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Abstract

This paper investigates the economic growth impact of cultural diversity, both domestically and in neighbouring countries, in a balanced panel of 94 countries covering the period 1970 to 2004. The measures of cultural diversity used in this article were derived from a recently developed computer algorithm intended primarily to measure linguistic distances in an automated fashion. The empirical analysis suggests that the degree of cultural diversity in contiguous neighbouring countries has substantial positive effects on domestic per capita income growth, even controlling for a broad set of regional, institutional, religious and other proximate factors of economic growth. The conclusion is that culturally homogeneous countries gain a strategic advantage over their culturally diverse neighbours.

Keywords: cultural diversity; ethnic diversity; economic growth

JEL: O11; O5

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1 Introduction

In recent years, a vast literature has emerged debating the impacts of ethnic heterogeneity on socioeconomic factors such as economic development and public policy choices. Since the influential contribution of Easterly & Levine (1997), much attention has been devoted to the negative relationship between ethnic diversity and contemporary per capita income growth (e.g. Alesina et al. (2003); Alesina & La Ferrara (2005); Garcia-Montalvo & Reynal-Querol (2005a)). More recent contributions have investigated deeply rooted factors of cross-country income differences, arguing that genetic differences across countries, as a proxy for barriers of technological diffusion, may account for different paths of economic development (e.g. Spolaore & Wacziarg (2009) and Ashraf & Galor (2012)). The discussion of the impacts of ethnic heterogeneity is not restricted to economic development alone. Researchers have also investigated the determinants of civil conflicts, where measures of ethnic polarisation are strong predictive variables explaining the incidence and duration of civil wars (e.g. Vanhanen (1999); Doyle & Sambanis (2000); Collier (2001); Reynal-Querol (2002); Fearon & Laitin (2003); Garcia-Montalvo & Reynal-Querol (2005b) and Esteban & Ray (2008)). Furthermore, the literature has also found a negative empirical relationship between ethnic heterogeneity and the provision of public goods across nations (e.g. Mauro (1995); Alesina & Perotti (1996); Hall & Jones (1999); La Porta et al. (1999); Annett (2001); Alesina et al. (2003) and Alesina & Zhuravskaya(2012)) and also in ethnic communities within nations (e.g. Alesina et al. (1999) and Miguel (2004)). The impacts of ethnic heterogeneity on redistribution have attracted recent attention among some scholars (e.g. Alesina et al. (2001); Luttmer (2001); Vigdor (2004); Desmet et al. (2009, 2012)).

Since measures of ethnic diversity appear to have a strong predictive power in cross-country studies, they have become standard explanatory variables in development economics. While the effects of ethnic diversity on socioeconomic outcomes (e.g. economic growth, public goods, civil conflicts, etc.) are generally acknowledged, the concrete mechanisms by which ethnic diversity functions in contemporary societies have been debated extensively. For example, Annett (2001) found that ethnically heterogeneous societies are more prone to political instability, and that political powers may therefore increase unproductive government expenditures in order to reduce the risk of being overthrown. Alesina & Perotti (1996) reported that political instability is detrimental to investment decisions. But investments in physical capital are conducive to per capita income growth. Especially in the context of cross-country growth regressions, the majority of the literature has relied on reduced-form regressions, leaving unresolved the question of how precisely ethnicity affects growth.[1] Since the measures used for ethnic heterogeneity are sometimes linked to a specific notion of cultural diversity (e.g. Fearon (2003)), one may argue that differences in cultural attitudes across countries are responsible for cross-country differences in economic outcomes. Guiso et al. (2006) relates culture to the values, norms and beliefs in a society that change only very slowly over time and that have an explicit effect on cross-country differences in economic outcomes. These cultural dimensions (e.g. interpersonal trust) are interpreted as channels by which culture affects various economic outcomes.[2] Some of the variables that may proxy for cultural attitudes are religious affiliations, ethnic background, common language, and genetic differences.[3] The contribution of this paper is twofold. First, it seeks to redefine the concept and measurement of cultural diversity. The most frequently used approach in the economics literature to date has been to rely on established definitions of ethnic groups, although some researchers have carefully constructed their own ethnic classifications.[4] Furthermore, many researchers have generally assumed that cultural distance is constant and identical across groups due to the difficulty of defining and measuring this concept.[5] This approach has two serious shortcomings. On the one

[1]See the article by Garcia-Montalvo & Reynal-Querol (2005a), which identifies three main channels (civil wars, government consumption and investments) by which ethnicity indirectly affects growth.

[2]See, for instance, Gorodnichenko & Roland (2011) for an extensive analysis of cultural impacts from various sources on output per capita.

[3]The main idea behind genetic distance is that it captures barriers to the diffusion of development and hence the adaptation of complex technological and institutional innovations (Spolaore & Wacziarg (2009)). Furthermore, societies that are more closely related genetically may have a stronger basis of trust and may thus exchange information more intensively.

[4]See, for instance, the classification of groups in Alesina et al. (2003) and Fearon (2003).

[5]One argument for treating cultural distance across groups as constant and equal was put forward by Garcia-Montalvo & Reynal-Querol (2005b), who argued that "[...] the dynamics of

hand, the widely used measure of ethnic fractionalisation is highly sensitive to the number of groups, and on the other hand, it does not take into account the asymmetric notion of alienation perceived across groups. Hence, the first contribution of this paper is to provide a set of ethnic diversity measures *adjusted* for the cultural resemblance across groups using a lexicostatistical setup. These newly constructed measures will be referred to as *cultural diversity*. The notion underlying this definition comes from Greenberg (1956), who argued that from two geographical regions with the same population share, the one with the lowest resemblance across groups should exhibit a higher measure of diversity. Based on this definition, a number of researchers have developed useful measures of cultural similarity across groups. For example, Fearon (2003) and Desmet et al. (2009) developed the concept of 'phylogenetic trees' to capture the genealogy and hence the relationships among languages as a proxy for resemblances among ethnic groups. In contrast to this heuristic approach, the present article proposes a computerised lexicostatistical method to derive measures of resemblance across language pairs. To the best of my knowledge, to date only the contribution of Desmet et al. (2005) has used a lexicostatistical (but *non-computerised*) approach in constructing lexical percentages of cognates for basic meanings across languages. In their contribution, however, the analysis is limited to a restricted number of Indo-European languages. Therefore, the wide variety of Asian, African and indigenous Latin American languages is not considered because of the lack of data availability. The lexicostatistical approach has a clear advantage over the use of language trees. For example, Spolaore & Wacziarg (2009) mentioned that language trees sometimes rely on arbitrary classifications of languages into groups, so that the discrete number of common nodes across languages may not capture such cultural distances appropriately. The use of lexicostatistical percentages will at least weaken such shortcomings. Despite the advantage of the lexicostatistical approach, the lack of data availability has discouraged researchers from using lexicostatistical percentages to construct measures of cultural distances.[6]

the 'we' versus 'you' distinction is more powerful than the antagonism generated by the distance between them".

[6]For instance, Desmet et al. (2009) used distance measures based on tree diagrams to construct different indices of diversity because the data in Dyen et al. (1992) had only covered Indo-European

Hence, this paper should also be viewed as an attempt to close this research gap. Second, this article seeks to explain the effects of cultural diversity in contiguous neighbouring countries on domestic per capita income growth. The empirical analysis is based on a balanced panel of developed and emerging countries for the period 1970 to 2004. Although the direct effects of ethnic diversity on per capita income growth are well documented, until now, to the best of my knowledge, no study has investigated potential spatial externalities of cultural diversity from contiguous neighbouring countries. This paper argues that possible detrimental effects of cultural diversity on economic growth may be conditional on the particular location of the country in question. Arguments in favour of this thesis come from the literature on international investment decisions, in which it is argued that international investors may see language and cultural differences as a possible source of information disadvantages, which contributes to the well-known home bias phenomenon (see, e.g. the contributions of Grinblatt & Keloharju (2001); Chan et al. (2005); di Giovanni (2005); Bhattacharya & Groznik (2008); and Siegel et al. (2011) among others.). It follows, then, that international investors favour culturally similar countries to overcome possible adjustment costs in the foreign market. Furthermore, if potential international investors have a choice among a range of countries in a particular location, they may choose countries that are culturally homogeneous, since these countries have higher economic development, better public policies and a lower incidence of civil wars. Hence, having an ethnically homogeneous society and well-established political institutions in a highly culturally diverse environment (e.g. Botswana) may be favourable for a country's own economic development. This statement will be tested in the empirical part of this paper. The empirical analysis reveals substantial positive effects of cultural diversity from nearby countries on domestic per capita income growth that are not captured by a broad number of regional, institutional, religious or other proximate factors of economic growth. Hence, the empirical results are in line with the statement that culturally homogeneous countries surrounded by

languages and neglected the wide variety of African, Asian and American languages. The number of observations in the empirical analysis in Spolaore & Wacziarg (2009) was reduced substantially once the authors controlled for linguistic distance in their regressions, also using the more detailed data in Dyen et al. (1992).

culturally diverse countries gain a strategic advantage that is conducive to domestic per capita income growth.

The paper is organised as follows. Section 2 reviews the methods used in the economics literature to measure cultural similarity using language tree branches, and discusses the advantage of lexicostatistical methods over the use of language trees. The computerised lexicostatistical approach chosen here to derive similarity measures between pairs of languages is presented in Section 3. Section 4 discusses the data set and estimation methodology. The empirical results are presented in Section 5. Finally, Section 6 concludes and highlights some important points for further research.

2 Measurement Issues Affecting Cultural Distance

This section introduces Greenberg's (1956) measure of cultural diversity and highlights some important shortcomings of recently developed approaches to measure the cultural similarity between ethnic groups. Greenberg's (1956) index of cultural diversity, GI, has the following form:[7]

$$GI = 1 - \sum_{i=1}^{G} \sum_{j=1}^{G} p_i p_j r_{ij}, \tag{1}$$

where p_i and p_j refer to the respective proportions of groups i and j in the particular country's population. The resemblance between groups i and j is captured by the factor r_{ij}, which is restricted between 0 and 1 (where a value of 1 means full cultural similarity between the two groups). The idea behind this functional form is that

[7] It is well known that Greenberg's (1956) measure of diversity is closely related to the generalised polarisation index introduced in the seminal paper of Esteban & Ray (1994). The latter define the concept of polarisation as the sum of interpersonal antagonisms, where the main distinguishable feature is income differences between the different groups. They also limit the class of allowable functions by imposing three important axioms. It is well known that for particular parameter values, this general polarisation measure can generate different measures of diversity: namely, ethnic fractionalisation, polarisation and measures of peripheral heterogeneity. These results are available from the author upon request.

from two geographical regions with the same population share, the one with the lowest resemblance across groups should exhibit the highest measure of diversity. It can be shown that if the resemblance between all groups is 0, then GI exactly equals the widely used Herfindahl-based ethnic fractionalisation measure. An important feature of the Greenberg index is that one could also use very disaggregated data of population shares and let the resemblance factors decide the degree to which different ethnic groups are merged.

A crucial point in assigning cultural distances to groups is the specification of the resemblance factors r_{ij}. Fearon (2003) used the concept of linguistic tree diagrams to investigate this issue. He argued that the number of shared tree branches of two languages could be used as a proxy for the cultural similarity between the groups. By assigning each pair of groups a corresponding number of shared tree branches and dividing this value by the maximum number of language classifications, one obtains the cultural similarity between this language pair. However, as Fearon (2003) mentioned, this function should be an increasing and concave function of the resemblance ratio, indicating that early divergence in a language tree corresponds to earlier cultural divergence rather than later divergence. This property is achieved by raising the resemblance ratio to the power of δ, requiring that the exponent is bounded between 0 and 1. Higher values of δ assign more cultural difference to more minor differences in linguistic structure. Nevertheless, the use of language trees to construct cultural resemblance factors has three main shortcomings. First, the main disadvantage of language trees is that all living languages are considered to be equidistant from their corresponding proto-languages within and also across languages. Second, not all languages have the same number of language branches, which means that one tends to overestimate the cultural distance between languages from the same language family. Therefore, tree diagrams give no information about the point in time when a given pair of languages diverged.[8] The last shortcoming of this approach lies in the functional form of the resemblance function. Fearon (2003) argued that this function ensures that earlier divergence between two lan-

[8]See, for instance Serva & Petroni (2008) for a brief overview of the use of lexicostatistical percentages to derive separation times of language families. This research field is also known as glottochronology, and was developed primarily by Swadesh (1952).

guages should indicate greater cultural distance than later divergence. Nevertheless, the degree to which two languages differ in their cultural distance depends crucially on the parameter δ, which captures this notion precisely. Therefore, the choice of the parameter δ has a non-negligible impact on the measures of cultural diversity.[9] While Fearon (2003) used a value of one-half, Desmet et al. (2005) argued that for their measures of linguistic diversity, values of δ in the range of [0.04, 0.10] continue to give similar results in terms of the statistical significance of the linguistic effects on redistribution. This discussion shows that in using language trees to measure cultural distances, one has to rely on arbitrary parameter choices that are crucial in measuring the cultural distance across ethnic groups.[10]

Another related research line argues in favour of lexicostatistical methods in measuring the cultural similarity across groups. In particular, Desmet et al. (2005) have used the lexicostatistical measures in Dyen et al. (1992) as proxies for cultural distance between language pairs. The lexicostatistical method is used mainly for language classifications and is based on four main steps:[11] First, a list of basic meanings is collected that are so fundamental that every language contains them (e.g. meanings like I, we, water, fire, etc.). Based on these words, a linguist is needed to provide a carefully considered judgement of whether two words in a particular language pair share the same basic meaning and ancestry in both languages. After the judgement process is completed for any two particular languages, step 3 deals with the computation of lexicostatistical percentages between them. Finally, step 4 deals with the subgrouping of different languages using an appropriate statistical approach (i.e. clustering methods) based on the computed percentages of cognates in the previous step. Dyen et al. (1992) focussed on 200 different basic words and meanings for 84 Indo-European languages, and computed the number of cognates between given pairs of languages. The term cognate was used if the two languages have an unbroken history from the same ancestor. The result is a 84×84 symmetric

[9]Fearon (2003, Footnote 26) acknowledges that depending on this parameter value, one obtains different correlation measures between cultural and ethnic fractionalisation, where higher values for δ indicate a higher correlation between the two measures.

[10]Alesina & La Ferrara (2005) noted that this approach is of a more heuristic nature.

[11]For a brief overview of this method, see Appendix 3 in Dyen et al. (1992).

matrix of percentage cognates between each pair of Indo-European languages. It would be desirable to have measures of cultural similarity that also cover the wide variety of Asian, African and indigenous Latin American languages. In this case, the empirical analysis would also cover many African, Asian and Latin American countries, too. Since, one main purpose of the present paper lies on the provision of cultural diversity measures for a large number of countries, the lexical measures in Dyen et al. (1992) are not suitable for this task. Therefore, the following section introduces a recently established method based on a computer algorithm to estimate percentage cognates between any pair of languages. This is the first paper that uses this method to investigate the relationship between cultural diversity at home and abroad on per capita income growth.

3 The New Computerised Lexicostatistical Approach

In the year 2007, a group of linguists and statisticians began to efforts toward automated comparison of languages and founded the Automated Similarity Judgment Program (hereafter called ASJP). The ASJP project is based in the Linguistics Department of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. It aims at establishing relationships between languages on the basis of standardised word lists (e.g. the Swadesh (1971) 100-item list). The recent list from October 2012 covers nearly 6013 living languages and dialects. Swadesh's basic 100-word list has become an important tool in deriving genetic relations between languages. Holman et al. (2008) showed that this list could be considerably reduced to about 40 items without any lost of consistency and even with a gain in language classificatory reliability. This subset of core vocabulary items is given in the following Table 1.

Table 1. Core word list from Bakker et al. (2009).

ASJP No.	Meaning	ASJP No.	Meaning	ASJP No.	Meaning	ASJP No.	Meaning
1	I	25	leaf	47	knee	74	star
2	you	28	skin	48	hand	75	water
3	we	30	blood	51	breast	77	stone
11	one	31	bone	53	liver	82	fire
12	two	34	horn	54	drink	85	path
18	person	39	ear	57	see	86	mountain
19	fish	40	eye	58	hear	92	night
21	dog	41	nose	61	die	95	full
22	louse	43	tooth	66	come	96	new
23	tree	44	tongue	72	sun	100	name

As mentioned in Bakker et al. (2009), to transform this word list into a standardised format that is constant across languages, a special alphabet was created (the ASJP code), that makes use of 34 consonant symbols and 7 vowel symbols.[12] Once 40-item word lists are assembled and converted into a single standard orthography using the ASJP code, it is possible to apply the ASJP algorithm to derive pairwise percentage cognates between any pair of languages. The algorithm makes use of the Levenshtein (1966) distance.[13] In short, the Levenshtein distance (hereafter called LD) is simply the minimum number of insertions, deletions, or substitutions of a single character to transform one word into the other. Based on this definition, Serva & Petroni (2008) normalised this distance in dividing LD by the length of the longest string to get the normalised Levenshtein distance (LDN). This normalisation is very important, because LD is sensitive to the word length under consideration. More precisely, given two words of the same meaning in language α_i and β_i, LDN is defined as

$$LDN\left(\alpha_i, \beta_i\right) = \frac{LD(\alpha_i, \beta_i)}{L(\alpha_i, \beta_i)}, \tag{2}$$

where α and β refer to languages and the subscript i stands for the selected meaning in the ASJP sample. Furthermore, $L(\alpha_i, \beta_i)$ indicates the maximum word length of meaning α_i and β_i. Then the distance between any two languages, Λ, of N items

[12]See Brown et al. (2008) for an extensive discussion of this issue.

[13]For a thorough technical overview, the interested reader is referred to Brown et al. (2008), Bakker et al. (2009) and Petroni & Serva (2010).

$i = 1, 2, ..., N$ equals the arithmetic average of expression (2)

$$\Lambda(\alpha, \beta) = \frac{1}{N} \sum_{i=1}^{N} LDN\left(\alpha_i, \beta_i\right). \tag{3}$$

Since, $LDN\left(\alpha_i, \beta_i\right)$ lies between 0 and 1, the distance between any pair of languages is also restricted to the interval $[0, 1]$. As pointed out by Bakker et al. (2009), unlike most other approaches to determining the similarity of language pairs using expert judgement, such as Dyen et al. (1992), this method is very straightforward and easy to implement and requires a minimum of computing time. This method automates both the judgement of cognancy and constitutes the basis of subsequent phylogeny inferences. Furthermore, since lexical similarity may be influenced by accidental resemblance due to an overlap in the phoneme inventories or shared phonotactic preferences of the two languages under consideration, the above authors suggested a second normalisation of LDN by dividing it by the mean LDN of all other $N(N-1)$ pairings of words with different meanings, which yields $LDND$. Therefore, first define the *global distance* between any pair of items with different meanings between languages α and β

$$\Gamma(\alpha, \beta) = \frac{1}{N(N-1)} \sum_{i=1}^{N} \sum_{j \neq i}^{N} LDN\left(\alpha_i, \beta_j\right). \tag{4}$$

Petroni & Serva (2010) interpreted this measure as a distance of the vocabulary of the two languages, without comparing words with the same meaning. It therefore only considers general similarities in the frequency and ordering of characters. Taking into account this global distance measure, the second normalisation takes the following form

$$LDND\left(\alpha, \beta\right) = \frac{\Lambda(\alpha, \beta)}{\Gamma(\alpha, \beta)}. \tag{5}$$

According to Petroni & Serva (2010), this second normalisation should cancel out situations where unrelated languages that are grouped together simply because they have similar sound structures (e.g. Finnish and Japanese). Therefore, performing this procedure on M distinct languages or dialects would result in an $M \times M$ symmetric matrix whose entries correspond to the lexical distances between all pairs of languages.

The rest of this section deals with the construction of cultural resemblance factors using automated linguistic distance measures. We first apply the ASJP procedure for the classification of ethnicities outlined in Alesina et al. (2003), who provided measures for ethnic, linguistic and religious fractionalisation on a highly disaggregated level for about 190 countries. The classification of ethnicities in Alesina et al. (2003) is less aggregated than in Fearon (2003) and therefore quite useful in applying cultural distances to groups to let the data decide how closely related different ethnic groups are. Fearon (2003) assembled data on ethnic groups that constitute more than 1% of a given population. His data are therefore less disaggregated than the classification in Alesina et al. (2003). However, these small differences do not greatly affect the correlation between the two measures, since the correlation is still relatively high.[14] Based on the raw data from Alesina et al. (2003) and their definition of the relevant ethnicities in a particular country, an assignment of the relevant language spoken to each ethnicity is met. The identification between ethnicity and language spoken was done using the information in the *Ethnologue* database. In cases where more than one language is possible, the first, second, third, and so on (depending on data availability in the ASJP sample) most prevalent language is used instead. For example, Alesina et al. (2003) used the definition by Mande (50% of the population) as an ethnic group in Mali. According to *Ethnologue*, Mande is constituted of 72 languages within the Niger-Congo language family, of which Bamanankan is spoken widely in Mali. So assigning Bamanankan to the ethnic group Mande should proxy for cultural differences. However, a finer categorisation of ethnic groups in Mali would also be useful given the country's high cultural diversity. In this case, the data on percentage cognates across languages (or ethnicities) would decide to what degree different related languages are merged together.[15] In situa-

[14]The classification of ethnic groups remains a serious task in measuring ethnic diversity as ethnicity does not necessarily coincide with the language spoken: factors like skin colour or clan membership may also shape the identification with a particular group. The present paper does not seek to identify the specific factors that constitute an ethnic group; instead, the interested reader is referred to Fearon (2003) and Alesina & La Ferrara (2005) for an excellent discussion of this topic.

[15]Note that the effect of the number of ethnic groups on the construction of the diversity measures is still prevalent due to the lack of a finer classification of ethnicities in the raw data in Alesina

tions, where the language spoken by a particular group has not yet been covered by the ASJP project, the language with the highest resemblance to the missing one is assigned. For example, Standard German was used for Austrian instead of Bavarian (a dialect of German) in Austria and Mongolian (Peripheral) was replaced by Mongolian (Halh) in China for the Mongolian ethnicity. Nevertheless, this approach did not resolve all of the problems with respect to data lacking in the ASJP sample. Countries like Angola or India would still be missing due to missing language data for the groups Luimbe-Nganguela, Nyaneka and Luchazi in Angola or Bhili, Sindhi, Dogri and Khandeshi in India, to mention only a few.[16] Since most missing ethnicities are small minority groups in the particular countries that do not substantially alter the cultural diversity measures, the similarity measure of the missing groups relative to all others is set to 0.05 following Desmet et al. (2005).[17]

4 Data and Estimation Methodology

To examine the impact of neighbouring countries' diversity on domestic economic growth, a Barro-type growth equation was estimated. The base equation is similar to the recent analysis in Desmet et al. (2012), which includes the investment rate, a measure of human capital and the log of population. Furthermore, to establish the

et al. (2003). For example, Alesina et al. (2003) identified three main ethnic "groups" in India, Indo-Aryan, Dravidian and others, because many languages within the Indo-Aryan and Dravidian language families are closely related. According to Encyclopedia Britannica (2011), there are 31 main ethnolinguistic groups in India. Hence, constructing a measure of ethnic fractionalisation without controlling for the resemblance across groups would indicate that India is highly ethnically fractionalised. In order to apply the ASJP algorithm to the ethnic composition of India as well, the classification of ethnicities in Encyclopedia Britannica (2011) was used instead of the rough classification in Alesina et al. (2003). Applying the ASJP method to a highly disaggregated classification of ethnicities, also on the level of dialects, would be an interesting task for future research. See also the searchable pdf file at http://email.eva.mpg.de/~wichmann/languages.htm for a look at the languages that have been processed so far.

[16]Fortunately, the ASJP project is working to extend its already large database to include these missing languages. It is a matter of time until nearly all languages of the world are categorised with the help of the ASJP procedure to create a fruitful basis for further research.

[17]The complete list of languages matched to ethnic groups in all countries is available from the author upon request.

robustness of the results, measures for infrastructure quality, political instability, market size, inflation rate and government consumption were subsequently included in the regression equation. All regressions also included time dummies as well as a full set of regional, religion and legal origin variables.[18] For all empirical exercises, a balanced sample of 94 countries and data from 1970 to 2004 organised into five-year intervals was considered.[19] The method of estimation was ordinary least squares. Due to data availability of the different variables, the maximum number of observations was 658. Hence, for each country there were exactly seven observations. More precisely, the following commonly used specification for the growth equation in the empirical growth literature was used:

$$GROWTH_{it} = \alpha_t + region_i + \beta \times LNRGDPCH_{it} + \mathbf{X}'_{it}\gamma + \delta_1 GI_i + \delta_2 GI_i^{NB} + u_{it}, \quad (6)$$

where $GROWTH_{it}$ is the growth rate of real per capita GDP of country i from 1970-2004 averaged into five-year periods ($t = 1970-74, 1975-79, ..., 2000-2004$), $LNRGDPCH$ is the log of real GDP per capita at the beginning of every five-year period, α_t and $region_i$ are time- and region-specific effects. The region-specific effects include dummy variables for Sub-Saharan African, Latin American and Caribbean and Western democratic countries. In addition, the vector $\mathbf{X}_{it}$ incorporates country-specific control variables such as the investment rate, a measure of human capital, log of population, and so on. Furthermore, the measures GI_i and GI_i^{NB} refer to the cultural diversity and diversity measures, respectively, of neighbouring country i. The neighbouring country diversity measure is constructed as the simple average of the diversity measures of the neighbouring countries. For example, Germany has nine neighbours: Denmark (0.1422), Poland (0.1506), the Czech Republic (0.0594), Austria (0.0994), Switzerland (0.4960), France (0.3799), Luxembourg (0.4782), Belgium (0.5374) and the Netherlands (0.1053). Measures of cultural diversity for these countries are shown in parentheses. Hence, the average

[18]Tables A2 and A3 give the main summary statistics for the variables considered, and pairwise correlations between cultural diversity and the determinants of growth, respectively.

[19]The aggregation of multiple observations over time was used to filter out short-run business cycle effects. Recent examples that also consider panel data in studies of economic growth include Easterly & Levine (1997) and Alesina et al. (2003).

value of these measures of cultural diversity is 0.2720, which corresponds to the average cultural heterogeneity of Germany's neighbours.

5 Results

The main focus of the empirical analysis is how the neighbouring country diversity measure performs in cross-country growth regressions. This is the first paper to explicitly attempt to quantify the effect of cultural diversity from abroad. The question of how the neighbouring country diversity measure performs (positively or negatively) in explaining cross-country growth regressions is empirically unresolved. As mentioned above, since culturally diverse countries are prone to civil conflicts and have lower public goods provision (e.g. they lack political institutions that are growth-enhancing), homogeneous countries surrounded by culturally diverse neighbours may be of greater economic interest to international investors. Such a situation would result in a positive effect of neighboring countries' cultural diversity on domestic per capita income growth. Furthermore, it is well established that culturally diverse countries are more prone to corruption, a factor that is growth-reducing. Bribes and bureaucratic delays in doing business may discourage international investors from entering these markets due to higher associated costs. In this case, a higher cultural diversity measure of neighbouring countries would result in a positive effect on domestic per capita income growth. Nevertheless, it is also possible that neighbouring countries produce negative effects. For example, Murdoch & Sandler (2004) found a negative impact of civil wars in neighbouring countries on domestic per capita income growth. If civil wars resulted in an influx of refugees, for example, this would be an instance of nearby countries' cultural diversity negatively impacting domestic economic growth. Therefore, including the measure of neighbouring countries' cultural diversity in an augmented growth equation will show what kind of effect (positive or negative) predominates.

Figure 1 shows the spatial distribution of cultural diversity, where countries are divided into seven equal groups. The figure identifies a cluster of culturally highly diverse countries in Sub-Saharan Africa. Europe and the Scandinavian countries are among the most culturally homogeneous areas in the sample. Since the GI measure controls for the cultural resemblance across groups using the similarity of language pairs, Latin American countries like Brazil and Argentina are not as culturally diverse as proposed by the ethnic diversity measure of Alesina et al. (2003). This result stems from the fact that in Alesina et al. (2003), the groups were identified mainly according to somatic differences without controlling for their cultural resemblance. Figure 2 shows the spatial distribution of average per capita GDP growth

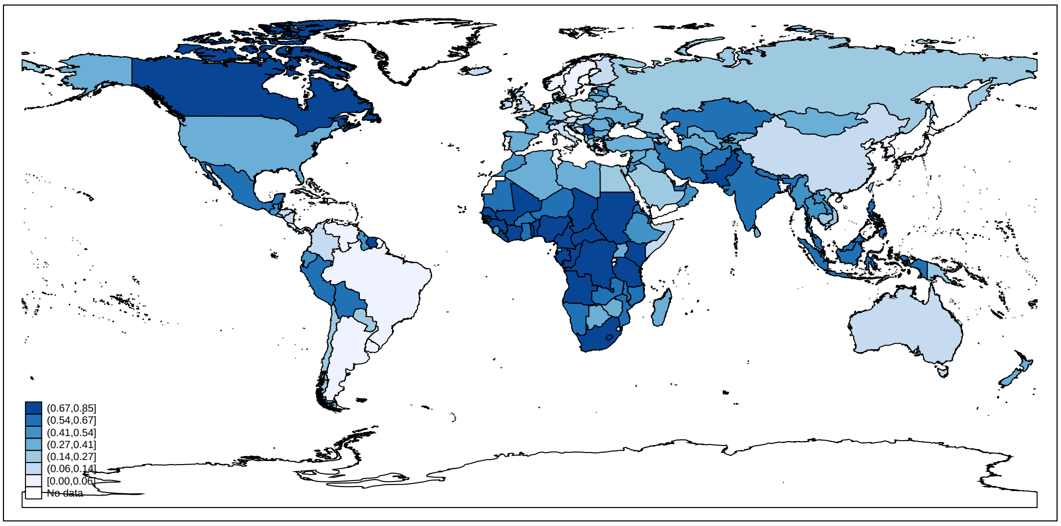

Figure 1: Spatial Distribution of Cultural Diversity

from 1970 to 2004. The negative association of cultural diversity and economic growth is once again also prevalent in this sample. Table 2 shows the empirical

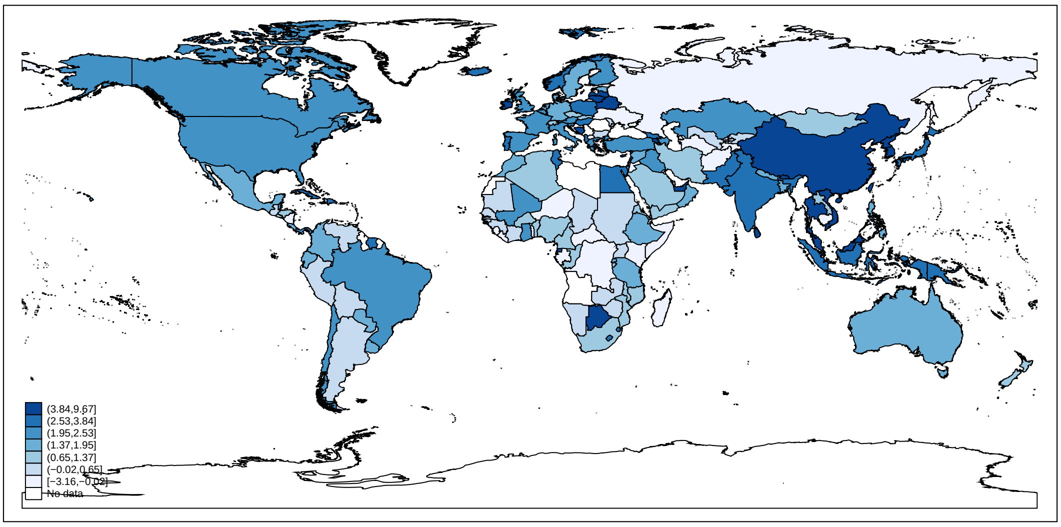

Figure 2: Spatial Distribution of Per Capita GDP Growth (1970-2004)

results for the different specifications. In a first step, the significance of a country's own cultural diversity was examined. This analysis corresponds to specification (1). The negative significance of diversity was also established in this balanced sample of 94 countries. The estimated coefficient suggests that going from a highly culturally diverse country (an index of 1) to a fully culturally homogeneous one (an index of 0) would result in a 2.14% higher real per capita income growth per year. This impact is substantial and not negligible and would account for a large portion of cross-country growth differences.[20] In other words, if, for example Gambia ($GI = 0.7666$) would have the same cultural diversity index as South Korea ($GI = 0.0020$), its real per capita income growth would be 1.64 ($2.1413 \times (0.7666 - 0.0020)$) percentage points higher per year. Generally speaking, a one-standard deviation decrease in cultural diversity (e.g. due to redrawing of borders) would increase per capita income growth by about 14.27% of its standard deviation. Specification (2) adds the neighbouring country cultural diversity index. The domestic diversity effect remains highly significant, with a negative sign. More interestingly, the effect of the neighbouring diversity measure is also highly significant and positive. Furthermore, this result is not driven by possible collinearity problems between GI and GI^{NB}, because the correlation between the two measures is moderate ($corr[GI, GI^{NB}] = 0.5639$, see also Table A3 in the Appendix). This result states that culturally homogeneous countries may benefit from being in a region with high cultural diversity in neighbouring countries. A possible explanation may be that ethnically diverse countries tend to lack growth-enhancing political institutions. Since the chosen reduced-form empirical methodology did not reveal the concrete mechanism by which neighbouring diversity affects domestic per capita income growth, a possible transmission channel may be the decisions of international investors. Siegel et al. (2011) claims that ethnically diverse countries[21] suffer from non-egalitarian political institutions. The authors claim that the greater the egalitarian distance between two countries, the greater the degree of institutional incompatibility between the host and home markets.

[20]This result is in line with the findings in Alesina et al. (2003) and Alesina & La Ferrara (2005).

[21]The authors use the definition "societal fractionalization".

Table 2. Growth and Cultural Diversity. Dependent variable is per capita GDP growth (five-year averages).

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Log initial real per capita GDP	-0.9152**	(2.25)	-0.9450**	(2.32)	-1.4352***	(2.97)	-1.4450***	(2.99)	-1.5138***	(3.16)	-1.4876***	(3.06)	-1.6031***	(3.28)
Dummy for the 1970s	14.3916***	(3.56)	14.2709***	(3.53)	12.9562***	(3.35)	12.6832***	(3.25)	11.4861***	(2.88)	11.4559***	(2.84)	13.5363***	(3.11)
Dummy for the 1975s	12.6273***	(3.06)	12.4976***	(3.03)	11.1755***	(2.81)	10.9341***	(2.73)	9.7199**	(2.39)	9.7007**	(2.36)	11.8495***	(2.71)
Dummy for the 1980s	10.6663***	(2.62)	10.5233***	(2.59)	9.2177**	(2.35)	8.9654**	(2.28)	7.7576*	(1.93)	7.7490*	(1.91)	9.9320**	(2.28)
Dummy for the 1985s	11.6191***	(2.84)	11.4571***	(2.80)	10.1723***	(2.58)	9.8822**	(2.49)	8.6545**	(2.13)	8.7112**	(2.13)	10.8607**	(2.49)
Dummy for the 1990s	10.9635***	(2.59)	10.7875**	(2.55)	9.5550**	(2.33)	9.3227**	(2.26)	8.0246*	(1.90)	8.1231*	(1.91)	10.2194**	(2.26)
Dummy for the 1995s	12.1961***	(2.90)	12.0060***	(2.85)	10.7042***	(2.64)	10.4342**	(2.55)	9.0629**	(2.16)	9.0773**	(2.14)	11.1334**	(2.47)
Dummy for the 2000s	11.7181***	(2.86)	11.5202***	(2.81)	10.2020***	(2.59)	9.9066**	(2.49)	8.4933**	(2.07)	8.5060**	(2.06)	10.5651**	(2.40)
Investment share of GDP	0.0841***	(3.77)	0.0830***	(3.77)	0.0708***	(3.39)	0.0691***	(3.36)	0.0497**	(2.15)	0.0505**	(2.18)	0.0536**	(2.38)
Log of schooling	0.0778	(0.14)	0.2347	(0.41)	-0.4107	(0.59)	-0.4490	(0.65)	-0.5105	(0.75)	-0.4848	(0.71)	-0.1231	(0.17)
Fertility	-0.4955**	(2.37)	-0.5122**	(2.46)	-0.3698*	(1.75)	-0.3704*	(1.75)	-0.3620*	(1.72)	-0.3515*	(1.69)	-0.3404	(1.62)
Log population	-0.4353	(1.60)	-0.4982*	(1.83)	-0.5343*	(1.93)	-0.5038*	(1.76)	-0.4000	(1.34)	-0.3950	(1.32)	-0.4009	(1.33)
Log of area	0.1880	(1.46)	0.2013	(1.56)	0.2553*	(1.88)	0.2494*	(1.82)	0.3450**	(2.47)	0.3499**	(2.52)	0.3583**	(2.57)
Western democracy dummy	-1.4502**	(2.34)	-1.4938**	(2.42)	-2.0979***	(3.10)	-2.1602***	(3.19)	-1.8001***	(2.60)	-1.7723**	(2.56)	-1.6872**	(2.44)
Latin America and Carib. dummy	-2.3606***	(3.70)	-2.2026***	(3.44)	-2.7258***	(3.84)	-2.6970***	(3.79)	-2.3626***	(3.25)	-2.3226***	(3.18)	-2.3133***	(3.20)
Sub-Saharan Africa dummy	-1.5468*	(1.75)	-2.2426**	(2.48)	-2.3590***	(2.59)	-2.4104***	(2.67)	-2.3486***	(2.59)	-2.3319**	(2.56)	-2.2959**	(2.54)
Island dummy	0.3846	(0.95)	0.8938*	(1.94)	1.1627***	(2.64)	1.1577***	(2.64)	0.9266**	(2.21)	0.8689**	(2.11)	0.7489*	(1.74)
Catholic share	0.0123**	(2.00)	0.0116*	(1.88)	0.0134**	(2.14)	0.0146**	(2.35)	0.0104*	(1.67)	0.0107*	(1.71)	0.0096	(1.54)
Muslim share	0.0037	(0.62)	0.0022	(0.37)	-0.0035	(0.56)	-0.0035	(0.56)	-0.0066	(1.04)	-0.0067	(1.06)	-0.0055	(0.87)
Protestantism share	-0.0157	(1.46)	-0.0183*	(1.69)	-0.0199*	(1.83)	-0.0200*	(1.84)	-0.0203*	(1.90)	-0.0193*	(1.79)	-0.0225**	(1.98)
British legal origin dummy	1.9797**	(2.57)	1.9272**	(2.50)	2.0307**	(2.56)	2.1377***	(2.69)	1.8591**	(2.43)	1.8500**	(2.39)	1.5289**	(2.10)
French legal origin dummy	1.0073	(1.27)	0.9645	(1.21)	1.1598	(1.43)	1.2574	(1.52)	1.0540	(1.33)	1.0653	(1.33)	0.7262	(0.89)
German legal origin dummy	1.4409*	(1.75)	1.7756**	(2.12)	2.0620**	(2.39)	2.1333**	(2.48)	2.2292***	(2.68)	2.1977***	(2.62)	1.5951**	(2.04)
Scandinavian legal origin dummy	2.1532**	(2.25)	2.5784***	(2.66)	2.9072***	(2.94)	3.0896***	(3.10)	2.8855***	(3.04)	2.8012***	(2.94)	2.7281***	(2.98)
Infrastructure quality					0.6982**	(2.12)	0.7169**	(2.19)	0.7093**	(2.17)	0.6672**	(2.02)	0.5962*	(1.82)
Measure of political instability							-0.4029**	(2.01)	-0.3516*	(1.80)	-0.3656*	(1.87)	-0.3553*	(1.81)
Openness									0.0105**	(2.37)	0.0103**	(2.34)	0.0110**	(2.50)
Inflation											-0.0008**	(2.40)	-0.0007**	(2.31)
Government consumption													-0.0419**	(2.16)
Diversity	-2.1413***	(2.72)	-2.4155***	(3.02)	-2.3710***	(2.93)	-2.3731***	(2.93)	-2.5714***	(3.06)	-2.5191***	(3.02)	-2.6534***	(3.23)
Diversity neighbours			2.6671**	(2.49)	2.9278***	(2.82)	2.9933***	(2.87)	2.4938**	(2.44)	2.2446**	(2.22)	2.0114**	(2.01)
Observations	658		658		658		658		658		658		658	
R^2	0.334		0.338		0.344		0.345		0.350		0.354		0.358	

Notes: Investment, fertility, log population, infrastructure, political instability, openness, inflation and government consumption are entered as five-year averages (i.e. 1970-1974, 1975-1979,..., 2000-2004). Schooling is measured at the beginning of each five-year period. The cultural diversity measures are based on the authors' calculations using the raw data in Alesina et al. (2003) and the cultural similarity measures calculated from the ASJP project. The measures for diversity of neighbours are calculated as the average value of cultural diversity of contiguous neighbouring countries. The base category is countries with legal origins in the Socialist system and shares of other religions. Absolute t-statistics between parenthesis based on heteroskedastic-consistent (robust) standard errors.

*: Significant at the 10% level. **: Significant at the 5% level. ***: Significant at the 1% level.

Hence, international investors would prefer culturally homogeneous countries because of lower information disadvantages. Nevertheless, negative spatial externalities from neighbouring countries are also possible due to higher political instability, civil conflicts and public policy choices.[22]

To illustrate the economic importance of the cultural diversity measures, Figure 3 shows the overall effect of cultural diversity going from a fully homogeneous country and environment to the particular country-specific indices. Consider the case of

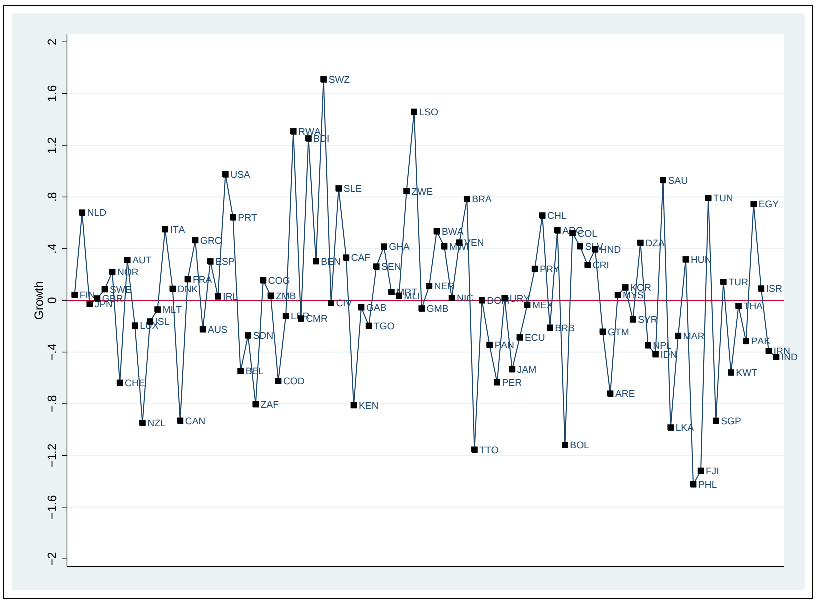

Figure 3: Country-Specific Effects of Diversity on Per Capita GDP Growth from Table 2, Specification (2).

Botswana and India. Both countries have experienced rapid growth over the last decades. Botswana, with a cultural diversity index of 0.3670, is relatively homogeneous compared to its neighbours (an index of 0.5325). The overall effect of its domestic diversity and neighbouring diversity effect is about 0.5337% compared to the benchmark case, where GI and GI^{NB} both have zero values.[23] Hence, Botswana benefits from its relatively homogeneous ethnic composition and from its relatively culturally diverse environment. Turning to India, the cultural diversity index indi-

[22]These are all fruitful points for further economic research, but are beyond the scope of this work.

[23]This corresponds to a fully culturally homogeneous country where the potential neighbours are also homogeneous.

cates that India is relatively culturally diverse (an index of 0.6367) compared to its contiguous neighbours (an index of 0.4123). The overall economic effect of this cultural environment is about -0.4383%. Contrary to Botswana, India suffers from its relatively culturally heterogeneous situation compared to its neighbouring countries. In general, the estimated effect of cultural diversity in this empirical specification means that a one-standard deviation increase in cultural diversity would decrease per capita income growth by about 16.10% of its standard deviation. Furthermore, a one-standard deviation increase in neighbouring country diversity is associated with a 15.56% increase of the standard deviation of per capita income growth.

In order to test the robustness of the results, the remaining specifications subsequently include different measures of infrastructure quality, political instability, trade openness, inflation rate and government consumption. The regression in Column (3) is designed to examine the robustness of the results to the inclusion of a measure of infrastructure quality, as captured by the log of telephones per capita of Banks (2011). The estimated effect of cultural diversity remains highly statistically significant and rather stable.

Column (4) demonstrates the robustness of the results to the inclusion of a measure of political instability (e.g. the average value of the number of political assassinations and coups d'tat per year). The coefficients associated with cultural diversity remain highly statistically significant and rather stable.

Column (5) establishes the spatial effect of cultural diversity on the inclusion of a control variable for market size (e.g. exports plus imports divided by GDP). The coefficients and statistical significance associated with cultural diversity is once again preserved.

Moreover, as reported in Columns (6) to (7), even if one accounts for the contribution of the economic policy environment (e.g. measured by the prevailing inflation rate) and the degree of government consumption, the spatial effect of cultural diversity remains qualitatively unaffected.

In summary, accounting for a broad set of regions, times, religions and proximate factors of economic growth, the relationship between cultural diversity and per capita income growth remains highly significant and stable.[24]

6 Conclusion

This paper has argued that potential effects of cultural diversity in contiguous neighbouring countries have a positive effect on per capita income growth. It has advanced and empirically tested the hypothesis that the degree of cultural diversity from neighbouring countries is a strong predictive measure in cross-country growth regressions that is not captured by regional, institutional, religious or other proximate factors of economic growth.

This work contributes to the existing literature in several ways. First, after defining an adequate concept of cultural diversity, it has provided measures of cultural resemblance across groups from a newly introduced computer algorithm, intended to derive the relationship between languages. Second, these resemblance factors have been used to derive Greenberg's index of cultural diversity for a broad panel of countries. Third, these newly constructed measures have been applied to explain cross-country growth differences. The empirical analysis reveals substantial neighbouring effects on per capita income growth, also controlling for a broad set of standard explanatory variables.

Hence, the empirical part of this work has shown that spatial externalities of cultural diversity exist and are economically important. Further work is needed to explain the concrete mechanisms by which cultural diversity of neighbouring countries affects economic development in general. For example, it is well known that foreign direct investment (FDI) decisions affect the accumulation of physical capital. But physical capital is an important explanatory variable in cross-country growth regressions. Therefore, further research should investigate the link between growth, physical capital, FDI and neighbouring countries' diversity.

[24] This result contradicts the findings in Alesina et al. (2003), who stated that because ethnic diversity affects economic growth through these channels, its estimated effect should become less pronounced. Nevertheless, it is unclear whether their result is partly due to their inclusion of further explanatory variables or the result of the varying sample in their economic analysis. To separate these two different effects, the analysis here was based on a balanced panel.

The empirical methodology used here to derive possible neighbouring country effects on domestic economic growth is not restricted exclusively to the examination of cultural diversity. Further empirical work should analyse potential spatial effects of political instability, corruption, civil conflicts and economic development in neighbouring countries on various economic outcomes using advanced econometric techniques, e.g. spatial econometric methods.

Appendix

Table A1. Measures of Cultural Diversity.

Country	Code	*GI*	*GI neighbours*	western	lamerica	ssafrica	island	sample
AFGHANISTAN	AFG	0.6478	0.4222	0	0	0	0	0
ALBANIA	ALB	0.2086	0.3221	0	0	0	0	0
ALGERIA	DZA	0.3175	0.4545	0	0	0	0	1
ANDORRA	AND	0.6022	0.3308	1	0	0	0	0
ANGOLA	AGO	0.6721	0.7014	0	0	1	0	0
ANTIGUA	ATG	0.0935	0.0000	0	1	0	1	0
ARGENTINA	ARG	0.0000	0.2028	0	1	0	0	1
ARMENIA	ARM	0.1195	0.3925	0	0	0	0	0
AUSTRALIA	AUS	0.0929	0.0000	1	0	0	0	1
AUSTRIA	AUT	0.0994	0.2067	1	0	0	0	1
AZERBAIJAN	AZE	0.2032	0.3443	0	0	0	0	0
BAHAMAS	BHS	0.2642	0.0000	0	1	0	1	0
BAHRAIN	BHR	0.4576	0.0000	0	0	0	0	0
BANGLADESH	BGD	0.0183	0.5628	0	0	0	0	0
BARBADOS	BRB	0.0875	0.0000	0	1	0	1	1
BELARUS	BLR	0.1965	0.3055	0	0	0	0	0
BELGIUM	BEL	0.5374	0.2814	1	0	0	0	1
BELIZE	BLZ	0.6436	0.5265	0	1	0	0	0
BENIN	BEN	0.6845	0.7333	0	0	1	0	1
BHUTAN	BTN	0.5751	0.3873	0	0	0	0	0
BOLIVIA	BOL	0.6671	0.1848	0	1	0	0	1
BOSNIA AND HERZEGOVINA	BIH	0.1199	0.3338	0	0	0	0	0
BOTSWANA	BWA	0.3670	0.5325	0	0	1	0	1
BRAZIL	BRA	0.0119	0.3045	0	1	0	0	1
BRUNEI	BRN	0.5007	0.5877	0	0	0	0	0
BULGARIA	BGR	0.3527	0.3418	0	0	0	0	0
BURKINA FASO	BFA	0.6501	0.7052	0	0	1	0	0
BURUNDI	BDI	0.0506	0.5155	0	0	1	0	1
CAMBODIA	KHM	0.2049	0.3933	0	0	0	0	0
CAMEROON	CMR	0.8426	0.7105	0	0	1	0	1
CANADA	CAN	0.6924	0.2780	1	0	0	0	1
CAPE VERDE	CPV	0.0138	0.0000	0	0	0	1	0
CENTRAL AFRICAN REPUBLIC	CAF	0.7414	0.7955	0	0	1	0	1
CHAD	TCD	0.8514	0.6830	0	0	1	0	0
CHILE	CHL	0.1861	0.4146	0	1	0	0	1
CHINA	CHN	0.1379	0.4263	0	0	0	0	0
COLOMBIA	COL	0.0774	0.2651	0	1	0	0	1
COMOROS	COM	0.0000	0.0000	0	0	0	1	0
CONGO, DEM. REP.	COD	0.8111	0.5009	0	0	1	0	1
CONGO, REPUBLIC OF	COG	0.7764	0.7610	0	0	1	0	1

(continued on next page)

Table A1. Measures of Cultural Diversity.

Country	Code	*GI*	*GI neighbours*	western	lamerica	ssafrica	island	sample
COSTA RICA	CRI	0.0584	0.1556	0	1	0	0	1
COTE D'IVOIRE	CIV	0.7723	0.6919	0	0	1	0	1
CROATIA	HRV	0.2102	0.2181	0	0	0	0	0
CUBA	CUB	0.0198	0.0000	0	1	0	1	0
CYPRUS	CYP	0.0933	0.0000	0	0	0	1	0
CZECH REPUBLIC	CZE	0.0594	0.1608	0	0	0	0	0
DENMARK	DNK	0.1422	0.1625	1	0	0	0	1
DJIBOUTI	DJI	0.5235	0.3873	0	0	1	0	0
DOMINICA	DMA	0.0715	0.0000	0	1	0	1	0
DOMINICAN REPUBLIC	DOM	0.0000	0.0000	0	1	0	1	1
ECUADOR	ECU	0.4800	0.3271	0	1	0	0	1
EGYPT	EGY	0.1793	0.4419	0	0	0	0	1
EL SALVADOR	SLV	0.1781	0.3181	0	1	0	0	1
EQUATORIAL GUINEA	GNQ	0.3252	0.7903	0	0	1	0	0
ERITREA	ERI	0.5458	0.5755	0	0	1	0	0
ESTONIA	EST	0.4835	0.3761	0	0	0	0	0
ETHIOPIA	ETH	0.5067	0.5368	0	0	1	0	0
FIJI	FJI	0.5459	0.0000	0	0	0	1	1
FINLAND	FIN	0.1119	0.1173	1	0	0	0	1
FRANCE	FRA	0.3799	0.4053	1	0	0	0	1
GABON	GAB	0.7379	0.6481	0	0	1	0	1
GAMBIA, THE	GMB	0.7666	0.6706	0	0	1	0	1
GEORGIA	GEO	0.4818	0.2170	0	0	0	0	0
GERMANY	DEU	0.1625	0.2720	1	0	0	0	0
GHANA	GHA	0.6500	0.7447	0	0	1	0	1
GREECE	GRC	0.1768	0.3347	1	0	0	0	1
GRENADA	GRD	0.0667	0.0000	0	1	0	1	0
GUATEMALA	GTM	0.5112	0.3721	0	1	0	0	1
GUINEA	GIN	0.7182	0.6888	0	0	1	0	0
GUINEA-BISSAU	GNB	0.7857	0.6944	0	0	1	0	0
GUYANA	GUY	0.5198	0.2540	0	1	0	0	0
HAITI	HTI	0.0000	0.0000	0	1	0	1	0
HONDURAS	HND	0.1250	0.2610	0	1	0	0	1
HONG KONG	HKG	0.0620	0.0000	0	0	0	0	0
HUNGARY	HUN	0.1492	0.2538	0	0	0	0	1
ICELAND	ISL	0.0678	0.0000	1	0	0	1	1
INDIA	IND	0.6367	0.4123	0	0	0	0	1
INDONESIA	IDN	0.6473	0.4298	0	0	0	1	1
IRAN	IRN	0.5750	0.3741	0	0	0	0	1
IRAQ	IRQ	0.3627	0.4087	0	0	0	0	0
IRELAND	IRL	0.0869	0.0901	1	0	0	1	1
ISRAEL	ISR	0.2830	0.2906	0	0	0	0	1
ITALY	ITA	0.0820	0.2804	1	0	0	0	1
JAMAICA	JAM	0.2208	0.0000	0	1	0	1	1
JAPAN	JPN	0.0119	0.0000	1	0	0	1	1
JORDAN	JOR	0.4558	0.3066	0	0	0	0	0

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Table A1. Measures of Cultural Diversity.

Country	Code	*GI*	*GI neighbours*	western	lamerica	ssafrica	island	sample
KAZAKHSTAN	KAZ	0.5976	0.2795	0	0	0	0	0
KENYA	KEN	0.8091	0.4286	0	0	1	0	1
KIRIBATI	KIR	0.0491	0.0000	0	0	0	1	0
KOREA, DEM. REP.	PRK	0.0392	0.1251	0	0	0	0	0
KOREA, REPUBLIC OF	KOR	0.0020	0.0392	0	0	0	0	1
KUWAIT	KWT	0.5307	0.2714	0	0	0	0	1
KYRGYZSTAN	KGZ	0.3747	0.3951	0	0	0	0	0
LAOS	LAO	0.4490	0.3125	0	0	0	0	0
LATVIA	LVA	0.5168	0.3014	0	0	0	0	0
LEBANON	LBN	0.1262	0.3419	0	0	0	0	0
LESOTHO	LSO	0.2007	0.7289	0	0	1	0	1
LIBERIA	LBR	0.7694	0.6511	0	0	1	0	1
LIBYA	LBY	0.3466	0.4541	0	0	0	0	0
LIECHTENSTEIN	LIE	0.3275	0.2977	1	0	0	0	0
LITHUANIA	LTU	0.2901	0.2748	0	0	0	0	0
LUXEMBOURG	LUX	0.4782	0.3599	1	0	0	0	1
MACEDONIA	MKD	0.4674	0.2989	0	0	0	0	0
MADAGASCAR	MDG	0.2943	0.0000	0	0	1	1	0
MALAWI	MWI	0.5858	0.6870	0	0	1	0	1
MALAYSIA	MYS	0.5877	0.5479	0	0	0	1	1
MALI	MLI	0.6718	0.6220	0	0	1	0	1
MALTA	MLT	0.0294	0.0000	1	0	0	1	1
MARSHALL ISLANDS	MHL	0.0600	0.0000	0	0	0	1	0
MAURITANIA	MRT	0.5843	0.5533	0	0	1	0	1
MAURITIUS	MUS	0.4350	0.0000	0	0	1	1	0
MEXICO	MEX	0.5418	0.4776	0	1	0	0	1
MICRONESIA, FED. STS.	FSM	0.6388	0.0000	0	0	0	1	0
MOLDOVA	MDA	0.5136	0.3162	0	0	0	0	0
MONACO	MCO	0.6025	0.3799	1	0	0	0	0
MONGOLIA	MNG	0.3101	0.1866	0	0	0	0	0
MOROCCO	MAR	0.4445	0.2996	0	0	0	0	1
MOZAMBIQUE	MOZ	0.6577	0.5158	0	0	1	0	0
MYANMAR (BURMA)	MMR	0.4889	0.3475	0	0	0	0	0
NAMIBIA	NAM	0.5501	0.6090	0	0	1	0	0
NEPAL	NPL	0.5718	0.3873	0	0	0	0	1
NETHERLANDS	NLD	0.1053	0.3499	1	0	0	0	1
NEW ZEALAND	NZL	0.3926	0.0000	1	0	0	1	1
NICARAGUA	NIC	0.0936	0.0917	0	1	0	0	1
NIGER	NER	0.6409	0.6218	0	0	1	0	1
NIGERIA	NGA	0.8306	0.7548	0	0	1	0	0
NORWAY	NOR	0.0581	0.1352	1	0	0	0	1
OMAN	OMN	0.4101	0.4023	0	0	0	0	0
PAKISTAN	PAK	0.6820	0.4994	0	0	0	0	1
PALAU	PLW	0.4301	0.0000	0	0	0	1	0
PANAMA	PAN	0.2176	0.0679	0	1	0	0	1

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Table A1. Measures of Cultural Diversity.

Country	Code	*GI*	*GI neighbours*	western	lamerica	ssafrica	island	sample
PAPUA NEW GUINEA	PNG	0.2718	0.6473	0	0	0	1	0
PARAGUAY	PRY	0.1490	0.2264	0	1	0	0	1
PERU	PER	0.5768	0.2845	0	1	0	0	1
PHILIPPINES	PHL	0.5894	0.0000	0	0	0	1	1
POLAND	POL	0.1506	0.2157	0	0	0	0	0
PORTUGAL	PRT	0.0451	0.2816	1	0	0	0	1
QATAR	QAT	0.6868	0.1800	0	0	0	0	0
ROMANIA	ROU	0.2975	0.3615	0	0	0	0	0
RUSSIA	RUS	0.2353	0.2794	0	0	0	0	0
RWANDA	RWA	0.0000	0.4900	0	0	1	0	1
SAMOA	WSM	0.0078	0.0000	0	0	0	1	0
SAN MARINO	SMR	0.2808	0.0820	1	0	0	0	0
SAUDI ARABIA	SAU	0.1800	0.5118	0	0	0	0	1
SENEGAL	SEN	0.6706	0.7053	0	0	1	0	1
SERBIA AND MONTENEGRO	SCG	0.4573	0.2661	0	0	0	0	0
SEYCHELLES	SYC	0.2009	0.0000	0	0	0	1	0
SIERRA LEONE	SLE	0.4628	0.7438	0	0	1	0	1
SINGAPORE	SGP	0.3857	0.0000	0	0	0	1	1
SLOVAK REPUBLIC	SVK	0.2309	0.1587	0	0	0	0	0
SLOVENIA	SVN	0.1461	0.1352	0	0	0	0	0
SOLOMON ISLANDS	SLB	0.1110	0.0000	0	0	0	1	0
SOMALIA	SOM	0.1092	0.6131	0	0	1	0	0
SOUTH AFRICA	ZAF	0.7289	0.3587	0	0	1	0	1
SPAIN	ESP	0.2816	0.3679	1	0	0	0	1
SRI LANKA	LKA	0.4074	0.0000	0	0	0	1	1
ST. KITTS AND NEVIS	KNA	0.0582	0.0000	0	1	0	1	0
ST. LUCIA	LCA	0.0711	0.0000	0	1	0	1	0
ST.VINCENT AND GRENADINES	VCT	0.0786	0.0000	0	1	0	1	0
SUDAN	SDN	0.6961	0.5286	0	0	1	0	1
SURINAME	SUR	0.7108	0.2659	0	1	0	0	0
SWAZILAND	SWZ	0.0579	0.6933	0	0	1	0	1
SWEDEN	SWE	0.0583	0.0850	1	0	0	0	1
SWITZERLAND	CHE	0.4960	0.2102	1	0	0	0	1
SYRIA	SYR	0.4008	0.3076	0	0	0	0	1
TAIWAN	TWN	0.2487	0.0000	0	0	0	1	0
TAJIKISTAN	TJK	0.4886	0.3792	0	0	0	0	0
TANZANIA	TZA	0.7353	0.4932	0	0	1	0	0
THAILAND	THA	0.4958	0.4326	0	0	0	0	1
TOGO	TGO	0.8118	0.6615	0	0	1	0	1
TONGA	TON	0.0869	0.0000	0	0	0	1	0
TRINIDAD AND TOBAGO	TTO	0.4783	0.0000	0	1	0	1	1
TUNISIA	TUN	0.0391	0.3321	0	0	0	0	1
TURKEY	TUR	0.3100	0.3341	0	0	0	0	1
TURKMENISTAN	TKM	0.2932	0.5442	0	0	0	0	0

(continued on next page)

Table A1. Measures of Cultural Diversity.

Country	Code	*GI*	*GI neighbours*	western	lamerica	ssafrica	island	sample
TUVALU	TUV	0.1629	0.0000	0	0	0	1	0
UGANDA	UGA	0.3630	0.5889	0	0	1	0	0
UKRAINE	UKR	0.3349	0.2707	0	0	0	0	0
UNITED ARAB EMIRATES	ARE	0.6246	0.2951	0	0	0	0	1
UNITED KINGDOM	GBR	0.0901	0.0869	1	0	0	1	1
UNITED STATES	USA	0.2780	0.6171	1	0	0	0	1
URUGUAY	URY	0.0000	0.0060	0	1	0	0	1
UZBEKISTAN	UZB	0.3564	0.4804	0	0	0	0	0
VANUATU	VUT	0.0405	0.0000	0	0	0	1	0
VENEZUELA	VEN	0.0392	0.2030	0	1	0	0	1
VIETNAM	VNM	0.2350	0.2640	0	0	0	0	0
ZAMBIA	ZMB	0.6681	0.6187	0	0	1	0	1
ZIMBABWE	ZWE	0.3187	0.6054	0	0	1	0	1
$\sum$				28	33	44	42	94

Table A2. Summary statistics for cultural diversity, growth and its determinants.[a]

Variable	Mean	Std. Dev.	Min	Max
Growth	1.7301	4.0220	-27.7226	51.9710
Log initial per capita GDP	8.4975	1.1250	5.1391	11.0808
Investment share of GDP	15.9904	8.8839	1.7276	91.9660
Log of schooling	1.6781	0.5685	0.1778	2.6393
Fertility	4.0617	1.9635	1.1659	8.2650
Log population	9.0582	1.5582	5.3458	13.8489
Log of area	12.2070	2.0282	5.7557	16.1157
Western democracy dummy	0.2447	0.4302	0	1
Latin America and Carib. dummy	0.2234	0.4168	0	1
Sub-Saharan Africa dummy	0.2872	0.4528	0	1
Island dummy	0.1702	0.3761	0	1
Catholic share	37.8755	38.3871	0	97.3000
Muslim share	20.6553	34.9868	0	99.4000
Protestantism share	14.8585	22.8572	0	97.8000
British legal origin	0.3511	0.4777	0	1
French legal origin	0.5426	0.4986	0	1
German legal origin	0.0426	0.2020	0	1
Scandinavian legal origin	0.0532	0.2246	0	1
Infrastructure quality	8.4221	1.9077	3.0910	11.3365
Political instability	0.1612	0.4554	0.0000	5.1000
Openness	70.2068	49.3488	6.6187	403.7973
Inflation	48.5203	348.9775	-6.6284	6962.8310
Government consumption	19.7735	7.8340	2.5532	54.1432
Diversity[b]	0.3719	0.2680	0	0.8426
Diversity neighbours[b]	0.3482	0.2347	0	0.7955

[a] Number of observations: 658

[b] Number of countries: 94

Table A3. Correlation matrix for cultural diversity, growth and its determinants.[a]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Growth	1.0000													
(2) Log initial per capita GDP	0.0784	1.0000												
(3) Investment share of GDP	0.2661	0.4918	1.0000											
(4) Log of schooling	0.0872	0.7684	0.4325	1.0000										
(5) Fertility	-0.1382	-0.7804	-0.4907	-0.8517	1.0000									
(6) Log population	-0.0259	-0.0306	0.0848	0.0344	-0.1109	1.0000								
(7) Log of area	-0.0811	-0.1267	-0.0435	-0.1335	0.1695	0.6821	1.0000							
(8) Infrastructure quality	0.1345	0.9146	0.5410	0.8583	-0.8760	0.0130	-0.1541	1.0000						
(9) Political instability	-0.0733	-0.0158	-0.0751	-0.0190	-0.0030	0.2055	0.1222	-0.0075	1.0000					
(10) Openness	0.1512	0.1386	0.2050	0.1070	-0.0874	-0.5282	-0.5833	0.1247	-0.1865	1.0000				
(11) Inflation	-0.1303	-0.0669	-0.0748	-0.0314	0.0655	0.0451	0.0869	-0.0884	0.0248	-0.1061	1.0000			
(12) Government consumption	-0.0692	-0.2216	-0.0481	-0.0646	0.1377	-0.0139	0.0351	-0.1791	-0.0168	0.0374	0.0713	1.0000		
(13) Diversity[b]	-0.1508	-0.4714	-0.2393	-0.4447	0.4937	0.0488	0.2057	-0.5083	-0.0642	0.0790	0.0281	0.0298	1.0000	
(14) Diversity neighbours[b]	-0.1382	-0.5769	-0.3735	-0.6112	0.6310	0.0617	0.2691	-0.6329	-0.0326	-0.0257	-0.0173	0.0480	0.5639	1.0000

[a] Number of observations: 658

[b] Number of countries: 94

Table A4. Data Description.

Growth	Growth of real GDP per capita (Chain) in %: rgdpch [Base year: 2000] for 1970-2004, constant price entries. Source: Heston, Summers & Aten (2006), Penn World Table Version 6.2 (SH v. 6.2).
Log initial real per capita GDP	Log of per capita GDP at the beginning of each five-year period [Base year: 2000]. Source: SH v. 6.2.
Investment share of GDP	Investment share of real GDP per capita (Laspeyres) in %: ki [Base year: 2000], constant price entries. Source: SH v. 6.2.
Log of schooling	Log of (1 + avg. schooling years in the total population over age 25). Source: Barro & Lee (2010).
Fertility	Total fertility rate (children per women). Source: World Bank.
Log population	Log of population. Source: SH v. 6.2.
Openness	Exports plus imports divided by GDP (rgdpl) [Base year: 2000] in %, constant price entries. Source: SH v. 6.2.
Log of area	Log of area (in square kilometers). Source: Banks (2011).
assassp	Number of political assassinations per year. Source: Banks (2011).
coups	Number of Coups d'Etat per year. Source: Banks (2011).
Measure of political instability	Computed according to (0.5×assassp + 0.5×coups).
Inflation	Inflation rate in %. Source: World Development Indicators; compiled by Teorell et al. (2011).
Government consumption	Government share of real GDP per capita (Laspeyres) in %: kg [Base year: 2000], constant price entries. Source: SH v. 6.2.
Measure of infrastructure quality	Log of telephones per capita. Source: Banks (2011).
Western democracy dummy	Takes value 1 if the country belongs to the western democracies (inlcluding Japan). Source: Fearon (2003).
Latin America and Carib. dummy	Dummy for Latin-American and Caribbean countries. Source: Fearon (2003).
Sub-Saharan Africa dummy	Dummy for Sub-Saharan African countries. Source: Fearon (2003).
Island dummy	Dummy for island countries. Source: Tavares & Wacziarg (2001).
Religion shares	Measured in %. Source: La Porta et al. (1999).
Legal origin dummies	Takes value 1 if the country has British, French, German or Scandinavian legal origin. Source: La Porta et al. (1999).
Diversity	Measure of cultural Diversity based on the authors' calculations using the raw data in Alesina et al. (2003) and the cultural similarity measures calculated from the ASJP project.
Diversity neighbours	Average cultural diversity from contiguous neighbouring countries.

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