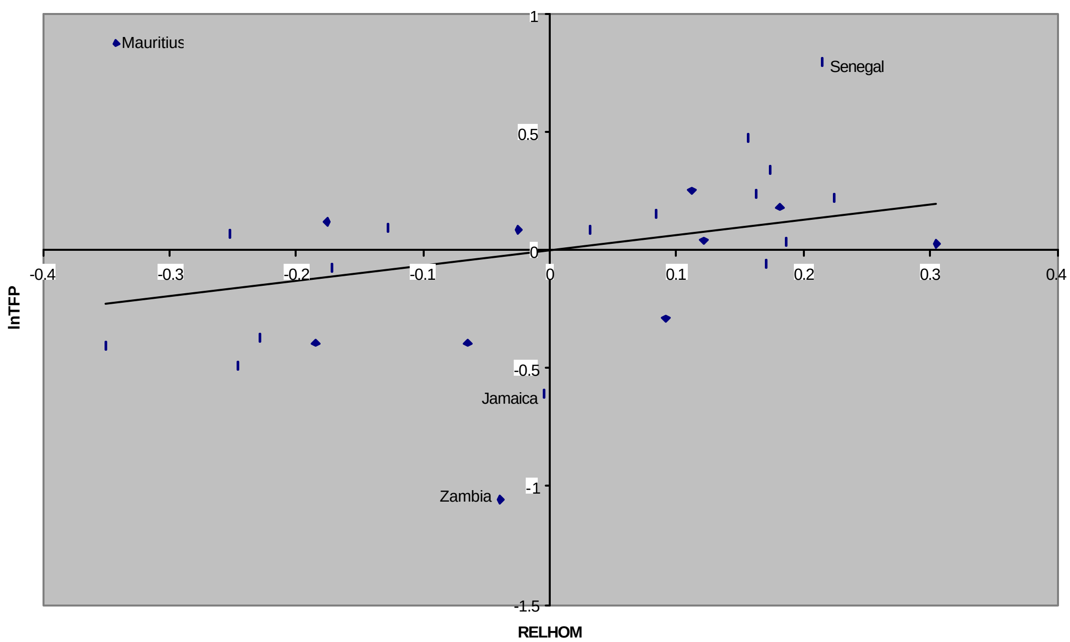
ln*TFP* against *EDDIST*



ln*TFP* against *AYS*



ln*TFP* against *RELHOM*



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End Notes

[1] Putnam (1993, p. 37) observed that "…generalized reciprocity is more efficient than a distrustful society, for the same reason that money is more efficient than barter. Trust lubricates social life".
[2] Nitsch (2000, p. 1104) uses data from the European Union and observes that "…an average EU country still exports about seven to ten times more to itself than to a partner country, after adjustment is made for sizes, distance, common language, common border, and remoteness".
[3] Dunbar (1996, p. 18) observes "…sociality is at the very core of primate existence; it is their principal evolutionary strategy, the thing that marks them out as different from all other species. It is a very special kind of sociality, for it is based on intense bonds between group members, with kinship often providing a platform for these relationships".
[4] The notion that cooperation is a successful strategy (in evolutionary terms) has been examined by both biologists and economists. Axelrod and Hamilton's (1981) paper "The Evolution of Cooperation" has spawned a vast literature on the rationality of cooperating among self-interested individuals. This work has recently been popularized in books by Ridley (1996) and Wright (2000), among others.
[5] Arrow (1962, p. 172) acutely observed that "…society has created institutions, education and research, whose purpose it is to enable learning to take place more rapidly".
[6] An important implication of their model is that investment decreases with increased social heterogeneity.
[7] For example, Knack (2000, p. 5) argues that "[i]n general, the more homogeneous a society, the more trust a (randomly selected) principal will place in a (randomly selected) agent". Knack also notes that such factors can affect the radius of trust; for example, in ethnically diverse societies, there may be high levels of trust within ethnic groups but low levels of generalized (wide-radius) trust.
[8] Fukuyama (1999, pp. 207-211) argues that this is consistent with high levels of social capital. This is because he defines the network as social capital. In turn the network is viewed (p. 199) as "a group of individual agents who share informal norms or values beyond those necessary for ordinary market transactions". Since the networks are the mechanism for information distribution, this characterization of social capital is rather different from the notion of generalized trust and, in this case, much more compatible with our emphasis on the exchange of ideas and knowledge. The essential role of communication in this case is reinforced by Saxenian's (1994, p.33) observation (quoted by Fukuyama) that "informal conversations were pervasive and served as an important source of up-to-date information about competition, customers, markets, and technologies. … In an industry characterized by rapid technological change and intense competition, such informal communication was often of more value than more conventional but less timely forums such as industry journals". The networks stemmed from factors such as common educational background, common employment histories and shared norms of the local counterculture (Fukuyama, 1999, p.208).
[9] See Alesina and Perotti (1994) for a review of the political economy of growth.
[10] Easterly and Levine use the ethnolinguistic fractionalization index data of Mauro (1995), which we also use in this paper. By contrast, Lian and Oneal (1997) construct their own index of diversity, which includes (equally weighted and standardized) components for ethnic, linguistic and religious diversity, and find that it is not statistically significant in an otherwise conventional growth regression. Disaggregating the index and including each component separately or in combination does not change this conclusion. Nettle (2000) reports evidence of a significant negative association between linguistic diversity and the level of GDP per capita.
[11] See Aghion, Caroli and García-Peñalosa (1999) for a review and evaluation of some of these theoretical mechanisms.
[12] A further motivation for focusing on TFP is the evidence that a high proportion of cross-country variation in the level and growth rate of output per capita is accounted for by variation in the level and growth rate of productivity (e.g., Hall and Jones, 1999; Easterly and Levine, 2000).
[13] We restrict our analysis to only *social* measures that prevent communications and the exchange of ideas across groups and do not include measures of the physical barriers to communications in our regressions. While there are multiple dimensions to social divergence, much of the existing empirical work focuses on one of these at a time. For example, Zak and Knack (1998) report regressions where growth or measures of trust are regressed on sets of explanatory variables that include uni-dimensional proxies for heterogeneity,

such as the Gini coefficient for income inequality, the Gini coefficient for land inequality, an index for economic discrimination, and a measure of ethno-linguistic heterogeneity.

[14] Hall and Jones use a cross-country levels-accounting analogue of growth accounting to decompose cross-country differences in output per worker into differences in inputs and productivity.

[15] Barro and Lee's Appendix Table contains information on the typical duration of primary school, the first cycle of secondary school and the second cycle of secondary school for each country. Barro and Lee assign half the duration of primary school to the incomplete primary category, the full duration of the first cycle of secondary school to the incomplete secondary category, and assume a duration of two and four years, respectively, for the incomplete higher and complete higher categories. While this is somewhat arbitrary, our measure does reflect both the distribution of the population across the categories and the distance between different categories. By contrast, the more conventional *ETHLING* and *RELHOM* measures reflect only the distributional aspects of these dimensions of divergence.

[16] López, Thomas and Wang (1998) and Castelló and Doménech (2001) calculate educational Gini coefficients, which measure educational inequality. It is important to note that educational inequality (as measured by the Gini coefficient) and educational distance are different concepts. This point is best illustrated by considering the extreme case where one person has all the education. This would give a Gini coefficient of one, representing perfect inequality. However, if all the population but one person have the same level of education, this would represent a low degree of educational distance.

[17] Measures of income inequality and income distance may differ. A measure of income distance, calculated in a similar way to educational distance, requires data on income shares and would reduce the number of observations in the sample to 21 countries. For this reason, we use the Gini coefficient for personal expenditure in the regressions.

[18] See, for example, Perotti (1996), Forbes (2000), Barro (2000), Banerjee and Duflo (2000), Alesina and Rodrik (1994), Clarke (1995), Birdsall, Ross and Sabot (1995), Deininger and Squire (1998) and Keefer and Knack (2000).

[19] Keefer and Knack (2000) argue that in the Deininger and Squire (1996) data set the differences between households and individuals appear to matter little as, for cases with data on both, Gini coefficients based on individual income are, on average, only 1.7 percentage points higher than those based on household data. However, they do not report how much variation there is around this average across countries. They also apply the same argument to pre-tax and post-tax income, with the Gini coefficient based on pre-tax income being 2.7 percentage points higher on average. Again, they do not report how much variation there is in this figure across countries. Given that some countries redistribute much more income than others, we would expect there to be significant variation in this figure across countries. In fact, Deininger and Squire (1996) note that for Sweden in 1981 the Gini coefficient is 5 percentage points higher when measured pre-tax, rather than post-tax.

[20] Deininger and Squire (1996) report that in their data set the Gini coefficients based on gross income are, on average, 6.6% points higher than Gini coefficients based on expenditure.

[21] Deininger and Squire (1998) Forbes (2000) and Keefer and Knack (2000) 'transform' the data in an attempt to make the data more compatible across countries. For example they add 6.6, the average difference between expenditure- and gross-income-based Gini coefficients, to expenditure-based Ginis (although there is significant variation in this difference across countries and time). However, they do not adjust for the fact that some data are based on individuals and other data on households. Atkinson and Brandolini (1999, p. 24), in a critique of the Deininger and Squire (1996) data set, caution against such adjustments, arguing "[i]n our view, the solution to the heterogeneity of the available statistics is unlikely to be the simple additional or multiplicative adjustment. In order to assess differences in income distribution across countries, what is needed is a data-set where the observations are as fully consistent as possible".

[22] We also experimented with adding a measure of trade openness to the estimated equation because it reflects to some extent the degree to which a country is open to the ideas and knowledge of persons in other countries. The variable used was taxes on trade as a percent of exports plus imports in 1990. The data are from Gwartney, Lawson and Block (1996), Table IV-A. However the coefficient on this variable was not statistically significant in any regression in which it was included. Given that omitting this variable increases the sample size, we chose to focus on the results that do not include trade openness. Excluding trade openness tends to increase the t-statistic on *GINI* (which is not significant if openness and the education variables are included), but to reduce the t-statistic on *ETHLING* for the results reported in Table 3.

[23] The simple correlation coefficient between the two variables is 0.47.
[24] The cut off values used were 2 for the RSTUDENT statistic, 2k/n for the h_i statistic and $2/\sqrt{n}$ for the DFBETAS statistics. These are the cut off values suggested by Belsley, Kuh and Welsch (1980).
[25] Squaring or cubing the difference in the years of schooling, when weighting the relevant proportions to calculate *EDDIST*, does not affect its lack of significance. Measuring educational distance as the variance in years of schooling also fails to make this variable significant.
[26] For *GINI* and *ETHLING* the relevant ratio is the mean of *TFP* in levels for the lower quartile countries (with lowest level of social divergence) divided by the mean for upper quartile countries (with highest level of social divergence). For *RELHOM* the relevant ratio is the mean of *TFP* in levels for the upper quartile countries (with lowest level of social divergence) divided by the mean for lower quartile countries (with highest level of social divergence).
[27] This could partly be due to the rather imprecise nature of the survey question, which asks: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Glaeser, Laibson, Scheinkman and Soutter (2000) combine survey and experimental evidence to suggest that responses to this question are better at predicting respondents' trustworthiness rather than their trust in others.
[28] Previous cross-country empirical work (for example, Temple, 1998a, b; Knowles and Owen, 1995) has shown that empirical results that hold for a broad cross-section of countries (which includes developed and developing countries) are not always robust if the high-income countries are omitted from the data sample. As we use data for developing countries only, our results are less likely to suffer from this problem. However, our results for developing countries will not necessarily apply to developed countries.