A Note on Migration, Diversity and Economic Growth: a Replication Study of Bove and Elia (World Development, 2017)

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Abstract

A recent paper (Bove and Elia (2017)) argues that migrants' diversity, as captured by the indexes of both fractionalization and polarization, exerts a posive effect on GDP growth. In fact, by using the same dataset and methodology, it can easily be shown that the impact of diversity cannot be distinguished from that of migration itself, due to the very high correlation among the corresponding variables. Also, if one disentangles migration from diversity, following Alesina et al. (2016), only migration maintains a positive impact on growth while diversity, as captured by fractionalization, turns out to be weakly and positively associated to growth, but limitedly to the 1980-2010 time span. Polarization, on the other hand, does not seem to exert any effect on growth. The question as to whether diversity is more or less beneficial in terms of economic growth remains therefore an intriguing one, and calls for more theoretical and empirical analyses, possibly based on less (geographically) aggregated data.

Keywords: Diversity, economic growth, migration.
JEL Classification: C23, C51, E21, F36

1 Introduction

Recently, Bove and Elia (2017) have presented some interesting and influential empirical findings showing that diversity, both in the form of fractionalization, i.e. the coexistence of many different ethnic communities in a given country, and polarization, i.e. the spliting of migrants' community in two or few more groups, may enhance economic growth.

In this paper, it is shown that correlations between fractionalization, polarization and the share of migrants in total population may indeed have played a role in uncovering that empirical nexus, and that the share of migrants itself is sufficient to justify the positive impact on growth. The very high correlation between those key variables has to be taken in due account while assessing the impact of diversity on economic growth, and this paper shows, by extending to polarization the approach taken in Alesina et al. (2016) with regard to fractionalization, that migration itself has a strong and positive impact on growth, and that only fractionalization exerts an additional positive effect, though rather weak, on growth. The empirical finding that migration, in and by itself, plays a positive role on growth continues to hold even when one accounts for endogeneity, by using a two stage approach based on a gravity model for migration, following Bove and Elia (2017).

The rest of the paper is organized as follows: section 2 reviews the recent literature on migration, diversity and growth. Section 3 discusses the measures of diversity and illustrates their decomposition in terms of their main constituents, as well as the main empirical strategy. Section 4 briefly illustrates the data used in the empirical analysis and the main statistics. Section 5 presents and comments upon the regression results, while section 6 concludes, with an eye to future research.

2 Literature

In times when migrations represent a substantial piece of our daily news, and peoples mobility across countries a matter of incessant political and social debate, economics research has also critically contributed to analysing the subject and its potential effects. The evidence has been manifold and perhaps conflicting, but it nevertheless touched different fields and areas of interest. As Lucas (2005), among others, claim, there is a two-way relationship between migration and economic factors: clearly a countrys development can affect migration flows (Massey (1988); Faini et al. (1994);

Vogler and Rotte (2000)), but the reverse might also occur, as migration has an impact on economic development. Lately, the latter aspect has received particular attention and it is the direction this paper focuses on. De Haas (2010) offers an interesting outline of how theoretical views on the subject have evolved over time, with the alternation of migration optimists (Neo-classical migration theory and Developmentalist theory, considering migration as contributing towards an optimal spatial allocation of production factors) and migration pessimists (historical-structuralist and dependency views that implied migration was instead increasing spatial disparities in development levels). In this paper, we are mainly interested in the effects on the receiving country (i.e. the effects of immigration), although the source country will obviously also be greatly affected by the phenomenon (Chen (2006); Di Maria and Stryszowski (2009); Docquier and Rapoport (2012)), for instance through remittances and by increased risk sharing among the household when part of it remains in the country of origin. In practice, conclusions will often depend on the assumptions made about the economic environment and technologies. Kemnitz (2001) finds that, in the presence of endogenous growth, natives will benefit from immigration only if the average immigrant owns more capital than the average native. Similarly, Azarnert (2010) claims that highly skilled immigration favours growth when its positive contributions, in terms of brain gain, outweigh the negative effect on natives incentives that a potential decrease in their expected returns to human capital investments (due to competition) might cause. Also on a macroeconomic line of thought, Boubtane et al. (2013) use a panel vector autoregression approach on a OECD countries dataset to find that migration contributes to the host economic prosperity, in terms of GDP per capita and unemployment rates. Part of the effects will be channelled through a direct impact of immigration on the wage distribution of the receiving country. Standard economic theory with competitive labour markets and where natives and foreign workers are perfect substitutes would predict that an increase in labour supply due to migration pressure should decrease wages in the host country. As a matter of fact, the two labour sources do not seem to be perfectly substitutable, and data do not always support this result. By using the assumption that foreign workers with education levels similar to locals are not perfect substitutes to the latter, Borjas (2003) estimates that a 10 percent increase in the labour supply by migrants decreases wages of competing workers by 3 to 4 percent. On the other hand, both Butcher and Card (1991) and Card and Lewis (2007) find little effects on relative wages of less educated natives in

the US. Moreover, by introducing a production function that takes into account both complementarity and substitution effect between US and foreign workers, Ottaviano and Peri (2005) find overall large positive effects both on natives average wage and on housing values in metropolitan areas. Along the same lines, Peri and Sparber (2009) use a model of comparative advantage and imperfect specialization and focus on low-skilled workers to show that, following immigration flows, natives reallocate their task supply towards more communication-intense jobs (in which they are assumed to have a comparative advantage, as opposed to manual jobs), thus alleviating the downward push on wages. Many studies have also stressed the contribution of high skilled immigration towards a countrys growth. Wadhwa et al. (2008) for instance, show how advanced education in scientific fields, which, they argue, is often a characteristic of highly skilled immigrants in the US, is correlated with entrepreneurship and innovation both among natives and foreign founders. Similarly, Hunt and Gauthier-Loiselle (2010) find that in the US, during the period 1940-2000, a one percentage point increase in the share of immigrant graduates gives rise to a 9-18 percent increment in patents per capita. Finally, Stuen et al. (2012) use exogenous variations caused by macroeconomic shocks in supply of students by source countries to identify the contribution of doctoral students to innovation in the US for the period 1973-1998, and find that visa restrictions that potentially constrain high quality students to enter the country are harmful to innovation. From this wide literature, a particular stream focusing on the role of cultural diversity of the migrated populations has recently arisen. The theoretical foundations for this distinction rely on the hypothesis that its not only the share of migrants in a country population that matters, but its composition, with the degree of diversity it brings, should also affect economic outcomes. This has been pointed out, for instance, by Alesina and La Ferrara (2005), who claim that individuals that interpret problems and use cognitive skills differently might favour productivity and innovation. Furthermore, Guiso et al. (2006) argue that this effect is channelled through the values transmitted by older generations, while Gören (2014) individuates the connection between culture and economic outcomes in a series of intermediaries, among which investment behaviour, political freedom and fertility. Clearly, there are many indicators that could potentially signal for this variety in the labour force. Ottaviano and Peri (2006a) use a measure of diversity popularized by Mauro (1995), which corresponds to the probability that two randomly selected individuals belong to a different cultural group, in terms of birthplace, and it is increasing

in both the number of group and their sizes. Based on their results, and following the model in Roback (1982), they classify cultural diversity in the US as a production amenity, i.e. having a positive effects on both wages and rents. Bellini et al. (2013) replicate this exercise for 15 European countries, finding a positive correlation between diversity and productivity. The same measure is used by Trax et al. (2015), which finds that fractionalization within German plants, rather than the sole share of foreign workers, increases firms total factor productivity. Similarly, the results in Alesina et al. (2016) support a favourable effect of diversity on output in the long run. Gradstein and Justman (2019) present a formal model supporting the idea that some cultural diversity is economically valuable, in terms of efficiency and innovation, but that excessive cultural distance between individuals is counter-productive, and that the cost of excessive polarization increases with the level of economic activity. Another measures of diversity that has been found to affect economic performance is the so called polarization index, that reaches its maximum when the population splits in two equally sized groups. Ager and Brückner (2013a) compare this to the previous parameter finding opposites effects, with polarization potentially capturing the scope for conflicts among groups. Quite differently, Bove and Elia (2017) find positive effects of both measures on GDP per capita, particularly in developing countries. Rodríguez-Pose and Hardy (2015) use instead Theil entropy indexes, which are expected to be more sensitive to the distribution and variety of groups, exploiting both professed ethnicity and birthplace as diversity criteria: their evidence suggests that both measures positively correlate to entrepreneurship in England and Wales, although birthplace diversity is more relevant to knowledge-intense entrepreneurship. Finally, another interesting criterion is based on genetic diversity, which Ashraf and Galor (2013) find to have a world-wide hump-shaped effect on development, but that would also appear to be significantly related to long run economic performance in the US Ager and Brückner (2013b).

3 The model and the empirical specification

The main ingredient of the empirical model used is diversity, as the aim of the analysis is that of assessing the impact of diversity on growth. Since diversity is a key variable of all the empirical models presented in the sequel, it is worth discussing it at some lenght, and in particular in relation to total migration. As in Bove and Elia (2017), two measures of diversity will be used, fractionalization and polarization, as they

capture two distinct aspects of diversity. The former is a frequently used (as, for instance, in Ottaviano and Peri (2006b) and in Alesina et al. (2016)) measure of diversity. For country s in year t this index is defined as:

$$DI_{st} = 1 - \sum_{i=1}^{M} \left(\frac{CoB_{ist}}{TP_{st}} \right)^2 = 1 - \sum_{i=1}^{M} (share_{ist})^2 \tag{1}$$

where CoB_{ist} is the number of residents born in country i, TP_{st} is the total population of the country, and M the number of different cultural/ethnic groups that are present on the territory. The diversity (or fractionalization) index yields the probability that two individuals randomly drawn from the population of the state are born in different countries.

By some straightforward algebraic manipulations it can be seen that the Diversity index can be expressed as the sum of two components, one representing diversity *between* natives and all foreign born and the other representing differences *within* the groups of immigrants. As it happens, they both depend, in a multiplicative way, on the share of migrants over total population, which in turn implies that the correlation between the share of foreign born population and the diversity index is likely to be very high. Following the steps in Alesina et al. (2016), the index can therefore be decomposed as

$$\begin{aligned} DI_{st} &= DI_{between} + DI_{within} = \\ &= 2 * Migration_{st} * (1 - Migration_{st}) + Migration_{st}^2 * DI_{mst} \end{aligned} \tag{2}$$

where $Migration_{st}$ is the share of migrants over total population and DI_m is computed just like DI, but for the foreign born population only.

The other diversity index used in Bove and Elia (2017) is the so called polarization index, which measures the distance from a situation where the population is perfectly split in two groups (perfect polarization). Polarization can be written as:

$$POL_{st} = 4 \sum_{i=1}^{M} \left(\frac{CoB_{ist}}{TP_{st}} \right)^2 \left(1 - \frac{CoB_{ist}}{TP_{st}} \right) \tag{3}$$

where the variables have the same meaning as in (1), and the factor 4 insures that the index ranges between 0 (zero polarization, i.e. an infinte number of small groups) to 1, which stands for perfect polarization (in two distinct groups). A decomposition

similar to the one we implemented for (1) yields:

$$\begin{aligned} POL_{st} &= POL_{between} + POL_{within} = \\ &= 4 * Migration_{st} * (1 - Migration_{st})^2 + 4 * Migration_{st}^3 * POL_{mst} \end{aligned} \tag{4}$$

where $Migration_{st}$ is the share of migrants over total population and POL_m is computed just like POL, but for the foreign born population only.

Also in the case of polarization, the decomposition suggests that the correlation with the share of migrants might be very high. Indeed, in our sample the correlation of both measures of diversity is very high, as shown in table 1, panel A. The correlation between fractionalization and migration is almost 0.98, while that of polarization is about 0.85. What is also rather striking is that the correlation between the two measures of diversity, which in principle capture two opposite phenomena, is extremely high, 0.93. This should suggest that the dynamics of these two apparently diverse variable is very likely to be driven by a common factor, which the analytical decompositions stated above identify in the share of migrants.

Table 1: Correlation coefficients

Panel A	Fractionalization	Polarization	Migration
Fractionalization	1.000		
Polarization	0.934	1.000	
Migration	0.977	0.851	1.000
Panel B.	**Fractionalization$_{mig}$**	**Polarization$_{mig}$**	**Migration**
Fractionalization$_{mig}$	1.000		
Polarization$_{mig}$	-0.155	1.000	
Migration	0.036	0.011	1.000

Notes: Diversity indexes are calculated as in equations (1) and (3) on the whole population (including natives) in Panel A, and only on the subsample of migrants in Panel B. Migration is the share of foreign born for each country and year.

A confirmation of this can also be found in Panel B of table 1, illustrating the correlations between the diversity measures, computed only on the subsamples of migrants, between them and with the share of migrants. In this case, the correlations

between the two measures of diversity and the share of migrants is below 0.05 for both measures, and the correlation between fractionalization and polarization is negative and strongly statistically significant, as expected. Not surprisingly, the correlation between the diversity measures computed on the whole population, and those computed on the subsample of migrants are very low, which means that the two sets of variables tell different stories about the structure of migration across countries and time.

In view of the correlations shown in Table 2 we cannot use both migration and diversity indexes as distinct regressors in the same specification, if diversity indexes are computed on the whole population. In their work, Bove and Elia (2017) do observe that the correlation between fractionalization and polarization is very high, which motivates their using those measures separately in the regressions, but fail to observe that this correlation is most likely spurious, and do not mention the very high correlation between fractionalization and migration, as well as the high correlation between polarization and migration. Since the goal of this note is to show that migration, in and by itself, is the driver of the positive impacts on growth, well before any reference to diversity may be advanced, we will adopt the following empirical strategy. The first step of the analysis consists in running the regressions:

$$\tilde{y}_s = \alpha + y_{st_0} + \gamma_2 \tilde{DI}_s + \gamma_3 X_s + \varepsilon_s \ , \tag{5}$$

where $\tilde{y}_s$ is the average growth rate of GDP over a given time span in country s, y_{st_0} is the level of GDP at the start of the period in country s, $\tilde{DI}_s$ is the average growth rate of an index of diversity (either fractionalization or polarization) over the same time interval in country s, and X_{it} is a vector of variables thought to affect GDP growth, all taken at the beginning of the reference period. Control variables will be mentioned in the section about data, along with their main statistics.

The second, and key step, in the analysis, will consist in running the following regressions:

$$\tilde{y}_s = \alpha + y_{st_0} + \gamma_1 \tilde{Mig}_s + \gamma_3 X_s + \varepsilon_s \ , \tag{6}$$

where $\tilde{DI}_{ms}$ is replaced by $\tilde{Mig}_s$, i.e. by the rate of growth in the share of migrants over the specified time period in country s, and all the other variables are the same

as in the previous specifications.

Finally, the main regressions of our empirical analysis will be a combination of (5) and (6), and take the form:

$$\tilde{y}_s = \alpha + y_{st_0} + \gamma_1 Mig_s + \gamma_2 \tilde{DI}_{ms} + \gamma_3 X_s + \varepsilon_s \ , \tag{7}$$

where both the growth rate in the share of migrants, $\tilde{Mig}_s$, and the growth rate in the diversity index (either fractionalization or polarization) $\tilde{DI}_{ms}$ are included, but the diversity indexes are computed on the subsample of migrants, only; all the other variables and controls are the same as in the previous specifications. This is the main specification in the empirical analysis, as it will allow to disentangle the effect of migration from that of pure diversity.

Recognizing the potential endogeneity of migration and the related diversity measures, and following Bove and Elia (2017), equations (5) - (7) have also been estimated by a two stage, instrumental variable, procedure. In particular, building on the work by Docquier, Lodigiani, Rapoport, and Schiff (2015) and taking advantage of the bilateral nature of the dataset on migration, a gravity model is estimated and used to predict countries bilateral migration stocks by a set of exogenous bilateral variables. We then use the bilateral predicted immigration stocks to construct indices of fractionalization and polarization; finally, these gravity-based predicted diversity indices are used as instruments for birthplace diversity (fractionalization and polarization). The gravity model of bilateral migration stocks has been implemented by pooling data relative to the complete time span (1960 to 2010), and the exogenous variables used as intruments are: a dummy for contiguous states; dummy variables for a colonial relationship, for a common colonizer, for a common language, or for belonging to the same country in the past; the log of the country of origin's population and the capital-to-capital distance. Also, as in Docquier et al. (2015) interactions between geographic distance and time dummies are also used as instruments, capturing changes in impediments to migration, as well as interactions between country of origin and destination and time dummies.

4 Data

The dataset employed in the analysis includes variables from different sources, covering a time span of several decades, 1960-2010. Table 2 illustrates the main descriptives of the variables used in the amalysis.

Table 2: Descriptive Statistics.

Variable	Observations	Mean	Standard Deviation	Min	Max
Fractionalization	1060	.103	.13	0	.851
Fractionalization, only migrants	1060	.705	.208	.006	.971
Polarization	1060	.172	.175	0	.755
Polarization, only migrants	1060	.532	.189	.011	.964
Share of Migrants	1061	.059	.088	0	.966
Per capita GDP	922	8.287	1.279	5.193	11.376
Schooling	828	1.7	.622	.013	2.669
Investments (% GDP)	922	2.99	.599	.361	4.539
Openness (% GDP)	922	4.025	.739	.651	6.014
Govt consumption (% GDP)	922	2.274	.658	-1.129	4.186
Population growth rate	884	1.826	1.25	-1.281	9.847
Ethnic inequality	1007	.43	.256	0	.966
Latin American countries	1061	.175	.38	0	1
Sub-Saharan countries	1061	.259	.438	0	1
Developed countries	1061	.158	.365	0	1

Notes: Fractionalization and polarization are computed according to equations (1) and (3), on the whole sample and on the subsample of migrants, for all countries and periods for which migration is positive. All continuous variables are expressed in logs, except for growth rates and for the index of ethnic inequality. The last three variables are indicator variables, taking value one if the country belongs to the corresponding group of countries.

Data on migration are taken from the World Bank, and integration thereof. The number of countries covered by the data is quite large, 135, mostly developing, according to the definition of the World Bank. Data on GDP, population, investment share, government consumption share, trade to GDP ratio come from the Penn World Tables, version 7.1.7. Data on human capital, and notably the average years of school attainment, are drawn from the Barro and Lee dataset. The ethnic inequality index comes from Alesina et al (2016). More specific details on thedatasets and variables used in the empirical analyses can be found in the data section of Bove and Elia (2017), to which we refer the interested reader. Infact, the main descriptives are

almost identical to the ones in Table 1 in Bove and Elia (2017), with the addition of fractionalization and polarization computed only on the subset of migrant population. It is interesting to notice that both fractionalization and polarization, when computed on the subsample of migrants, are much larger in mean, and that their relative ranking is reversed. Also, variability in the two indexes, as expressed by the coefficient of variation, is much lower when those measures are computed on the subsample of migrants, only.

5 Results

Empirical results are presented in Tables 3 - 10.

Table 3: Growth and Diversity - OLS results.

	60-10	70-10	80-10	90-10	00-10
Fractionalization	0.148***	0.111**	0.129***	0.058*	-0.043*
	(0.046)	(0.043)	(0.040)	(0.034)	(0.025)
per capita GDP, t_0	-1.133***	-0.960***	-0.971***	-0.723***	-1.202***
	(0.173)	(0.140)	(0.158)	(0.202)	(0.197)
Population growth rate	-0.376**	-0.197	-0.281*	-0.258*	-0.508**
	(0.181)	(0.150)	(0.153)	(0.146)	(0.221)
Investments (% GDP)	0.550***	0.386*	0.132	0.516*	0.602
	(0.152)	(0.231)	(0.279)	(0.311)	(0.436)
Schooling	0.888***	0.938***	1.035***	0.452	0.843
	(0.292)	(0.285)	(0.376)	(0.509)	(0.637)
Openness (% GDP)	0.185	0.151	0.033	-0.089	-0.234
	(0.154)	(0.157)	(0.203)	(0.226)	(0.426)
Gov't Consumption (% GDP)	0.118	0.081	0.116	0.296	0.071
	(0.124)	(0.192)	(0.223)	(0.319)	(0.428)
Ethnic inequality	-0.954*	-0.852	-1.043*	-0.766	1.027
	(0.546)	(0.588)	(0.626)	(0.619)	(0.819)
Latin American countries	-0.562**	-0.624**	-0.751***	-0.108	-0.817*
	(0.246)	(0.255)	(0.286)	(0.373)	(0.458)
Sub-Saharan countries	-1.616***	-1.713***	-1.582***	-1.656***	-2.248***
	(0.295)	(0.350)	(0.401)	(0.420)	(0.561)
Constant	8.951***	7.572***	8.499***	6.380***	11.229***
	(1.235)	(1.175)	(1.443)	(1.909)	(2.162)
Observations	95	118	118	127	135
R^2	0.606	0.503	0.453	0.307	0.372

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

Table 4: Growth and Diversity - OLS results.

	60-10	70-10	80-10	90-10	00-10
Polarization	0.152***	0.112**	0.130***	0.059*	-0.045*
	(0.047)	(0.044)	(0.041)	(0.034)	(0.025)
per capita GDP, t_0	-1.120***	-0.942***	-0.950***	-0.712***	-1.215***
	(0.173)	(0.139)	(0.158)	(0.201)	(0.196)
Population growth rate	-0.391**	-0.193	-0.271*	-0.248*	-0.517**
	(0.176)	(0.149)	(0.151)	(0.146)	(0.217)
Investments (% GDP)	0.548***	0.383	0.124	0.517*	0.602
	(0.153)	(0.232)	(0.278)	(0.310)	(0.434)
Schooling	0.873***	0.932***	1.033***	0.455	0.848
	(0.292)	(0.286)	(0.376)	(0.508)	(0.635)
Openness (% GDP)	0.194	0.156	0.042	-0.085	-0.242
	(0.155)	(0.158)	(0.204)	(0.226)	(0.425)
Gov't Consumption (% GDP)	0.115	0.073	0.106	0.294	0.075
	(0.123)	(0.193)	(0.222)	(0.318)	(0.427)
Ethnic inequality	-0.930*	-0.851	-1.040*	-0.764	1.027
	(0.547)	(0.589)	(0.626)	(0.620)	(0.817)
Latin American countries	-0.577**	-0.643**	-0.776***	-0.116	-0.806*
	(0.245)	(0.255)	(0.284)	(0.374)	(0.459)
Sub-Saharan countries	-1.617***	-1.720***	-1.588***	-1.658***	-2.248***
	(0.294)	(0.350)	(0.401)	(0.420)	(0.562)
Constant	8.883***	7.455***	8.338***	6.261***	11.348***
	(1.240)	(1.179)	(1.452)	(1.900)	(2.150)
Observations	95	118	118	127	135
R^2	0.606	0.501	0.452	0.307	0.372

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

Table 3 and Table 4 almost exactly replicate Table 3, Panels A and B, in Bove and Elia (2017), with minor differences due to small differences in data (periodic data revisions) and to data trimming. A cursory inspection of these tables reveals a somewhat striking result. In fact, although fractionalization and polarization tell in principle two very different stories, their impact on growth is strikingly similar, as revealed by the corresponding coefficients' estimates. From expressions (1) and (3) we know that when fractionalization is large, polarization is small, and vice versa, as a large number of small migrant communities increase diversity, and decrease polarization. It is thus peculiar that the coefficients attached to the corresponding variables are extremely similar in both absolute value and statistical signinficance,

which begs an explanation.

Table 5: Growth and Diversity - OLS results.

	60-10	70-10	80-10	90-10	00-10
Share of migrants	0.146***	0.111***	0.127***	0.059*	-0.041*
	(0.045)	(0.042)	(0.039)	(0.033)	(0.024)
per capita GDP, t_0	-1.139***	-0.967***	-0.981***	-0.731***	-1.197***
	(0.173)	(0.141)	(0.158)	(0.202)	(0.198)
Population growth rate	-0.373**	-0.202	-0.288*	-0.261*	-0.503**
	(0.184)	(0.151)	(0.154)	(0.147)	(0.223)
Investments (% GDP)	0.551***	0.388*	0.134	0.517*	0.596
	(0.152)	(0.231)	(0.280)	(0.312)	(0.436)
Schooling	0.896***	0.942***	1.040***	0.460	0.835
	(0.292)	(0.285)	(0.376)	(0.508)	(0.639)
Openness (% GDP)	0.182	0.148	0.028	-0.091	-0.227
	(0.154)	(0.157)	(0.203)	(0.226)	(0.427)
Gov't Consumption (% GDP)	0.118	0.083	0.119	0.296	0.070
	(0.124)	(0.192)	(0.223)	(0.318)	(0.428)
Ethnic inequality	-0.960*	-0.849	-1.038	-0.754	1.015
	(0.544)	(0.588)	(0.626)	(0.619)	(0.820)
Latin American countries	-0.559**	-0.618**	-0.745**	-0.098	-0.821*
	(0.246)	(0.255)	(0.286)	(0.373)	(0.458)
Sub-Saharan countries	-1.616***	-1.708***	-1.577***	-1.652***	-2.251***
	(0.295)	(0.350)	(0.401)	(0.420)	(0.561)
Constant	8.993***	7.628***	8.579***	6.422***	11.194***
	(1.232)	(1.174)	(1.440)	(1.913)	(2.171)
Observations	95	118	118	127	135
R^2	0.607	0.504	0.453	0.308	0.370

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

The reason for this apparent puzzle is to be found in the high correlations (displayed in Table 2) between the two variables, when they are computed on the whole population, and between the two diversity variables and the variable expressing the share of migrants.

As a further confirmation, Table 5 above contains results for the same regression, in which fractionalization and polarization have been replaced by the share of migrants. As expected, the estimated coefficients of the variable "share of migrants" are extremely close, in value and statistical significance, to both the coefficients of fractionalization and of polarization in Table 3 and 4, for all time periods, revealing

that the common factor driving those results is, indeed, the share of migrant population over total population. Needless to say, the same share of migrants is, a priori, compatible with many different values for both fractionalization and polarization. We can conclude, therefore, that the positive effects on growth previously ascribed to diversity and polarization should, in fact, be imputed to the share of migrant population.

Nevertheless, the additional relevant question is whether or not fractionalization and polarization do retain some explanatory power for economic growth, over and above the explanatory power possessed by the share of migrants. In other words: is migration sufficient to bring about some positive effects on growth, or should it be accompanied by diversity, in order to exert its beneficial effects? To help shed some light on this, a plausible empirical strategy is to disentangle the two factors making up fractionalization and polarization, as per equations (2) and (4).

To evaluate the effects of both migration and diversity on growth we resort to an alternative identification strategy, in the spirit of Alesina et al. (2016), whereby we use as independent variables both the share of foreign born and, alternatively, fractionalization and polarization calculated for the migrant population only (DI_{ms} and POL_{ms}, as in equation (7).

The estimation results for the two regressions are presented in Tables 6 and 7. In both OLS regressions, the variable "share of migrants" displays coefficients which are very close to those in Table 5, and even closer to those in Table 3 for fractionalization and polarization, in Bove and Elia (2017). Importantly, fractionalization, computed on migrants only, features positive coefficients, which are sizeable for the periods 1970-2010 and 1980-2010, and statistically significant only in the latter.

Tables 6 and 7 provide a confirmation, albeit weak, of the results on fractionalization in Bove and Elia (2017), as it appears that diversity, as measured by fractionalization, does exert a positive effect on economic growth. In particular, for the two central time spells, the growth rate of per capita GDP increases by about 0.08 percent as fractionalization increases by one unit. On the other hand, polarization does not appear to exert any effect whatsoever on growth, as the corresponding estimated coefficients are extremely low, and not statistically significant.

Table 6: Growth and Diversity - OLS results.

	60-10	70-10	80-10	90-10	00-10
Share of migrants	0.149***	0.113***	0.135***	0.059*	-0.042*
	(0.048)	(0.041)	(0.039)	(0.034)	(0.025)
Fractionalization, only migrants	0.020	0.083	0.087**	0.004	-0.007
	(0.042)	(0.067)	(0.044)	(0.025)	(0.022)
per capita GDP, t_0	-1.130***	-0.925***	-0.955***	-0.730***	-1.197***
	(0.176)	(0.141)	(0.163)	(0.203)	(0.199)
Population growth rate	-0.368*	-0.180	-0.249	-0.259*	-0.509**
	(0.188)	(0.152)	(0.158)	(0.147)	(0.227)
Investments (% GDP)	0.550***	0.378	0.134	0.514*	0.607
	(0.153)	(0.232)	(0.282)	(0.310)	(0.444)
Schooling	0.894***	0.932***	1.042***	0.466	0.813
	(0.295)	(0.288)	(0.376)	(0.514)	(0.648)
Openness (% GDP)	0.190	0.155	0.032	-0.088	-0.239
	(0.156)	(0.152)	(0.200)	(0.230)	(0.432)
Gov't Consumption (% GDP)	0.122	0.116	0.162	0.297	0.066
	(0.125)	(0.202)	(0.228)	(0.321)	(0.432)
Ethnic inequality	-0.967*	-0.804	-1.019	-0.752	1.005
	(0.548)	(0.584)	(0.625)	(0.622)	(0.820)
Latin American countries	-0.540**	-0.566**	-0.707**	-0.096	-0.826*
	(0.252)	(0.264)	(0.292)	(0.378)	(0.460)
Sub-Saharan countries	-1.590***	-1.625***	-1.526***	-1.647***	-2.260***
	(0.300)	(0.359)	(0.396)	(0.423)	(0.563)
Constant	8.868***	7.117***	8.136***	6.397***	11.276***
	(1.322)	(1.252)	(1.557)	(1.982)	(2.188)
Observations	95	118	118	127	135
R^2	0.607	0.510	0.463	0.308	0.370

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

Table 7: Growth and Diversity - OLS results.

	60-10	70-10	80-10	90-10	00-10
Share of migrants	0.146***	0.110***	0.127***	0.059*	-0.040
	(0.046)	(0.042)	(0.039)	(0.033)	(0.024)
Polarization, only migrants	0.013	-0.011	0.007	0.007	0.021
	(0.057)	(0.069)	(0.077)	(0.050)	(0.035)
per capita GDP, t_0	-1.130***	-0.973***	-0.977***	-0.726***	-1.178***
	(0.189)	(0.156)	(0.168)	(0.215)	(0.199)
Population growth rate	-0.376**	-0.200	-0.290*	-0.261*	-0.506**
	(0.185)	(0.152)	(0.157)	(0.147)	(0.222)
Investments (% GDP)	0.548***	0.388*	0.135	0.516	0.570
	(0.151)	(0.232)	(0.280)	(0.314)	(0.445)
Schooling	0.895***	0.943***	1.038***	0.461	0.834
	(0.295)	(0.287)	(0.377)	(0.510)	(0.642)
Openness (% GDP)	0.187	0.148	0.027	-0.090	-0.207
	(0.161)	(0.158)	(0.203)	(0.227)	(0.433)
Gov't Consumption (% GDP)	0.120	0.081	0.123	0.298	0.081
	(0.126)	(0.196)	(0.226)	(0.319)	(0.438)
Ethnic inequality	-0.949*	-0.855	-1.034	-0.745	1.067
	(0.550)	(0.597)	(0.635)	(0.637)	(0.809)
Latin American countries	-0.562**	-0.614**	-0.747**	-0.099	-0.828*
	(0.250)	(0.263)	(0.292)	(0.374)	(0.458)
Sub-Saharan countries	-1.613***	-1.707***	-1.579***	-1.654***	-2.266***
	(0.296)	(0.350)	(0.399)	(0.418)	(0.567)
Constant	8.918***	7.682***	8.548***	6.373***	10.975***
	(1.410)	(1.267)	(1.516)	(2.004)	(2.241)
Observations	95	118	118	127	135
R^2	0.607	0.504	0.453	0.308	0.372

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

To interpret these results, it is probably important to remember that the level of aggregation of the analysis is the entire country, which makes the interpretation of fractionalization rather difficult. In fact, it may be the case that even though, at the country level, fractionalization is high, as many conspicuous communities of different geographic origin coexist, at a more geographically disaggregated level (region, province, city, village) the situation might be completely different, and even feature high polarization. If that was the case, and fractionalization was the kind of diversity that fosters growth, as suggested in much of the literature, our econometric analysis might not detect the corresponding effect, as fractionalization would in fact be hiding

a smaller or greater amount of polarization.

As a further robustness check, Tables 8 - 10 display the results the same analysis as the one contained in tables 4 - 6, but using instruments, to account for the potentially endogenous variables fractionalization, polarization and the share of migrants.

Table 8: Growth and Diversity - 2SLS results.

	60-10	70-10	80-10	90-10	00-10
Fractionalization	0.213***	0.270***	0.268***	0.149	0.030
	(0.079)	(0.088)	(0.093)	(0.158)	(0.145)
per capita GDP, t_0	-1.219***	-1.109***	-1.034***	-0.739***	-1.274***
	(0.171)	(0.160)	(0.162)	(0.194)	(0.220)
Population growth rate	-0.385**	-0.147	-0.254	-0.251	-0.604**
	(0.196)	(0.185)	(0.172)	(0.158)	(0.241)
Investments (% GDP)	0.546***	0.365*	0.099	0.423	0.475
	(0.145)	(0.219)	(0.270)	(0.303)	(0.470)
Schooling	0.926***	0.976***	0.987**	0.340	0.605
	(0.281)	(0.313)	(0.397)	(0.561)	(0.797)
Openness (% GDP)	0.229	0.139	0.026	-0.086	-0.164
	(0.140)	(0.143)	(0.203)	(0.223)	(0.393)
Gov't Consumption (% GDP)	0.126	0.043	0.122	0.336	0.068
	(0.114)	(0.192)	(0.222)	(0.313)	(0.404)
Ethnic inequality	-0.861	-0.824	-1.093*	-0.758	0.788
	(0.544)	(0.614)	(0.643)	(0.610)	(0.857)
Latin American countries	-0.469*	-0.459	-0.536	-0.022	-0.765*
	(0.261)	(0.289)	(0.335)	(0.382)	(0.438)
Sub-Saharan countries	-1.618***	-1.683***	-1.437***	-1.573***	-2.226***
	(0.289)	(0.357)	(0.404)	(0.404)	(0.561)
Constant	9.362***	8.714***	8.966***	6.695***	12.445***
	(1.198)	(1.250)	(1.461)	(1.840)	(3.517)
Observations	95	118	118	127	135
R^2	0.592	0.420	0.374	0.258	0.328

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

Table 9: Growth and Diversity - 2SLS results.

	60-10	70-10	80-10	90-10	00-10
Polarization	0.225***	0.282***	0.276***	0.155	0.032
	(0.083)	(0.091)	(0.096)	(0.162)	(0.149)
per capita GDP, t_0	-1.208***	-1.076***	-0.990***	-0.709***	-1.266***
	(0.169)	(0.158)	(0.161)	(0.194)	(0.200)
Population growth rate	-0.408**	-0.132	-0.233	-0.225	-0.598***
	(0.190)	(0.185)	(0.171)	(0.167)	(0.230)
Investments (% GDP)	0.543***	0.354	0.081	0.421	0.473
	(0.146)	(0.221)	(0.270)	(0.305)	(0.471)
Schooling	0.907***	0.966***	0.980**	0.342	0.599
	(0.281)	(0.316)	(0.398)	(0.556)	(0.807)
Openness (% GDP)	0.245*	0.152	0.045	-0.076	-0.158
	(0.140)	(0.144)	(0.206)	(0.223)	(0.393)
Gov't Consumption (% GDP)	0.123	0.020	0.102	0.332	0.065
	(0.113)	(0.193)	(0.220)	(0.311)	(0.408)
Ethnic inequality	-0.818	-0.820	-1.088*	-0.754	0.786
	(0.551)	(0.620)	(0.647)	(0.614)	(0.857)
Latin American countries	-0.484*	-0.495*	-0.579*	-0.037	-0.773*
	(0.258)	(0.290)	(0.330)	(0.378)	(0.439)
Sub-Saharan countries	-1.620***	-1.700***	-1.443***	-1.575***	-2.225***
	(0.289)	(0.359)	(0.407)	(0.406)	(0.562)
Constant	9.298***	8.501***	8.641***	6.398***	12.372***
	(1.199)	(1.254)	(1.468)	(1.809)	(3.201)
Observations	95	118	118	127	135
R^2	0.590	0.411	0.368	0.253	0.326

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

Table 10: Growth and Diversity - 2SLS results.

	60-10	70-10	80-10	90-10	00-10
Share of migrants	0.207***	0.265***	0.265***	0.153	0.030
	(0.077)	(0.087)	(0.093)	(0.162)	(0.148)
per capita GDP, t_0	-1.225***	-1.125***	-1.054***	-0.758***	-1.280***
	(0.172)	(0.161)	(0.163)	(0.197)	(0.236)
Population growth rate	-0.381*	-0.158	-0.270	-0.260*	-0.610**
	(0.199)	(0.186)	(0.175)	(0.158)	(0.259)
Investments (% GDP)	0.548***	0.370*	0.104	0.423	0.476
	(0.144)	(0.218)	(0.270)	(0.304)	(0.469)
Schooling	0.936***	0.986***	0.995**	0.357	0.604
	(0.281)	(0.313)	(0.398)	(0.557)	(0.804)
Openness (% GDP)	0.223	0.133	0.015	-0.090	-0.167
	(0.139)	(0.142)	(0.202)	(0.224)	(0.395)
Gov't Consumption (% GDP)	0.126	0.048	0.128	0.337	0.068
	(0.114)	(0.191)	(0.223)	(0.314)	(0.404)
Ethnic inequality	-0.872	-0.817	-1.082*	-0.727	0.790
	(0.541)	(0.612)	(0.642)	(0.614)	(0.854)
Latin American countries	-0.468*	-0.449	-0.520	0.006	-0.761*
	(0.261)	(0.289)	(0.337)	(0.393)	(0.439)
Sub-Saharan countries	-1.618***	-1.674***	-1.426***	-1.562***	-2.222***
	(0.289)	(0.357)	(0.404)	(0.408)	(0.559)
Constant	9.408***	8.830***	9.135***	6.812***	12.507***
	(1.198)	(1.255)	(1.465)	(1.871)	(3.779)
Observations	95	118	118	127	135
R^2	0.594	0.422	0.373	0.253	0.328

$*p < 0.10, **p < 0.05, ***p < 0.01$. Huber-White robust standard errors in parentheses.
Columns report regressions' coefficients for 5 consecutive time spells, as indicated in the headings.
Growth rates of GDP, migrants' share and diversity indexes are average over periods.

The instruments used in the two-stage regressions have been obtained by adopting the same strategy as in Bove and Elia (2017), to which we refer the reader for more details. In a nutshell, the procedure consists in modelling bilateral migration by a gravity model, based on presumably exogenous variables, and then using the predictions of bilateral migration flows to compute instruments for the share of migrants, fractionalization and polarization. Two stage OLS regressions have then been performed by using such instruments for the share of migrants, fractionalization and polarization. Tables 8 - 10 confirm the intuition we got from the previous OLS regressions, illustrated in Tables 3-5, in that the coefficients attached to the share of migrants variable are extremely close to those of either fractionalization and polariza-

tion, which are themselves very close to each other. Instrumenting for both the share of migrants and fractionalization or polarization[1] does not yield interesting results, as both sets of variables lose statistical significance with respect to two stage regressions only including the share of migrants, and both fractionalization and polarization never turn out to significantly affect the rates of GDP growth over the various time intervals. Two stage least squares regressions, therefore, confirm that what is really relevant in terms of growth is migration itself, and that diversity does not appear to be influential, at least at this level of geographical aggregation.

6 Conclusions

In a recent paper in this Journal, Bove and Elia (2017) presented some important results linking diversity, in the form of both fractionalization and polarization, to economic growth. Unfortunately, most of these findings are seriously impaired by a very large correlation between both measures of diversity and the share of migrants over total population. This correlation has at least two important consequences: 1) the effect of diversity on growth is originated by migration itself, independently of whether migration is accompanied by a higher or lower degree of fractionalization or polarization, and 2) fractionalization and polarization exert almost the same effect on economic growth, which is definitely unexpected, in as much as the two forms of diversity represent very different, if not opposite, features of migration.

By extending to polarization an analytical decomposition illustrated by Alesina et al. (2016) for fractionalization, this note shows why we should expect such a large correlation between fractionalization, polarization and the share of migrants. Moreover, by replicating the results in Bove and Elia (2017) it also clearly shows that the impact on growth previously ascribed to diversity should just be imputed to the share of migrants over total population, without necessary reference to its feature in terms of fractionalization or polarization.

To disentangle the effect of diversity from that of migration itself, fractionalization and polarization are computed on the population of migrants only, which eliminates the correlation with migration, and those measures are alternatively used as regressors in addition to the share of migrants over total population. Regressions' results confirm a (weak) impact of fractionalization on growth, but totally disprove any link between polarization and growth. In view of these results, it seems reasonable to

[1] Results not included for brevity, but available on request from the author.

conjecture that less (geographically) aggregated data should be used to assess the impact of diversity on economic growth, and especially to evaluate the relative impact of fractionalization and polarization, which should constitute the focus of further empirical research.

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