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Measuring cultural diversity: ethnic, linguistic and religious fractionalization in the OECD

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Abstract

Many claim that national economic success depends upon cultural homogeneity. We collect new time-series data and develop new measures of ethnic, linguistic and religious fractionalization for the OECD countries. We show that cultural diversity may vary by type across countries and over short periods of time. We also show that our measure of ethnic fractionalization is a significant predictor of economic performance in OECD countries despite the fact that they constitute a particularly homogeneous and economically advantaged group.

Keywords: Ethnic categories; political economy; inter-ethnic social distances; cross-national analyses; national identity; data collection.

A striking claim of contemporary social science is that national economic success depends upon cultural homogeneity (e.g. Alesina *et al*. 1997; Levine 1997; Alesina, Baqir and Easterly 2003; Easterly and Putnam 2007).[1] The argument is that capitalism requires constant change and that this is often best managed in societies that are cohesive and able to make sacrifices for the common good so as to respond flexibly to a changing external environment. The issue is also important because it could be used to justify homogenization practices ranging from restrictive immigration to ethnic genocide (McGarry and O'Leary 1993; Mann 2005).

The convention for measuring national homogeneity was initially to use an ethno-linguistic fractionalization index (ELF) based on data compiled by Soviet ethnographers. Several researchers used it to assess the relationship between homogeneity and economic performance

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(e.g. Easterly and Levine 1997). Since then researchers have criticized this index and improved it (e.g. Posner 2004; Cederman and Girardin 2007; Fearon, Kasara and Min 2007). One of the most ambitious and widely used of these new indices was created by Alesina *et al*. (2003) who developed measures of ethnic, linguistic and religious fractionalization in 190 countries using more current data from the *Encyclopaedia Britannica Book of the Year* (2001), hereafter referred to in brief as *Encyclopaedia Britannica*, and other sources. But again scholars offered criticisms (e.g. Fearon 2003; Posner 2004). First, there is inconsistency in terms of the years covered. For instance, the *Encyclopaedia Britannica* provides ethnicity data for only 124 of 190 countries, so Alesina had to resort to other sources for the rest. Hence, his ethnicity data covered years ranging from 1979 to 2001, depending on the country. Second, he offered one-time measures of fractionalization, thereby being unable to say anything about change over time – a problem with the ELF data as well (Laitin and Posner 2001).

A few scholars addressed these problems by constructing improved indices for subsets of countries, notably African and post-communist groups. They corroborated that national homogeneity enhanced economic performance (Posner 2004; Campos and Kuzeyev 2007). However, almost no one tried to do this for the advanced industrial countries – the OECD (but see Fearon 2003). We focus on the OECD because issues of diversity and economic performance are at the centre of political debate there. More important, research that has established the relationship between fractionalization and economic performance is typically based on datasets that include virtually all countries in the world, some of which, notably several African countries, have extremely high levels of cultural diversity and very poor economic performance (e.g. Easterly and Levine 1997; Alesina *et al*. 2003). But the OECD countries are a more culturally homogeneous group by world standards due to much twentieth-century nation-building involving the expulsion, coercive assimilation, population transfer and genocide of certain groups (Mazower 2000). The OECD is also the most economically advanced group in the world. Given these unique features, does the inverse relationship between fractionalization and economic performance hold for the OECD countries?

We offer new data for fractionalization in the OECD countries that helps answer this question. Our data have advantages. Among other things, they measure fractionalization at two points in time – 1985 and 2000. This allows us to explore whether fractionalization changed appreciably over a short period of time and whether such change was associated with recent national economic performance.

We limit our data to improving only the nominal measurement of diversity – the size of ethnic groups, but not the depth of divisions

between them. Some scholars argue that not every nominal cultural difference leads to problems (e.g. Posner 2004, 2005; Habyarimana *et al*. 2009). Objective differences are not always perceived by citizens as being substantively meaningful. Hence, a few researchers have combed through national ethnographies and consulted with area specialists to develop indices measuring politically salient differences (e.g. Posner 2004, 2005; Min, Cederman and Wimmer 2010). Some have concluded that ethnic differences are not substantively relevant in several OECD countries (Min, Cederman and Wimmer 2010, p. 9). For this reason and because nominal measures continue to dominate the field this paper concentrates on improving them.

We proceed as follows. First, we discuss our new fractionalization data. As far as we can tell, ours are the only data that do several important things simultaneously. They allow for tracking three types of fractionalization and thus for the possibility of assessing the strengths and weaknesses of three main aspects of cultural diversity that the literature suggests may impact on national economic performance. They encompass two periods of time, thus permitting historical comparisons. And they cover the OECD countries. We will also address challenges in constructing the dataset. This is important insofar as changes in national data-collection methodologies as well as changes in population composition may affect fractionalization indices – a point not always appreciated by those who construct or use them. Second, we compare our indices to make two points: cultural diversity may vary significantly by type across countries and over short periods of time. Third, we deploy our index of ethnic fractionalization to see whether the inverse relationship between fractionalization and economic performance holds in the OECD. Using multiple regression techniques we find support for this relationship. Finally, we discuss the broader implications of our findings.

Among the indices on offer today, Alesina's is the most comparable to ours. His data cover the OECD countries whereas some others do not (e.g. Posner 2004; Campos and Kuzeyev 2007). Furthermore, among those that do cover the OECD only Alesina provides measures of the three types of fractionalization – ethnic, linguistic and religious – that cover the full array of cultural dimensions that others have identified as being relevant for economic performance (e.g. Gellner 1983; Laitin 2007; Bates 2008). Others provide only one or two (e.g. Fearon 2003). For these reasons and because Alesina's data have been used by and received extensive attention from several researchers (e.g. Fearon 2003; Posner 2004; Bjørnskof 2008) we occasionally refer to his data to illustrate the advantages of ours.

Fractionalization data for the OECD

We collected fractionalization data from the *Encyclopaedia Britannica* yearbooks from 1986 through 2007. The *Encyclopaedia Britannica* collects data from official government reports especially national censuses. Short of retrieving data directly from the national censuses in all the OECD countries, which would be a very expensive and time-consuming effort requiring formidable language skills to understand the census categories and data-collection methodologies in all of these countries, the *Encyclopaedia Britannica* data are the best available and a close approximation anyway. More specifically, we took 'ethnic composition', 'language' and 'religious affiliation' data from the *Encyclopaedia Britannica* and converted them to ethnic, linguistic and religious fractionalization indices, respectively, ranging from 0 to 1 using the 'one minus the Herfindahl index' formula typically adopted in the literature. This formula estimates the probability that two randomly selected individuals in a country belong to different groups (e.g., Alesina *et al*. 2003). A score of 1 implies a highly heterogeneous country whereas a score of 0 refers to a perfectly homogeneous country. For example, an ethnic fractionalization score of .0238 for Denmark means that the odds of two people selected randomly belonging to different ethnic groups is slightly over 2 per cent.

We limit our data collection to the thirty current OECD members. We also base our research on a fundamental notion that the ethnic, linguistic and religious composition of society may change over time. Hence, we collected data for as close to two time points as possible: 1985 and 2000. We chose 1985 because it was the earliest date for which *Encyclopaedia Britannica* data were available for all dimensions for all of our countries. Similarly, we picked 2000 because it was the most recent date for which *Encyclopaedia Britannica* data were available for all dimensions for all of our countries.

Regarding the last point, we collected data on the ethnic and religious composition of all thirty OECD countries that were as close to the years 1985 and 2000 as possible given the year of observation provided in various *Encyclopaedia Britannica* yearbooks. This resulted in more compressed and therefore more precise time points for the ethnic and religious fractionalization data than Alesina achieved. For example, his data for ethnic fractionalization in the OECD covered eighteen years ranging from 1983 for one country to 2001 for four others. Data for most countries reflected their situations in the early to mid-1990s. By contrast, our data for 1985 spanned five years and our data for 2000 spanned two years. Similarly, our religious composition data represent the narrowest time spans available in the *Encyclopaedia Britannica* data for both 1985 and 2000. The time spans for 1985 and 2000 are five and four years, respectively. Alesina took religious

composition data only from the *Encyclopaedia Britannica* 2001 yearbook so his data on religious fractionalization presumably refer only to years near 2000. Things were more difficult for the linguistic composition data. The *Encyclopaedia Britannica* does not provide the actual years of observation for these data so, similar to Alesina's approach, we assume that the linguistic data refer to the years close to 1985 in the 1986 yearbook and to the years close to 2000 in the 2001 yearbook. Constructing an index for each fractionalization type involved additional challenges.

Consider *ethnic* fractionalization. For the most part, the *Encyclopaedia Britannica* provides the 'ethnic composition' for each society in the form of the percentage distribution of ethnic groups for the particular year of observation. The ethnic composition data are most often based on 'ethnic groups' but sometimes on either 'ethno-linguistic groups' or 'racial groups'. The particular label for each country is determined by the categories that countries themselves use in their national statistics – that is, categories that they believe are salient. The data are most often called 'ethnic composition' but in some cases they are conflated with language composition or political definitions of immigrants used within a country. For instance, for the 2000 ethnic data, twenty-two out of thirty countries carry the 'ethnic composition' label. However, for four countries (Japan, Germany, Luxembourg, Switzerland) the *Encyclopaedia Britannica* reports 'ethnic composition by nationality' and for another four countries it reports 'ethno-linguistic composition' (Italy), 'composition by race and Hispanic origin' (United States), 'composition by ethnic origin' (Canada) and 'composition by place of origin including second generation' (Holland).

Insofar as *religious* fractionalization is concerned, the *Encyclopaedia Britannica* provides 'religious affiliation' data for each country as the percentage distribution of the religious groups for a particular observation year. It automatically assigns the parents' religion to children. Furthermore, it cautions that the listed religious groups describe only nominal religious affiliations, regardless of whether their members are practising or not. One way to remedy the situation is that 'non-religious' and 'non-practising' people are often listed as a separate category for a country. We treated all the categories of non-believers and the non-practising as separate religious groups. This slightly inflates the level of religious fractionalization. However, we felt that such treatment better reflects the religious diversity of the societies in question.[2]

The *Encyclopaedia Britannica* also presents the distribution of religious groups – that is, as the listing of absolute sizes of various religious groups in a given year. Alesina used this format to calculate the religious fractionalization for 2000. In contrast, we used the

percentage distribution format because the exact year of observation is reported in the percentage format but not in the listing format.

As for *linguistic* fractionalization, the way that the *Encyclopaedia Britannica* reports linguistic divisions in societies is different from how it reports ethnic and religious divisions. It provides estimates of the absolute size of the linguistic groups within each country. The sum of these linguistic groups corresponds approximately but not always exactly to the overall population of the country. Based on the absolute number of speakers in each language group, we calculated the percentage of speakers of major languages within the society and then calculated the index of linguistic fractionalization.

Data on linguistic composition are based principally on two ways of recording linguistic composition in national statistics. The first way, as the *Encyclopaedia Britannica* explains, is to use the mother tongue of the population reported in the national statistics. The second way – ethno-linguistic composition – is used for countries where the mother-tongue data are not recorded in the national statistics. In this case, the percentage of the representatives of a given ethnic group in a country is assumed to correspond to the percentage of speakers of its language. Hence, ethnic groups are equated to linguistic groups. This happens for seventeen of the thirty countries in the 1986 yearbook and for five of the thirty countries in the 2001 yearbook.

There are additional challenges with these data. First, given the occasional correspondence between language and ethnicity, the ethnic and linguistic fractionalization indices are likely to be correlated. Second, because the linguistic distributions are estimated inconsistently and reported in absolute numbers rather than as percentages the index is probably less precise than the two others. Third, the *Encyclopaedia Britannica* does not report bilingualism in 1985 at all and limits bilingualism in 2000 by indicating the *lingua franca* for those countries where one language serves as a common medium of communication, such as English in the United States. *Lingua franca* is reported for Australia, Ireland, the Netherlands and the United States but not for Canada or New Zealand. The problem is that including the number of speakers of the *lingua franca* pushes the number of people in all of the linguistic categories provided by the *Encyclopaedia Britannica* above 100 per cent of the national population. Therefore, we excluded the *lingua franca* bilingual groups when we calculated the index of linguistic fractionalization because the index can only be calculated based on mutually exclusive categories. These problems make the linguistic fractionalization index the weakest of our measures.

Three caveats are in order. First, virtually all of our data are only for the mainland of each country. Overseas or remote territories of countries like France, the Netherlands and Denmark are not included.

However, data for the United Kingdom include Northern Ireland and the Scottish isles. Second, because the Czech Republic and Slovakia were parts of the same country in 1985 the *Encyclopaedia Britannica* does not provide separate ethnic, religious or linguistic data for each one. Put differently, only national not regional data are available for that year. Third, Germany was a divided country in 1985 but subsequently reunified. Hence, we present data for 1985 based only on the Federal Republic of Germany not the German Democratic Republic.

In sum, there are several challenges for gathering data for measuring fractionalization even in the OECD where official statistics are most readily available. Despite the challenges our data have advantages relative to those collected by others. Most important, we have data on two points of time rather than just one, thus providing us with an opportunity for historical analysis. Furthermore, with respect to Alesina, his measure of fractionalization covers a comparatively wide range of years whereas ours covers a narrower range for each of our time points. Our indices, then, are more precise historically than others.

Fractionalization indices

We calculated three fractionalization indices for each country for the 1985 and 2000 time periods. Results are displayed in Tables 1 and 2. For purposes of comparison later, we also present Alesina's indices in Table 3.

Our data reveal that fractionalization in 1985 was rather low. The linguistic fractionalization mean was .1984 (.193).[3] Ethnic fractionalization averaged .2073 (.203). Thus, a majority of OECD countries were linguistically and ethnically homogeneous in 1985. By contrast, religious fractionalization averaged .3828 (.256). These measures were correlated in varying degree.[4] Ethnic and linguistic fractionalization were significantly correlated at the .808 level ($p = .01$). By contrast, the correlations between religious fractionalization, on the one hand, and ethnic (.077) and linguistic fractionalization ($-.049$), on the other, were small and statistically insignificant.

In 2000, religious fractionalization was again the highest of the three measures with a mean of .4625 (.247). Linguistic fractionalization was again the lowest of the three with a mean of .1987 (.184). However, ethnic fractionalization, with a mean of .2867 (.204), was no longer similar to linguistic fractionalization. These measures were correlated much as they were for 1985. Ethnic and linguistic fractionalization were significantly correlated at the .718 level ($p = .01$). Again the correlations between religious fractionalization, on the one hand, and

Table 1. *Ethnic, linguistic and religious fractionalization, 1985*

Country	Ethnic	Linguistic	Religious
Australia	0.1077	0.0239	0.8260
Austria	0.0760	0.0477	0.2809
Belgium	0.1683	0.5419	0.0768
Canada	0.7463	0.6299	0.6079
Czech Republic	0.4979	0.4968	0.5199
Denmark	0.0238	0.0629	0.1567
Finland	0.1201	0.1205	0.1932
France	0.2428	0.3286	0.3947
Germany	0.1378	0.1215	0.7035
Greece	0.0874	0.0988	0.0472
Hungary	0.0119	0.0204	0.6441
Iceland	0.0547	0.0324	0.0604
Ireland	0.1040	0.3541	0.1311
Italy	0.1133	0.0454	0.2886
Japan	0.0119	0.0114	0.4928
Korea (South)	0.0020	0.0020	0.6027
Luxembourg	0.4408	0.4037	0.1316
Mexico	0.5909	0.1711	0.1975
Netherlands	0.0760	0.0740	0.7082
New Zealand	0.2545	0.1252	0.7340
Norway	0.0473	0.0534	0.2223
Poland	0.0257	0.0256	0.3078
Portugal	0.0219	0.0199	0.1054
Slovak Republic	0.4979	0.4968	0.5199
Spain	0.4359	0.4360	0.0584
Sweden	0.1641	0.1729	0.5280
Switzerland	0.5322	0.5172	0.5711
Turkey	0.2536	0.1811	0.0159
United Kingdom	0.1082	0.1327	0.6433
United States	0.2637	0.2047	0.7155
Mean	*.2073*	*.1984*	*.3828*
Standard deviation	*.203*	*.193*	*.256*

ethnic (.046) and linguistic fractionalization (.135), on the other, were small and statistically insignificant.

Overall, average linguistic fractionalization did not change significantly. However, the increases in ethnic and religious fractionalization were statistically significant ($p = .01$). Average ethnic diversity in the OECD increased about 38 per cent; religious diversity increased about 21 per cent; linguistic diversity increased less than 1 per cent.

We expected fractionalization of all types to have increased between 1985 and 2000 because of immigration, which increased during this period in many OECD countries (Held *et al*. 1999, pp. 318–21). So the lack of change in linguistic fractionalization is surprising. There could be several reasons for this. To begin with, people may migrate to countries where they have or claim to have the dominant language,

Table 2. *Ethnic, linguistic and religious fractionalization, 2000*

Country	Ethnic	Linguistic	Religious
Australia	0.1496	0.3349	0.8367
Austria	0.2474	0.1522	0.4184
Belgium	0.6066	0.5409	0.3362
Canada	0.7261	0.5920	0.7041
Czech Republic	0.1802	0.3233	0.7052
Denmark	0.0932	0.1049	0.1576
Finland	0.1517	0.1412	0.2623
France	0.3998	0.1221	0.3141
Germany	0.2185	0.1642	0.7380
Greece	0.1809	0.0300	0.1639
Hungary	0.2826	0.0297	0.6684
Iceland	0.0607	0.0820	0.2235
Ireland	0.0969	0.0312	0.2149
Italy	0.0781	0.1147	0.3452
Japan	0.0258	0.0178	0.4168
Korea (South)	0.0451	0.0021	0.8626
Luxembourg	0.5719	0.6440	0.1769
Mexico	0.5315	0.1511	0.2398
Netherlands	0.3272	0.0814	0.6899
New Zealand	0.4960	0.2333	0.8249
Norway	0.1191	0.0673	0.2568
Poland	0.1866	0.0468	0.1872
Portugal	0.1543	0.0198	0.2308
Slovak Republic	0.2539	0.2551	0.4898
Spain	0.7033	0.4132	0.1484
Sweden	0.2144	0.1968	0.5829
Switzerland	0.3483	0.5441	0.6837
Turkey	0.5323	0.2216	0.4814
United Kingdom	0.1506	0.0532	0.6901
United States	0.4707	0.2514	0.8262
Mean	*.2867*	*.1987*	*.4625*
Standard deviation	*.204*	*.184*	*.247*

such as when people from the Caribbean islands, South Asia or Nigeria move to Britain and Ireland or when Vietnamese move to France. Moreover, immigrants may quickly learn the language of their new country in order to participate in the economy. They are likely to retain their ethnic and religious characteristics, which are not as important immediately for their economic well-being. However, it is also possible that a minimal change in linguistic fractionalization resulted from a different way of presenting the linguistic data in the *Encyclopaedia Britannica*. Recall that linguistic data are presented there differently from the ethnic and religious data. While the ethnic and religious data are presented as the *percentage* distribution of groups within each country, the linguistic data are presented in terms of the *absolute numbers* of speakers of particular languages. The sum

Table 3. *Alesina's ethnic, linguistic and religious fractionalization*

Country	Ethnic	Linguistic	Religious
Australia	0.0929	0.3349	0.8211
Austria	0.1068	0.1522	0.4146
Belgium	0.5554	0.5409	0.2127
Canada	0.7124	0.5772	0.6958
Czech Republic	0.3222	0.3233	0.6591
Denmark	0.0819	0.1049	0.2333
Finland	0.1315	0.1412	0.2531
France	0.1032	0.1221	0.4029
Germany	0.1682	0.1642	0.6571
Greece	0.1576	0.0300	0.1530
Hungary	0.1522	0.0297	0.5244
Iceland	0.0798	0.0820	0.1913
Ireland	0.1206	0.0312	0.1550
Italy	0.1145	0.1147	0.3027
Japan	0.0119	0.0178	0.5406
Korea (South)	0.0020	0.0021	0.6604
Luxembourg	0.5302	0.6440	0.0911
Mexico	0.5418	0.1511	0.1796
Netherlands	0.1054	0.5143	0.7222
New Zealand	0.3969	0.1657	0.8110
Norway	0.0586	0.0673	0.2048
Poland	0.1183	0.0468	0.1712
Portugal	0.0468	0.0198	0.1438
Slovak Republic	0.2539	0.2551	0.5655
Spain	0.4165	0.4132	0.4514
Sweden	0.0600	0.1968	0.2342
Switzerland	0.5314	0.5441	0.6083
Turkey	0.3200	0.2216	0.0049
United Kingdom	0.1211	0.0532	0.6944
United States	0.4901	0.2514	0.8241
Mean	*.2301*	*.2104*	*.4194*
Standard deviation	*.198*	*.191*	*.252*

of these linguistic groups approximates the size of the population in each country but is not exact, which suggests that the sizes of the linguistic groups are only estimates and thus perhaps not as accurate or time-sensitive as our other measures of fractionalization.

Two points are evident. First, differentiating among types of fractionalization makes sense insofar as the degree of fractionalization varies among types. This suggests that studies of the effect of fractionalization on political and economic variables need to recognize that results may vary depending on which type of fractionalization is being examined. Second, fractionalization may change over time – even short periods of time like our fifteen-year interval. Some types of fractionalization may change more than others. And the relative

position of countries *vis-à-vis* one another on a fractionalization scale may change too.

Consider the ethnic fractionalization data, which we use now because they seem to be the most reliable.[5] Using the mean ethnic diversity in each period as a dividing point, we can identify nineteen ethnically homogeneous countries and eleven heterogeneous countries in both 1985 and 2000 (see Figures 1 and 2). Some countries moved between the categories so defined. Thus, Belgium and the Netherlands became ethnically diverse by 2000 while the Czech Republic and Slovakia became ethnically homogeneous by 2000 after the Velvet Revolution divided them into independent nation-states in 1992. The threshold dividing homogeneous and heterogeneous countries in 1985 was located between Belgium and France but in 2000 it was between Hungary and Netherlands.

Alesina's one-time measurement of ethnic fractionalization also gives nineteen homogeneous and eleven heterogeneous countries, but he lists the Czech Republic and Slovakia as heterogeneous, more in line with the pre-1992 situation, and the Netherlands as homogeneous, again more similar to the late 1980s. The ability to observe change over time and avoid such problems is an advantage of our data. Indeed, several countries changed their relative positions on ethnic fractionalization even over this short period of time. Ethnic fractionalization scores for nine out of thirty countries changed by more than .2 points

Figure 1. *Ethnic fractionalization in OECD countries, 1985*

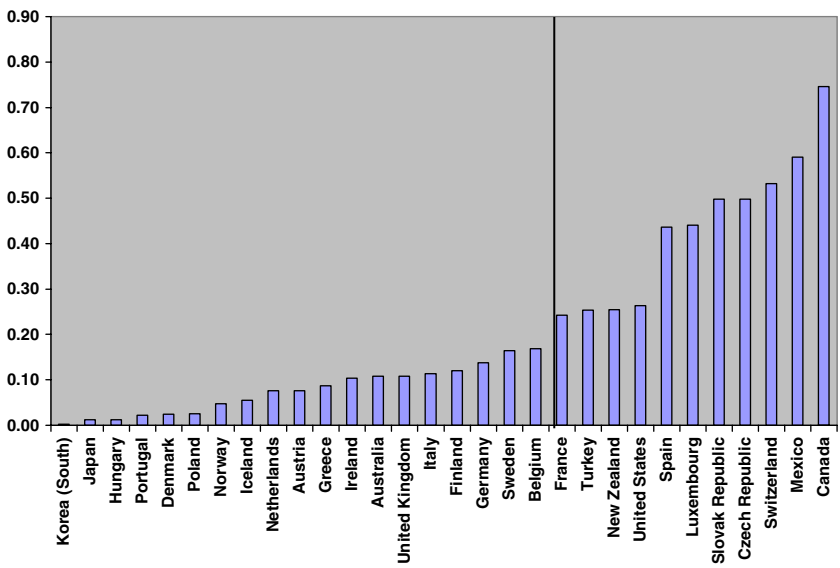
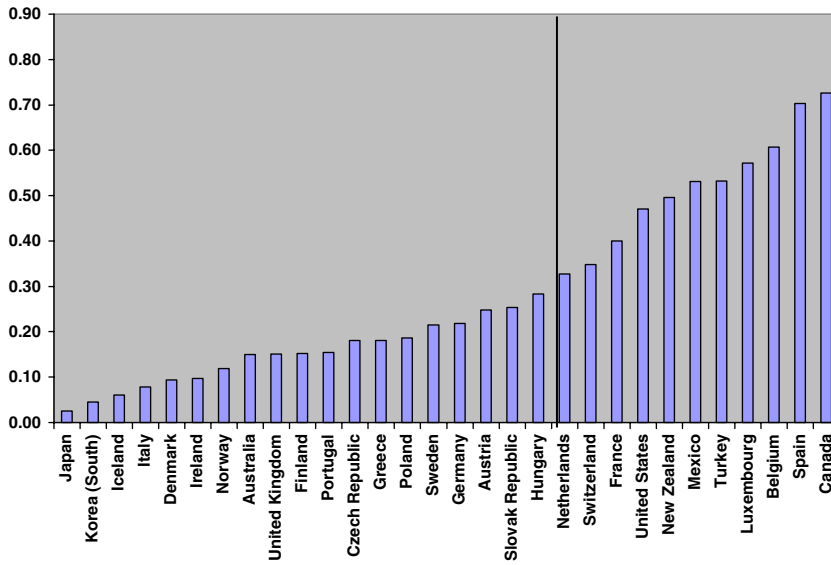


Figure 2. *Ethnic fractionalization in OECD countries, 2000*



between 1985 and 2000. The Czech Republic and Slovakia exhibited the greatest decline in heterogeneity – roughly .3 points – due to their separation. The greatest increase in ethnic fractionalization was in Belgium, which moved by more than .4 points from .1683 to .6066 or from the nineteenth to twenty-seventh place. We return to the Belgian case later. Hungary, Turkey, Spain, the United States, New Zealand and the Netherlands also demonstrated substantial jumps in ethnic fractionalization of around.2. Hungary, which in 1985 was extremely homogeneous, moved from the second to the nineteenth most homogeneous country. The Netherlands moved from ninth to twentieth place. Many countries, however, changed their ethnic fractionalization very little. In ten countries the absolute change in ethnic fractionalization did not exceed 0.05. Minimal changes were observed for Iceland, Ireland and Japan, all of whom remained very homogeneous in both periods, and for Canada, which remained very heterogeneous.

Shifts in fractionalization scores may occur for various reasons. Substantive changes in populations may occur. We suspect that immigration has driven much of the rise in average fractionalization for the OECD countries. A case in point is Denmark, which experienced increased immigration particularly from Muslim nations that contributed to a rise in its ethnic fractionalization score from

.0238 in 1985 to .0932 in 2000 (Hedetoft 2006). But changes in data collection may occur too. The dramatic increase in Belgium's ethnic diversity score is partly due to the fact that for political reasons government statistics in 2000 but not in 1985 distinguished between Flemish and Walloon groups. Similarly, Hungary collected data on six ethnic groups in 2000 for which it did not collect data in 1985. As best we can tell, these are the only instances in our *Encyclopaedia Britannica* data where major shifts in fractionalization in the OECD were due at least in part to changes in how countries categorized groups as well as changes in population composition. It would be interesting to investigate whether shifts in national census categories as well as changes in things like immigration policies were associated statistically with fractionalization measures over time across countries. But this would require a detailed historical analysis of census methodologies in each country, which is well beyond the scope of this paper (e.g. Kertzer and Arel 2002). Nevertheless, the point is that researchers must be careful when interpreting these changes.

To summarize, by our measures the OECD countries became more culturally heterogeneous between 1985 and 2000. However, there was considerable variation within this group such that several countries became more heterogeneous while a few others became more homogeneous. Our data permit such historical comparisons and thus are a significant improvement over indices that do not measure fractionalization over time. And in some cases, notably the Czech Republic, Slovakia and the Netherlands, this leads us to draw different conclusions than did Alesina about how homogeneous a country is.

Ethnic fractionalization and economic performance

The degree to which countries are culturally homogeneous is often cited as a predictor of economic performance – typically operationalized in terms of GDP growth rates (e.g. Alesina *et al*. 1997, 2003; Easterly and Levine 1997; Min, Cederman and Wimmer 2010). To see whether this relationship held up for the advanced capitalist countries we analysed the associations between our three measures of fractionalization and average annual GDP growth rates in the OECD.

First, we took data on GDP per capita growth rates from the World Bank World Development Indicators (2009) database. We then calculated the average annual GDP growth rate for the OECD countries over two periods: 1989–99 and 2001–7.[6] We selected these periods because they corresponded to the two business cycles most closely following the 1985 and 2000 years of our fractionalization indices. We began by calculating the correlations between our 1985 fractionalization indices and growth rates for 1989–99. The correlations for ethnic ($-.327$), linguistic ($-.172$) and religious ($-.232$)

fractionalization were inversely related to growth rates as much of the literature would expect but none of these relationships was statistically significant, although the correlation between ethnic fractionalization and growth ($p = .077$) came close. We did the same for our 2000 fractionalization indices and growth rates for 2001–7. Again, the correlations for ethnic ($-.164$) and linguistic ($-.142$) fractionalization were inversely related to growth rates. But now the correlation between religious fractionalization and GDP growth was positive (.046). None of these was significant statistically.

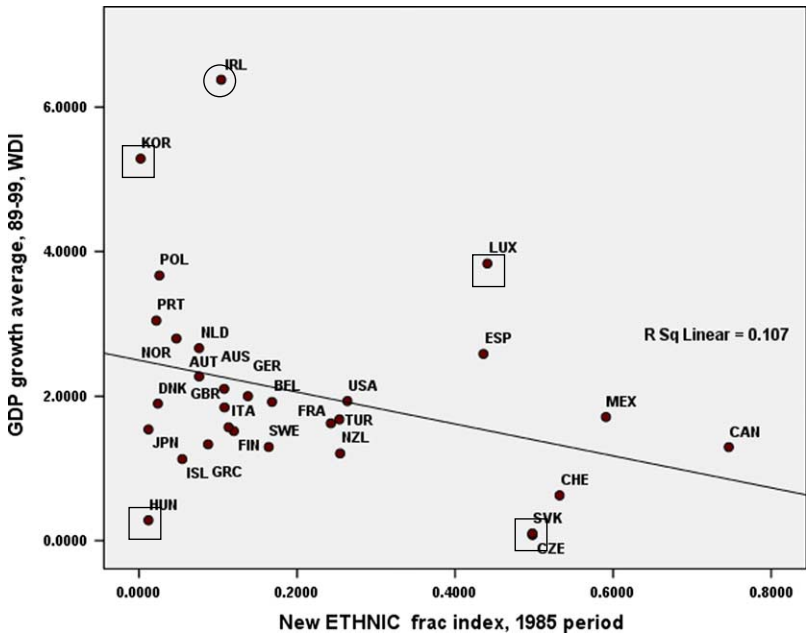
The statistically weak associations between fractionalization and economic growth suggest that if fractionalization affects growth the effect may be indirect. For example, cultural diversity may affect national economic performance by affecting the political-economic institutions that impact more directly on economic performance (Campos and Kuzeyev 2007, p. 621; Campbell and Hall 2009, Campbell and Hall 2010). Furthermore, the relationship between fractionalization and growth may change over time.

Second, to explore more closely the possibility of change we regressed average annual GDP growth rates on ethnic fractionalization and generated scatter plots of countries around the regression lines. We focused on ethnic fractionalization because its association with growth in the preceding analysis was the strongest. Figures 3 and 4 show the inverse and statistically insignificant relationship between ethnic fractionalization and growth, but also reveal changes for individual countries.

Figure 3 shows that during the 1989–99 years Ireland was an extreme case that did not fit the prediction of growth as related to ethnic fractionalization.[7] Because ethnic fractionalization in Ireland was low its growth rate should have been high, but only on the order of 2.23 per cent per year. Instead, Ireland's growth rate was 6.39 per cent per year. Other outliers, although not statistically significant, were South Korea and Luxembourg, which out-performed expectations, and Hungary and the Czech Republic, which under-performed expectations. Figure 4 repeats the exercise for 2001 through 2007. Slovakia was the only statistically significant outlier.[8] Slovakian growth was predicted to increase by 2 per cent per year but reached more than 6 per cent per year.

Note that the position of countries around the regression lines shifted – sometimes dramatically. For instance, Ireland, South Korea and Luxembourg all moved much closer to the regression line from the first to the second periods and were no longer outliers. Especially interesting is the fact that some countries moved *across* the line by considerable amounts. Hungary, the Czech Republic and Slovakia moved from notable under-performers to notable over-performers – a

Figure 3. *Ethnic fractionalization and average GDP growth, 1989–99*

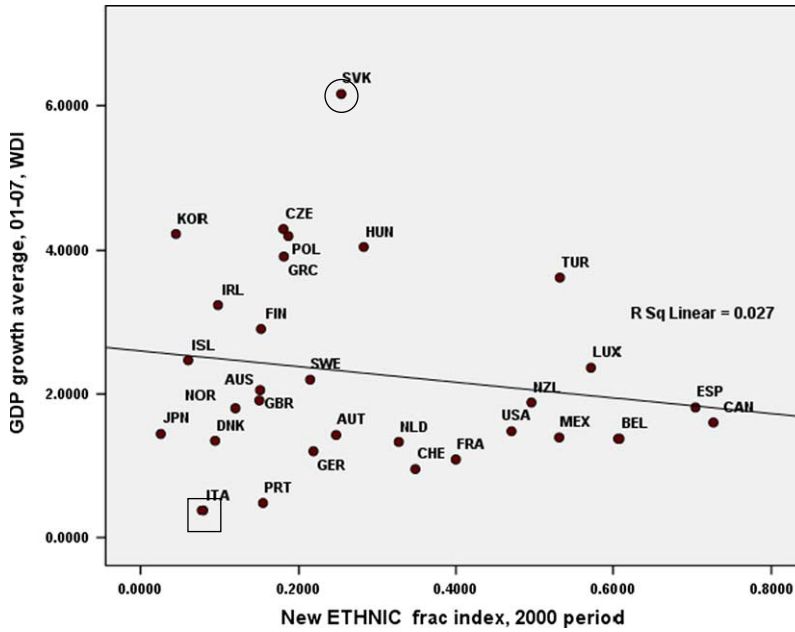


fact that surely reflects their change from communist to capitalist economic systems.

Third, to pursue things further we turned to multiple regression analysis. Much of the literature on the relationship between ethnic fractionalization and growth is based on a large number of countries from around the world. It often incorporates numerous control variables into the regression models. We have a much smaller number of countries than many other studies, which constrains our ability to add a lot of controls (Green 1991). However, most of the controls used in the literature are irrelevant for our purposes. For instance, following Easterly and Levine (1997), most of Alesina's controls involved measures of government quality, political corruption and the like because developing countries comprised a sizeable portion of his sample. But variation among OECD countries on these dimensions is minimal. Hence, incorporating these variables into our analysis made little sense. We included only controls that both made sense for our countries and that Alesina had used.

We pooled our 1985 and 2000 data in order to increase the sample size to sixty observations and permit the use of some control variables. Following Alesina, we included controls for GDP per capita at the

Figure 4. *Ethnic fractionalization and average GDP growth, 2001–7*



beginning of each time period and average schooling at the beginning of each period. The controls for initial GDP per capita included both the log of initial income as well as the log of initial income squared to account for possible non-linear effects.[9] The control for education was a log of average educational attainment at the beginning of each period.[10] We also included a dummy variable for the 1980s because our initial correlations suggested that the relationship between fractionalization and growth may have been stronger in the 1980s than the 2000s. Finally, we used dummy variables for the post-communist countries because many of them achieved remarkably rapid growth in the 1990s after their communist regimes collapsed. We used the Seemingly Unrelated Regression (SUR) technique as provided by Stata statistical software to analyse the data. SUR is appropriate for analysing pooled data like ours where a single regression model uses a number of linear equations in which the equation errors are likely to be correlated (Zellner 1962).

Results are reported in Table 4. For purposes of comparison we present models using both our and Alesina's ethnic fractionalization measures for the OECD countries. Models 1 and 2 estimate the direct effects of ethnic fractionalization on GDP growth rates in the OECD. Model 1, which uses our fractionalization measure, shows a small

Table 4. *SUR regression of economic growth on ethnic fractionalization*

	Model 1	Model 2 (Alesina)	Model 3	Model 4 (Alesina)	Model 5	Model 6 (Alesina)
Dummy for the 1980s			−.0038	−.0025	−.0061	−.0042
			(−1.10)	(−0.72)	(−1.86)	(−1.28)
Post − communist countries					−.0126	−.0122
					(−1.58)	(−1.48)
Log of initial income					−.0457	−.0507
					(−0.31)	(−0.33)
Log of initial income squared					.0018	.0025
					(0.10)	(0.14)
Log of schooling					.0430	.0441
					(1.95)	(1.92)
Ethnic fractionalization	*−.0146*	*−.0116*	*−.0169**	*−.0116*	*−.0199***	*−.0140*
	(−1.77)	*(−1.31)*	*(−1.97)*	*(−1.32)*	*(−2.63)*	*(−1.74)*
Number of observations	30;30	30;30	30;30	30;30	30;30	30;30
Overall R^2	.05	.03	.07	.04	.26	.21
R^2	.11;.03	.05;.01	.11;.03	.05;.01	.31;.66	.28;.66

*p = .05, **p = .01, t-statistics are in parentheses.

negative association between fractionalization and growth that is not statistically significant. Model 2 does the same thing but uses Alesina's fractionalization measure. It also reveals a negative relationship but one that is even weaker statistically than that presented in model 1.

Models 3 and 4 add a time control for the 1980s. Model 3 uses our fractionalization measure and finds that the inverse relationship between ethnic fractionalization and economic growth is significant statistically ($p = .05$). Model 4 uses Alesina's fractionalization measure and does not reveal a statistically significant relationship. Models 5 and 6 include all the controls. Model 5 shows that our measure of fractionalization remains inversely related to growth and is statistically significant ($p = .01$). An increase in ethnic fractionalization from 0 to 1 is associated with a 1.99 per cent decline in growth. This is consistent with what others have found world-wide (e.g. Easterly and Levine 1997; Alesina *et al.* 2003). Model 6 shows that Alesina's ethnic fractionalization measure is inversely related to economic growth but is not significant statistically.

Discussion and conclusion

Our indices have advantages relative to other popular fractionalization indices. Most important, our indices cover two time periods and so permit historical comparisons where others do not (e.g. Alesina *et al.* 2003; Fearon 2003). And ours cover the OECD countries where others do not (e.g. Posner 2004; Campos and Kuzeyev 2007).

Nevertheless, our results support the findings of other researchers. First, we found that from 1985 to 2000 average religious diversity and to a lesser degree average ethnic diversity increased while average linguistic diversity remained quite stable. Second, we found that ethnic fractionalization was more closely associated with economic performance than other types of fractionalization. Both of these findings are consistent with recent studies of other small groups of countries (e.g. Campos and Kuzeyev 2007). Third, in the multiple regression analysis we found an inverse and statistically significant relationship between ethnic fractionalization and economic growth in the OECD.

Our ethnic fractionalization data were significant in these models and Alesina's were not. We suspect that this reflects the fact that our data measure fractionalization at two times and his do not. That many fractionalization indices do not account for change over time is a general problem in this literature (Laitin and Posner 2001; Posner 2004; Wimmer 2008). Our data suggest that this is not a trivial concern insofar as fractionalization scores for some of our countries changed a lot and did so rather quickly. Others have discovered similarly rapid change in fractionalization for post-communist countries (e.g. Campos and Kuzeyev 2007). Failure to recognize change can lead to

misspecification of certain cases. For instance, as we have noted, Alesina's specification of ethnic fractionalization in the Czech Republic was rather different from ours. So was his specification of ethnic fractionalization in the United States (.4901), which was much closer to what we found for 2000 (.4707) than for 1985 (.2637).

Some have argued that things like geography and state history – deep-rooted factors – determine the degree of national ethnic diversity (e.g. Ahlerup and Olsson 2009; Michalopoulos 2008). If so, then we might be accused of omitting potentially important independent variables from our analysis. However, the unique advantage of having measures of ethnic fractionalization at two points in time only fifteen years apart enables us to show that short-term changes in fractionalization can still be profound enough to be significantly associated with economic growth. This suggests that ethnic fractionalization is determined in part by less deep-rooted and more immediate factors, such as changes in immigration policies or average income. Investigation of the determinants of ethnic fractionalization is worthy of further study.

Finding a strong inverse relationship between ethnic fractionalization and economic growth in the OECD is especially important insofar as these countries as a group are rather homogeneous by world standards. One might have suspected that the impact of ethnic diversity on economic performance in the OECD would be negligible. But it was significant. And this underscores how important the cultural composition of these countries still is for their performance. Nevertheless, the fact that our fully specified regression model explained only 26 per cent of the variance in growth reminds us that ethnic diversity may influence growth indirectly through the quality of national political and economic institutions. Indeed, national integration policies and welfare states matter for how well culturally diverse populations are assimilated into and perform in labour markets and other aspects of life in the OECD (Soysal 1994; Koopmans 2010).

Some of the challenges in constructing indices like ours stem from national politics. On the one hand, data collection methods vary somewhat across countries even though the *Encyclopaedia Britannica* strives to achieve rigorous cross-national comparability. Countries do not always agree on the best ways to measure the various facets of difference. On the other hand, national data collection methods occasionally vary over time – and may do so for political reasons (Kertzer and Arel 2002). For instance, as noted earlier, Belgium now distinguishes between Flemish and Walloon whereas it did not in the past. And measuring the language of daily use can be used to suggest that minorities have been integrated into the larger society whereas measuring mother tongue can be used to suggest that a minority is threatening the status of the majority. The point is that these

difficulties are unavoidable even if one were to go directly to national censuses rather than the *Encyclopaedia Britannica* for data. The problem is that shifts in fractionalization as measured by nominal quantitative indices reflect substantive changes in populations as well as methodological changes in national data collection. This suggests the need for combining this sort of quantitative analysis with in-depth case studies to establish exactly what is happening.

Some researchers have criticized fractionalization indices for not reflecting the degree to which nominal fractionalization has real political salience and whether this salience shifts over time (e.g. Fearon 2003; Posner 2004). For instance, so-called 'pillarization' policies in the Netherlands diminished the political salience of the traditional Protestant-Catholic divide. Catholics and Protestants were granted separate unions, political parties and the like in order to assuage religious tensions. The issue of salience also underscores the need to disaggregate various dimensions of fractionalization as we have done because some dimensions may be politicized in some countries or at some moments in time but not in others (Laitin and Posner 2001; Fearon 2003; Posner 2004, 2005). Posner (2005) suggests that one way to get to the bottom of this is to develop in-depth qualitative case studies. Case studies are also important for identifying the causal mechanisms underlying statistical relationships like those we have examined. This is especially so insofar as the processes of homogenization that underlie our measures in many OECD countries took a long time to unfold. Denmark, for example, underwent a cultural homogenization process that began at least as far back as the mid-nineteenth century and that has had significant impacts on her economic performance ever since (Campbell and Hall 2009). Unfortunately, good quantitative data on cultural diversity, which would be necessary for statistical analysis of such a long period of history, are not always available. Qualitative case studies are indispensable.

Of course, case selection is important in such a qualitative endeavour. Our data can be used to improve the case selection process. Lieberman (2005) showed that quantitative analysis can be a useful tool for picking country cases for more in-depth qualitative scrutiny later. He argued that by calculating a regression line and then displaying a scatter plot of countries around it, as we have done, one can determine which cases to pursue qualitatively by selecting some that conform to the model – that is, cases that fall close to the regression line – and others that are outliers both above and below that line. His point was that it is just as important to understand why some cases do not fit the model as it is to understand why others do. Doing so helps to identify more systematically the causal mechanisms operating, such as those by which ethnic fractionalization does or does not affect economic performance. Our analysis suggests that in

addition to picking cases depending on how close to a regression line they fall at one moment in time, one can also calculate the regression line and scatter plots for two different time periods in order to pick cases whose locations relative to the line and each other move significantly over time, as Hungary, the Czech Republic, Slovakia and Ireland did in our analyses. In addition to some countries whose locations were more stable, a few of these would be good cases to develop qualitatively if one were interested in understanding exactly how changes in ethnic fractionalization affected economic performance. But this cannot be done without historically sensitive fractionalization indicators, such as those offered here.

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Notes

1. Issues of cultural homogeneity are also of concern to students of nationalist insurgency (Cederman and Girardin 2007), civil war (Fearon, Kasara and Laitin 2007; Wimmer, Cederman and Min 2009), the provision of public goods (Habyarimana *et al*. 2009) and more.
2. Japan presented a special case insofar as some people reported that they were both Buddhist and Shintoist, which meant that the percentages totalled more than 100 per cent. Because calculating a fractionalization index requires that percentages total 100 per cent we adjusted the percentages accordingly by re-scaling them. That is, we kept the same proportions among groups but reduced the percentages to add up to 100 per cent. This slightly reduced religious diversity in Japan.
3. The standard deviation for each measure is presented in parentheses.
4. All correlations reported are Pearson correlations whose significance is tested with two-tailed tests.
5. As noted above, the linguistic data are the weakest. And the data on religious fractionalization are probably inflated by the inconsistent measurement across countries of non-religious and atheist groups.
6. Growth rates are missing in 1989 and 1990 for Poland and the Czech Republic. Therefore, their averages are for the years 1991–9 only.
7. Ireland's standardized regression residual is greater than 3.
8. Slovakia's standardized regression residual is greater than 2.5.
9. GDP per capita is in constant 2000 US dollars as reported in the World Bank World Development Indicators (2009) for the beginning of each period, 1985 and 2000.
10. This is the log of (1 + average years of education) at the beginning of each period, 1985 and 2000. Educational data come from Barro and Lee (2001).

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