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Explaining fiscal decentralization and the role of ethnic Diversity

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Abstract

This paper considers the causes of fiscal decentralization with a specific focus on the role of ethnic diversity. To do so, I employ an instrument for ethnic diversity based on the origin of anatomically modern human life. Using two measures of decentralization that capture decision making autonomy and accounting for the depth of divisions between ethno-linguistic groups using the structure of language trees, I find that ethnic diversity has a positive effect on the degree of decentralization. It is the amount of fractionalization towards the leaves of the trees, where groups are more numerous and less distinct, that drive decentralization.

KEYWORDS
ethno-linguistic diversity, fractionalization, instrumental variable

JEL CLASSIFICATION
H110; H710; H770; Z10

1 | INTRODUCTION

Decentralization has been linked to numerous economic outcomes. For instance, a higher degree of fiscal decentralization is associated with less corruption (Fisman & Gatti, 2002), a smaller informal sector (Teobaldelli, 2010) and a more efficient provision of public goods (Escaleras & Register, 2010; Faguet, 2004). More decentralization has been shown to reduce the effectiveness of aid (Lessmann & Markwardt, 2016) and to lower the rate of inflation (Baskaran, 2012; Neyapti, 2004). Across countries, we observe very different levels of decentralization and there is a small portion of literature that seeks to address how this variation has come about. Moreover, given the

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variety of outcomes decentralization is associated with, it is critical to understand how countries have become relatively more decentralized than others.

The overarching objective of this paper is to explore the determinants of fiscal decentralization with a specific focus on the role of ethno-linguistic fractionalization. The relationship has been covered in the literature and has been shown to be positively linked to decentralization, and has also been shown to affect a wide variety of economic and political outcomes. These types of fractionalization measure were first introduced by Easterly and Levine (1997), who show the negative consequences of ethnic fractionalization on development, which has since been confirmed by Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg (2003), Desmet, Ortuño-Ortín, and Wacziarg (2012), Ashraf and Galor (2013b), Duch (2014) and Papyrakis and Mo (2014). Additionally, others demonstrate how internal fractionalization can increase the risk of the onset of violent civil conflict (Desmet et al., 2012; Fearon & Laitin, 2003; Montalvo & Reynal-Querol, 2005).

The contribution of this paper lies in the treatment of fractionalization as an endogenous variable. The previous work assumes fractionalization as exogenous, however, this assumption is being challenged in recent work (Casey & Owen, 2014; Darity, Mason, & Stewart, 2006). As most migration occurs into those countries with higher levels of economic and institutional development, both positively associated with decentralization, it implies that OLS coefficients will be downwardly biased (Freeman, 2006). Reverse causality and omitted variables are also likely a source of endogeneity in terms of decentralization. In light of these concerns, I treat diversity as endogenous to decentralization. I follow the previous work by Ahlerup and Olsson (2012) on the historical determinants of fractionalization, which identifies a suitable instrument for examining the role ethno-linguistic heterogeneity.[1] Specifically, I use the origin of anatomically modern human life in each country as an instrument for ethno-linguistic diversity. This follows from the premise that a longer settlement duration breeds more ethnic heterogeneity. In terms of data on fractionalization, I use the Desmet et al. (2012) measures that account for the depth of divisions between ethno-linguistic groups. This allows for a distinction in the depth of the divisions between groups in the analysis and is also new to the decentralization literature. To capture the degree of decentralization I employ data produced by Hooghe et al. (2016), the Regional Authority Index (RAI). These data are not new (Hooghe et al., 2016; Niedzwiecki, Osterkatz, Hooghe, & Marks, 2018), although this paper seeks to explain the variation in two particular components of the RAI that capture a truer degree of fiscal decentralization than the traditional measures.

This paper finds that there is a positive causal relationship between the level of ethno-linguistic fractionalization and the degree of decentralization. More specifically, it is the amount of fractionalization where there are more groups, which are less distinctly defined, that drive the decentralizing of fiscal authority. These are the groups that are formed from the legacy of colonialism and uninterrupted human settlement. Whereas, the perennial groups, where cleavages are at their deepest, bear no impact on the degree of decentralization. Crucially, when treating fractionalization as an endogenous variable in the appropriate manner, the relationship persists.

The rest of this paper is organized as follows. The proceeding section presents and discusses the theoretical determinants of decentralization that have been used in the previous literature. Section 3 describes the data and presents the empirical strategy. Section 4 presents the results of the empirical analysis. Section 5 presents a number of robustness checks on the results and Section 6 concludes.

2 | THEORETICAL CONSIDERATIONS

2.1 | Ethno-linguistic heterogeneity

The primary focus of this paper is the role of ethno-linguistic diversity, which has a strong theoretical grounding with respect to decentralization—first introduced into the decentralization theorem by Oates (1972). There are at

[1]There are other seminal works on the origins of ethno-linguistic diversity (see, e.g., Michalopoulos (2012) and Ashraf and Galor (2013a)).

least two such reasons exist that warrant ethno-linguistic diversity's inclusion into a model that explains the degree of decentralization. The first focuses on economic efficiency. As different ethnic groups show heterogeneity in their preferences for public good provision it is expected that more fractionalized countries will therefore tend to be relatively more decentralized to provide different public goods regionally (Oates, 1972; Treisman, 2006). This relies on the idea that local governments are better placed to get constituents to reveal such preference heterogeneity (Tanzi, 2000). The example used in the literature to illustrate this channel is the decentralization of education policy. If the setting of this policy is decentralized to the sub-national level, then different ethnic groups can set the syllabi and financing in-line with their preferences.

The second reason is for political inclusivity. Decentralization can be used as a policy to integrate minorities into society. In particular if the central government decides to decentralize authority over issues of contention it will help to restrain communal violence, ethnic tensions or even civil war organized along ethnic lines (Sambanis & Milanovic, 2014; Treisman, 2006). By doing so, decentralizing authority will involve minorities into the policy making process to create and set decentralized policies. This falls in accordance with Alesina and Ferrara (2005), who argue that the implications of an ever increasingly fractionalized country fall partly on the local authorities to implement policies that increase racial integration.

This theoretical link between diversity and decentralization has been empirically tested since the original contribution by Oates (1972). Despite the lack of evidence of a relationship between sub-national expenditure or revenue shares and diversity in Letelier (2005) and Canavire-Bacarreza, Martinez-Vazquez, and Yedgenov (2017), others have found that higher levels of diversity are associated with more sub-national expenditure (Dreher, Gehring, Kotsogiannis, & Marchesi, 2018; Panizza, 1999). Arzaghi and Henderson (2005), however, find mixed results in that ethno-linguistic diversity increases the probability of having federal constitution, de facto more decentralized, but also that diversity spawns a centralization of government expenditure, which is contrary with Panizza (1999). This paper departs from this existing literature that takes a two-dimensional approach to diversity. I consider a more modern set of fractionalization measures that captures the depth of divisions between ethno-linguistic groups derived by Desmet et al. (2012). This allows for a historical dimension in the analysis. Also, two measures of sub-national government taxing and borrowing ability (that better capture decision making autonomy than traditional measures) are employed as measures of decentralization. These are both discussed in detail in the data section. Furthermore, the existing literature on decentralization considers diversity as an exogenous variable but recent studies have begun to challenge this assumption (see, e.g. Casey & Owen, 2014). This paper treats diversity as endogenous to decentralization and accounts for this in the empirical analysis.

2.2 | Other determinants of decentralization

The first key determinant is the level of income. Much of the empirical literature has found a positive relationship between income and decentralization (Arzaghi & Henderson, 2005; Bodman & Hodge, 2010; Garrett & Rodden, 2003; Letelier, 2005; Oates, 1972; Panizza, 1999; Sambanis & Milanovic, 2014). This follows that decentralization is perceived to be a superior good and demand therefore increases with the level of income (Tanzi, 2000). As individuals become richer, more educated and have more free time, they may also have more motivation to participate in making local policy decisions, so more autonomy is demanded.

Larger countries should also be relatively more decentralized (Bodman & Hodge, 2010; Canavire-Bacarreza et al., 2017; Dreher et al., 2018; Garrett & Rodden, 2003). As the country size increases, the cost of governing from the center increases. The dis-economy of scale of governance increases with country size when governing from the center only. In a large but decentralized nation there will exist decreasing per capita cost of public goods and economies of scale in taxation beyond a certain level. With a larger country surface area, the difficulty of satisfying a diverse population is particularly costly and can result in secession or civil conflict (Alesina & Spolaore, 1997; Oates, 1972). Implicit in this, is the idea that there are clear efficiency gains to make from decentralizing authority in larger nations.

A less straight forward determinant is the amount of natural resources. Sambanis and Milanovic (2014) show that, on a regional-level, areas with a greater share of natural resources in regional GDP should demand more autonomy to control the natural resources in their jurisdiction. However, on a country-level, it is possible that countries with a greater endowment of natural resources will tend to be more centralized as central policy makers will seek to gain from the externalities of consumption and production, whereas the costs are born locally (Dreher et al., 2018).

The quality of democracy has been shown to go hand-in-hand with decentralization (Alesina & Spolaore, 1997; Arzaghi & Henderson, 2005; Garrett & Rodden, 2003; Treisman, 2006). Central governments may wish to create strong sub-national governments to involve the citizens in policy making rather than exploiting their agenda-setting power. Stronger lower tier governments also act as a check on the central government from being abusive. The fall of autocratic regimes and creation of better political institutions was quickly followed a dispersion of power and drive toward the provision of local rights. Examples here include the fall of Franco in Spain and the Communist party in the Soviet Union.

The system of governance may also effect the degree of decentralization. Presidential regimes are often associated with smaller governments relative to parliamentary ones (Persson & Tabellini, 2003). Thus, parliamentary regimes may be more decentralized in order to effectively allocate the budget across the different layers of government.

There are a number of other drivers of decentralization. First, as discussed by Gorodnichenko and Roland (2015), historical disease prevalence should have a centralizing effect on the government due to the negative externalities from disease transmission. Thus, a country with a more repeated history of disease should be more centralized.

Globalization potentially impacts the fiscal system. On one hand, Alesina and Spolaore (1997) and Bolton and Roland (1997) argue that decentralization is likely to occur on the way to secession because of globalization. Whereas, Garrett and Rodden (2003) show empirically that globalization has a centralizing effect. One reason why one may expect to find a centralizing effect in more globalized countries is because these countries will need to concentrate export and import taxes at the central government level. Taxing global trade at the local level is not feasible (Bodman & Hodge, 2010; Letelier, 2005).

Population heterogeneity in terms of the demographic structure may also drive decentralization. The share of the elderly in a country goes beyond what ethnic diversity captures. That is, it captures public good and service preference heterogeneity between age groups. Consistent with this logic, the population living in more variable land areas may also have different preferences.

More tiers of governance may be associated with more decentralization. However, with more tiers of government real decision making authority may actually be diluted. This is especially interesting to examine with the decentralization measures used in this paper.

Lastly, inequality may also have an effect. As Sambanis and Milanovic (2014) argues high inequality will hinder collective action in pursuit of regional autonomy. It would ultimately undermine social cohesion and therefore have a centralizing effect. Moreover, fiscal redistribution in a highly unequal country may be more difficult in highly decentralized systems.

3 | DATA AND METHODS

3.1 | Data

I use two different measures of decentralization as dependent variables. These are taken from the RAI derived by Hooghe et al. (2016). This dataset contains information on 81 countries over the period 1950–2010.[2] There is a mix of developed and developing nations with different systems of governance, democratic rights and levels of income. The full list of countries contained in the sample is found in Table S1 and the spatial distribution in Figures S1 and

[2]Three countries are dropped due to data availability for independent variables.

S2. This paper focuses on two particular aspects of decentralization, that is, the degree of fiscal and borrowing autonomy, which are components of the RAI. The former, denoted 'FISC', represents the extent to which a sub-national government can independently tax it's population and is scored between 0 and 4. 0 means that the central government sets the base rate of all regional taxes, and 4 means that the regional government sets the base rate of at least one major tax. The latter, denoted 'BORRO', represents the extent to which a sub-national government can borrow autonomously and is scored between 0 and 3. 0 indicates that borrowing is prohibited and 3 means that a sub-national government may borrow without any centrally imposed restrictions. Both variables are naturally ordered so that higher (lower) values represent a higher (lower) degree of decentralization.[3,4] These measures are theoretically superior to the commonly used expenditure or revenue shares as they capture actual decision making autonomy on fiscal issues and autonomy over regulation that does not involve much money (Hooghe et al., 2016). They are not affected by business cycle fluctuations as variation in the RAI measures require constitutional change. Because of this, they do not conflate changes in public spending with meaningful decentralization (Stegarescu, 2005). Therefore, they constitute accurate measures of the true extent of decentralization.

The measure of ethnic heterogeneity, 'Fractionalization', is the probability that two randomly selected individuals will be from a different ethno-linguistic group. There are a variety of measures that capture ethno-linguistic differences in the population. In particular, the Fearon (2003) index of ethnic fractionalization, which does not account for linguistic distance between groups and the Alesina et al. (2003) measure of ethno-linguistic fractionalization. Whilst both these measures imply divisions across groups, they have come under criticism as they convey no information about how deep-set these divisions are (Posner, 2004) and are very likely out of date (Laitin & Posner, 2001). The favoured measures are therefore the Desmet et al. (2012) measures, which account for how perennial or superficial the cleavages across groups are by using country specific language trees.[5] The fractionalization measure at the highest level of aggregation (towards the tree leaves), where cleavages are at their deepest and least numerous is denoted 'ELF1'. The lowest level of aggregation (towards the tree roots), where cleavages are at their most superficial and most numerous is captured by 'ELF15'—this is most comparable to the Alesina et al. (2003) measure. The key advantage to the data is that it allows one to bring a historical dimension to the analysis. The coarse linguistic divisions that describe ancestral cleavages are more likely to reflect genetic diversity and prehistoric endogenous group formation processes (Ashraf & Galor, 2013b). Whereas the finer divisions that result from more recent group formation may be the result of different historical forces such as the legacy of colonialism or the dynamics of interrupted human settlement in a given location (Ahlerup & Olsson, 2012).

A number of studies have begun to question the exogeneity assumption in fractionalization. For example, as most migration occurs into countries with higher levels of economic and institutional development, this implies that OLS coefficients will underestimate the impact of fractionalization (Freeman, 2006). Darity et al. (2006) argue that ethnic identities are not definite categories and the choice to identify as a group is in response to costs and benefits. As argued by Alesina and Spolaore (1997) national boundaries may also be endogenous. This would create reverse causality between decentralization and fractionalization. Moreover, it is plausible that more diverse groups will sort themselves into more decentralized countries as there is likely a better chance of integrating into society. There are potential unobserved factors that are correlated with the dependent and the main independent variable, for instance the preferences of the centralized policy maker with respect to their desired degree of decentralization. Thus, the contribution here lies in the treatment of ethno-linguistic fractionalization as endogenous with respect to the degree of decentralization. The instrumental variable method in this paper should alleviate these concerns and represents

[3]Both measures can take values higher than their maximum due to population weighting when aggregating regional scores to the country level. See Hooghe et al. (2016) for a complete discussion on the construction of these measures. When reconstructing the decentralization data into naturally ordered categorical measures and re-estimating using an ordered probit, the results remain unchanged.

[4]For a full breakdown of each value of the decentralization measures see Table A2.

[5]See Table A3 for details on the three indices construction.

an improvement over the current approaches in the established literature. This approach will also provide more consistent estimates in the presence of measurement error in the independent variable (Angrist & Pischke, 2014).

Given the endogeneity concerns for fractionalization, identifying a valid instrument is crucial to correctly identifying the effect. That is, meeting the exclusion restriction (the instrument must be uncorrelated with decentralization), the independence assumption (unrelated to unobservables in the second-stage) and is sufficiently correlated with fractionalization. Fortunately, there exists a recent literature on the historical determinants of fractionalization which provides such an instrument. Thus, to instrument for fractionalization, I follow Ahlerup and Olsson (2012) who show that the duration of anatomically modern human life, 'Origtime', in a given country is strongly positively correlated with more ethno-linguistic heterogeneity. Life started in the Rift valley in Ethiopia 160,000 years ago and spread throughout Africa, and this where one finds the most diversity. Nations in Latin America were colonized by humans much later and have relatively little diversity. This follows from the fact that a country being colonized by modern humans for a longer amount of time creates more ethno-linguistic diversity.[6] Ahlerup and Olsson (2012) show that the actual duration of uninterrupted human settlement affects diversity beyond related factors, such as the distance from the equator or migratory distance from Ethiopia, which reflects the strength of the relationship. It is also worth noting that reverse causality here is illogical as there cannot be contemporary diversity without settlement. In terms of the exclusion restriction, 'Origtime' must not be correlated with fiscal decentralization in order to be a valid instrument. This makes sense as there is no direct theoretical link between historical settlement dates modern day sub-national taxing or borrowing power. That is to say that 'Origtime' is not plausibly correlated to decentralization through any other channel but diversity and income. For the independence assumption, settlement date should not be correlated with unobservable country characteristics. Therefore, as long as I condition on current income throughout the analysis, the exclusion restriction and independence assumption are satisfied and the instrument will be valid. Nonetheless, the 2SLS specifications are also estimated using a full set of controls and fixed effects to soak up any unobserved characteristics. Using the variation in modern human settlement as an instrument for fractionalization is not new to the literature per se, as it has been used in the same manner by Ahlerup (2010) and Casey and Owen (2014) to explain variation in income.

The remaining control variables are as follows. To capture to the level of income I use the natural log of real GDP per capita in 2000 US dollars. To control for country size I use the natural log of country surface area (in square kilometres), and as a measure of political institutions I use the level of democracy—measured by the average of the civil liberties and political rights indices from Freedom House. The following main control variables are from other related studies, these are: the proportion of the population aged 65 or over, total natural resource rents as a share of GDP and the historical prevalence of seven disease causing pathogens (Murray & Schaller, 2010). A set of previously discussed extended controls are also used for robustness purposes. The KOF index of trade globalization is as a measure of trade globalization (Gygli, Haelg, Potrafke, & Sturm, 2019). The index captures a country's trade in goods, trade in services and their trade partner diversity. The share of arable land from Ashraf and Galor (2013b), the Gini index of market income inequality (Solt, 2016), a dummy indicator for a parliamentary government (Cruz, Keefer, & Scartascini, 2016) and the number of tiers of elected sub-national government (World Bank, 1999). Further controls include historical dummies that are typical to this type of literature, namely colonial history and legal heritage dummies, which will help alleviate the omitted variable bias. Summary statistics, cross-correlation tables and complete variable descriptions with sources are detailed in Table 1; Tables S4 and S5 and are listed in the Appendix.

3.2 | Empirical strategy

The strategy is to first present results from a basic cross-country OLS estimation to show the association between fractionalization and decentralization. I then perform Two stage least squares (2SLS) estimation to apply a causal interpretation to the relationship. The second- and first-stage regression equations can be formalized, respectively, as follows:

[6]For a broad outline of the peopling of the world, see Ahlerup and Olsson (2012).

TABLE 1 Summary statistics of main variables

	No. of obs.	Mean	Std. Dev.	Min.	Max.
FISC	78	1.035	1.515	0	5.924
BORRO	78	0.988	1.131	0	4.282
EF	67	0.342	0.210	0.004	0.766
ELF	77	0.349	0.219	0.002	0.740
ELF1	78	0.139	0.174	0	0.647
ELF4	78	0.249	0.226	0	0.797
ELF7	78	0.295	0.252	0	0.846
ELF10	78	0.307	0.259	0.0002	0.897
ELF13	78	0.307	0.260	0.0002	0.897
ELF15	78	0.307	0.260	0.0002	0.897
GDP per capita	78	9.358	1.193	6.395	11.50
Country size	78	7.080	2.132	1.163	12.01
Proportion of 65+	78	11.23	5.096	3.275	21.32
Democracy	78	2.057	1.322	1	6.750
Natural resource rents	78	3.704	5.732	0	28.01
Pathogen prevalence	78	−0.139	0.558	−1.180	1.060
Trade	78	57.09	18.92	19.85	97.47
Arable land	76	17.43	13.32	0.0700	53.76
Tiers of government	78	1.551	0.658	1	3
Parliament	78	0.577	0.497	0	1
Gini	75	47.58	4.827	33.73	57.70
Origtime	78	0.259	0.209	0.012	0.750

$$y_i = \alpha_0 + \beta_1 \widehat{\text{`Fractionalization'}}_i + \beta_2 X_i + \varepsilon_i \tag{1}$$

$$\text{`Fractionalization'}_i = \alpha_1 + \phi_1 \text{`Origtime'}_i + \phi_2 X_i + \nu_i \tag{2}$$

where y is one of the measures of decentralization, either fiscal or borrowing autonomy, in country i. 'Fractionalization' is one of the various ethno-linguistic fractionalization measures that takes a value between 0 and 1, where 1 represents certainty that two randomly selected individuals will be from different ethno-linguistic groups. X is the set of control variables and ε_i and ν_i are the error terms. As mentioned above, the instrument 'Origtime', is the number of years anatomically modern humans have been settled in a given country and is scaled to 100,000 years. The decentralization measures are available in country-year format, however, there is little variation over time to exploit (see Tables S3 and S4). So for these and all other variables that vary over time, they are collapsed into their mean value for the 2005–2010 period.[7] Consistent with the main hypothesis and reasoning previously discussed, I expect β_1 and ϕ_1 to be positive and statistically significant. A positive and significant ϕ_1 coefficient indicates that a longer duration of human settlement creates more fractionalization. A positive and significant β_1 will then mean that more fractionalized countries causes a higher degree of decentralization.

[7]As a robustness check, the regressions are repeated using 1999–2004 data and the results are unchanged.

4 | RESULTS

4.1 | Baseline model

Given the number of ethno-linguistic indices available, I begin by cycling the indices for one another in separate regressions that includes the baseline set of controls. This "cycling" technique is especially useful in this case as it allows the data to guide the research to the most appropriate measure of diversity and is used by Desmet et al. (2012) and Michalopoulos (2012).[8] The results of this exercise are presented in Table 2.

Before discussing the fractionalization variables of interest, I make a comparison of the control variables here to those in the previous literature in order to motivate the validity of the new data as viable measures of decentralization. Income and country size are robustly positive and significant across all specifications, which chimes with a large portion of the empirical literature (Garrett & Rodden, 2003; Panizza, 1999). The share of the elderly and democracy are positively related to decentralization albeit insignificantly so in most columns.[9] Natural resource rents appear to have a persistent centralizing effect as in Dreher et al. (2018). The effect of historic pathogen prevalence is also very small and not significantly different from 0. All things considered, one can be confident that these are valid measures of fiscal decentralization.

Turning to the fractionalization measures, the results are particularly interesting. At the higher levels of aggregation, closer to 'ELF1', the coefficients are statistically insignificant. When the level of aggregation is decreased, moving towards 'ELF15', capturing a larger number of ethno-linguistic groups, the coefficients become significant at the 1% level. Qualitatively, this can be interpreted as a country that moves from a population of complete homogeneity to complete heterogeneity would be 1.5 points more decentralized. Evaluated at the mean 'FISC' score, the average country with complete population heterogeneity would have sub-national governments that are able to set the base and rate of minor taxes, holding all else constant. This pattern indicates that the deep ancestral cleavages between groups bear no impact on the level of decentralization. It is, however, the more recent cleavages that affect the degree of decentralization. One reason why this historical dimension effect of fractionalization on decentralization exists may be because it is the sheer number of ethno-linguistic groups that drive decentralization rather than the deep differences between a small number of groups. This does not imply that the deeper cleavages do not impact decentralization as these divisions are needed to create diversity at the lower levels of aggregation (Desmet et al., 2012).

Whilst this exercise has produced some intriguing results, they are taken with caution because of the endogeneity problem and further controls to introduce.[10] To proceed to the next stage of the analysis, this paper focuses on the 'ELF15' measure of fractionalization.[11]

4.2 | Main results

Following from analysis of the previous subsection, I now proceed to explore how the coefficient for 'ELF15' is affected in different OLS specifications in Table 3. In columns (1)–(5) the dependent variable is the degree of fiscal autonomy and in (6)–(10) it is the degree of borrowing autonomy. Simple bivariate specifications in column (1) and (6), controlling only for income, fractionalization is positive and significant. Columns (3) and (8) introduce the

[8]Desmet et al. (2012) use the cycling technique to show that 'ELF15' is associated with lower growth and public good provision, whereas 'ELF1' is related to the onset of civil war and redistribution.

[9]The results here remain the same when using the dichotomous measure of democracy from Boix et al. (2013).

[10]Another concern may be that as the aggregation of the Desmet et al. (2012) measures fall, the mean increases. To remedy this, Table 2 is re-estimated with standardized measures of fractionalization and decentralization. The results remain qualitatively the same. A one standard deviation increase in 'ELF15' increases 'FISC' by 0.263 standard deviations, and 'BORRO' by 0.247 standard deviations.

[11]The spatial distribution of 'ELF15' is presented in Figure A5.

TABLE 2 The effect of fractionalization on decentralization: baseline "cycling" results

	(1)	(2)	(3)	(4)	(5)	(6)
ELF1	−0.290 (0.677)					
ELF4		1.016 (0.625)				
ELF7			1.342** (0.546)			
ELF10				1.506*** (0.507)		
ELF13					1.532*** (0.515)	
ELF15						1.532*** (0.515)
GDP per capita	0.441** (0.175)	0.434** (0.179)	0.413** (0.179)	0.416** (0.177)	0.415** (0.177)	0.415** (0.177)
Country size	0.351*** (0.064)	0.370*** (0.063)	0.373*** (0.063)	0.374*** (0.064)	0.374*** (0.064)	0.374*** (0.064)
Proportion of 65+	0.047 (0.049)	0.063 (0.051)	0.062 (0.050)	0.062 (0.049)	0.062 (0.049)	0.062 (0.049)
Democracy	0.200 (0.143)	0.200 (0.135)	0.182 (0.125)	0.178 (0.124)	0.177 (0.124)	0.177 (0.124)
Natural resource rents	−0.035 (0.021)	−0.043** (0.021)	−0.041** (0.020)	−0.039* (0.020)	−0.039* (0.020)	−0.039* (0.020)
Pathogen prevalence	0.114 (0.343)	0.162 (0.333)	0.103 (0.322)	0.082 (0.310)	0.083 (0.310)	0.083 (0.310)
Constant	−6.330*** (1.609)	−6.832*** (1.602)	−6.774*** (1.537)	−6.862*** (1.530)	−6.867*** (1.532)	−6.867*** (1.532)
R^2	.377	.396	.423	.439	.442	.442
Observations	78	78	78	78	78	78

Notes:: The dependent variable in all columns is 'FISC'. Robust standard errors are reported in parentheses
*p < .1; **p < .05; ***p < .01.

extended set of controls which have a generally insignificant effect on decentralization. The variable acting as a proxy for globalization, *Trade*, is negative and only significant in the borrowing autonomy regressions. This indicates that more globalized countries, holding all else constant, are more centralized, which supports the empirical findings in Garrett and Rodden (2003). In column (4) and (9), I include controls for colonial history and in column (5) and (10) I introduce legal origin controls. A history of disease, captured by pathogen prevalence, is negative and significant for borrowing autonomy only, in line with the predictions of Gorodnichenko and Roland (2015). Here, it is unlikely that the decentralized governments could respond in unison to disease transmission and therefore required a centralization of spending (borrowing) powers to alleviate and eradicate disease. The fractionalization coefficient remains highly significant throughout the columns. The average effect across all columns for 'FISC' is 1.5 and for 'BORRO' it is 1. This difference in magnitude reflects the reluctance of central governments to decentralize spending powers relative to revenue raising powers. From these results it appears that a fractionalization is

TABLE 3 The effect of fractionalization on decentralization: extended controls

	FISC					BORRO				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ELF15	1.125* (0.583)	1.532*** (0.515)	1.638*** (0.545)	1.709*** (0.515)	1.444*** (0.497)	0.704* (0.419)	1.077*** (0.312)	1.262*** (0.354)	1.328*** (0.292)	0.934*** (0.306)
GDP per capita	0.437*** (0.133)	0.415** (0.177)	0.430* (0.252)	0.191 (0.185)	0.219 (0.196)	0.284*** (0.105)	0.203 (0.122)	0.208 (0.168)	0.009 (0.119)	0.072 (0.115)
Country size		0.374*** (0.064)	0.271*** (0.087)	0.390*** (0.064)	0.365*** (0.065)		0.328*** (0.043)	0.256*** (0.059)	0.342*** (0.036)	0.320*** (0.037)
Proportion of 65+		0.062 (0.049)	0.086 (0.058)	0.116* (0.061)	0.101* (0.057)		0.044 (0.035)	0.043 (0.039)	0.100** (0.040)	0.075** (0.032)
Democracy		0.177 (0.124)	0.315** (0.156)	0.201 (0.158)	0.218* (0.110)		0.098 (0.095)	0.174 (0.121)	0.137 (0.120)	0.151* (0.086)
Natural resource rents		−0.039* (0.020)	−0.038 (0.023)	−0.027 (0.022)	−0.031 (0.022)		−0.025* (0.015)	−0.022 (0.017)	−0.010 (0.015)	−0.016 (0.016)
Pathogen prevalence		0.083 (0.310)	−0.102 (0.350)	−0.220 (0.326)	−0.166 (0.381)		−0.151 (0.189)	−0.291 (0.227)	−0.443** (0.176)	−0.509** (0.210)
Trade			−0.017 (0.010)					−0.016** (0.007)		
Arable land			0.000 (0.012)					0.009 (0.009)		
Tiers of government			0.474* (0.240)					0.123 (0.167)		
Parliament			−0.211 (0.441)					0.093 (0.301)		
Gini			−0.001 (0.023)					−0.009 (0.018)		
Constant	−3.396*** (1.264)	−6.867*** (1.532)	−6.447** (2.626)	−5.452*** (1.535)	−5.749*** (1.865)	−1.889* (0.953)	−4.193*** (1.035)	−2.958 (1.863)	−3.222*** (0.959)	−4.168*** (1.191)
Colony FEs				✓					✓	
Legal origins Fes					✓					✓
R^2	.143	.442	.498	.513	.473	.107	.501	.538	.643	.583
Observations	78	78	73	78	78	78	78	73	78	78

Notes: Robust standard errors are reported in parentheses.

*$p < .1$;

**$p < .05$;

***$p < .01$.

positively associated with degree of decentralization, to attach a causal interpretation to this effect I now proceed to the 2SLS estimates.

TABLE 4 The effect of fractionalization on decentralization: 2SLS results

	FISC					BORRO				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Second-stage results										
ELF15	2.956* (1.721)	2.004** (0.998)	2.348* (1.352)	1.534 (0.959)	1.787** (0.879)	2.703* (1.504)	2.357*** (0.828)	2.943** (1.335)	1.763** (0.713)	2.085** (0.813)
GDP per capita	0.475*** (0.143)	0.407** (0.171)	0.441* (0.233)	0.194 (0.165)	0.221 (0.189)	0.326*** (0.120)	0.183 (0.131)	0.233 (0.172)	0.001 (0.116)	0.077 (0.138)
Country size		0.380*** (0.065)	0.256*** (0.082)	0.389*** (0.059)	0.368*** (0.062)		0.344*** (0.051)	0.220*** (0.071)	0.344*** (0.035)	0.330*** (0.043)
Proportion of 65+		0.065 (0.047)	0.091* (0.052)	0.113** (0.054)	0.102* (0.052)		0.054 (0.034)	0.056 (0.036)	0.108*** (0.036)	0.077** (0.031)
Democracy		0.170 (0.113)	0.290* (0.149)	0.202 (0.147)	0.210** (0.100)		0.077 (0.086)	0.115 (0.130)	0.135 (0.108)	0.127* (0.075)
Natural resource rents		−0.040* (0.021)	−0.038* (0.023)	−0.027 (0.020)	−0.032 (0.021)		−0.028 (0.017)	−0.022 (0.024)	−0.010 (0.014)	−0.018 (0.016)
Pathogen prevalence		0.075 (0.289)	−0.131 (0.302)	−0.208 (0.292)	−0.157 (0.358)		−0.173 (0.185)	−0.359* (0.214)	−0.472*** (0.172)	−0.478** (0.211)
Trade			−0.021* (0.011)					−0.025** (0.011)		
Arable land			0.002 (0.012)					0.013 (0.010)		
Tiers of government			0.447** (0.224)					0.059 (0.164)		
Parliament			−0.305 (0.419)					−0.130 (0.349)		
Gini			−0.002 (0.021)					−0.011 (0.020)		
Constant	−4.316*** (1.513)	−7.002*** (1.555)	−6.361*** (2.342)	−5.371*** (1.458)	−4.973*** (1.702)	−2.893** (1.304)	−4.559*** (1.237)	−2.756 (2.068)	−3.424*** (0.911)	−3.107** (1.316)

(Continues)

TABLE 4 (Continued)

	FISC					BORRO				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
First-stage results										
Origtime	0.469*** (0.128)	0.546*** (0.142)	0.515** (0.224)	0.607*** (0.166)	0.577*** (0.146)	0.469*** (0.128)	0.546*** (0.142)	0.515** (0.224)	0.607*** (0.166)	0.577*** (0.146)
Colony FEs				✓					✓	
Legal origin Fes					✓					✓
AR Wald Chi^2	0.068	0.073	0.146	0.156	0.059	0.035	0.001	0.014	0.012	0.002
	13.35	14.71	5.297	13.37	15.54	13.35	14.71	5.297	13.37	15.54
Observations	78	78	73	78	78	78	78	73	78	78

Notes: 'Origtime' is used as an instrument for 'ELF15'. First stage results are reported in full in Table S6. The *F*-stat is *F* statistic for the explanatory power excluded instruments in first stage regressions. Robust standard errors are reported in parentheses.

*$p < .1$; **$p < .05$; ***$p < .01$.

4.3 | Addressing endogeneity concerns

Prior to discussing the main results from the instrumental variable regressions, I examine some tests of instrument strength to support the estimation strategy. Specifically, in the bottom rows of Table 4 I report tests of instrument strength and weak identification that support the effort to correctly identify the effect of fractionalization. The first thing to note is the positive and statistical significance of the instrument, 'Origtime', in the first-stage. As expected the longer anatomically modern humans have been settled in a country, the more ethno-linguistically diverse that country is. In column (2), the size of the coefficient implies that 10,000 years earlier settlement is associated with a 5.46 percentage point increase in the probability that two randomly selected individuals in a population will come from the different ethno-linguistic groups. The full first stage results are reported in Table S6. The *F*-statistic is the first-stage *F*-statistic which measures the strength of the instrument. Values below the rule of thumb figure of 10 indicate a weak instrument (Stock & Yogo, 2005). In all cases but two, I can reject this null hypothesis, thus the instrument is sufficiently strong.[12] In the presence of a weak instrument, the results can be biased (Stock & Wright, 2000). To test whether the instrument still has a significant effect in the presence of weak instrument, I report the Anderson-Rubin Wald Chi-squared test. In all but two specifications, the *p*-values indicates that should the instrument be deemed weak, fractionalization still does have a significant effect. In sum, these diagnostic tests suggest that 'Origtime' is a sufficiently good instrument for identifying the effects of fractionalization.

The instrumental variable specifications directly mirror those in Table 3 for reasons of openness. Across all columns but one, instrumented 'ELF15' exerts a positive and highly significant impact on the degree of decentralization. For example, the results in column (2) imply that a country moving from complete population homogeneity to complete heterogeneity would be 2 points more decentralized in terms of taxing power. In column (7) the results predict that a country moving from complete homogeneity to heterogeneity would be 2.4 points more decentralized in terms of borrowing autonomy. The magnitude of the coefficients are larger than those produced by OLS estimation. Meaning that the OLS estimates were downwardly biased due to the endogeneity issue, as anticipated by Freeman (2006). To determine whether the results are affected by omitted variables, I include the colonial and legal origin controls. The magnitude of the fractionalization coefficient estimate falls (compared to the baseline specification in (2) and (7)) but remains statistically significant at the 5% level with the exception of coefficient in column (4).

On the whole, the results of Table 4 imply that fractionalization has a positive causal effect on the degree of decentralization. This is consistent with the theoretical predictions in the literature.

5 | ROBUSTNESS CHECKS

This section conducts a number of checks on the sensitivity of the results. The first thing to consider is whether the same relationship, based on the depth and number of cleavages, exists between borrowing decentralization and fractionalization. To do so, I repeat the specifications in Table 2 but change the dependent variable to 'BORRO'. The results, presented in Table S7, remain qualitatively the same.

In a more technical aspect, I assess the robustness of the preferred specifications in Table 4 columns (2) and (7) when removing certain groups of countries. The results are depicted in Table S8. I first focus on the stability of the dependent variable, given that I am conducting cross-country analysis, this requires there to be little variation over time. I remove countries that vary 2 or 1 points in their degree of decentralization over time in

[12]The instrument would be an even stronger predictor of diversity if the sample were to include African countries to create more variation to exploit, however, they are unfortunately not covered in the dataset. Nonetheless, there is still ample variation in the sample, with old nations, such as Indonesia and Malaysia that were first populated 75,000 years ago, and younger ones like the UK and Iceland, colonized 8,000 and 1,200 years ago, respectively.

columns (1)–(4). In the proceeding columns, I remove the top and bottom 10% countries by surface area. The coefficient for fractionalization across all columns remains positive and significant. Second, I exclude countries in the tails of the distribution of their surface area. Columns (5) and (6) remove the seven largest countries and columns (7) and (8) remove the 7 smallest. The coefficient of fractionalization results remain similarly robust in all 2SLS regressions.

To probe the findings further, I conduct a number of checks that are common to the literature. The results are shown in Table S9. First, I run a "horserace" regression between fractionalization and polarization.[13] At the lower levels of aggregation the two measures are correlated, however, the variance inflation factor indicates no serious problems of multicollinearity. The regressions in column (1) and (2) confirm my result, as only 'ELF15' is statistically significant at the 5% level.

As a second check, I examine whether the results differ between the New World and Old World. When splitting the sample between the Old and New World - defined as the Americas and Oceania- I find that the results are less robust for the New World.[14] This is consistent with the findings in Desmet et al. (2012) and may be a result of New World language replacement from colonialism that weakened the link between linguistic cleavages and divisions between groups. This was particularly prevalent in Latin America with the extractive institutions (Acemoglu & Robinson, 2012).

For a third exercise, I introduce a quadratic term to test for any non-linearity in fractionalization. The premise for this comes from Ashraf and Galor (2013b) who argue that very low or very high levels of diversity are detrimental to growth. However, in this instance, there is no evidence of an inverse-U shaped relationship.

In a fourth robustness check, I include a set of country-specific geographic controls. These are the log of the mean elevation, the log distance between the nearest river or coast, the share of tropical land, the log of the standard deviation of mean elevation (as a measure of land variability) and the log of absolute latitude. The fractionalization estimate remains statistically significant. As a fifth check, I replace the measure of democracy with the Boix, Miller, and Rosato (2013) dichotomous measure of democracy, this appears insignificantly as the previous measure did.

As one final check, I use an alternative main explanatory variable.[15,16] Using a different measure of ethno-linguistic diversity than a fractionalization measure is useful to show that the diversity effect is not driven by something spurious contained in the construction of the indices. By doing so, it emphasizes the importance of accounting for linguistic distance in the fractionalization measures and the implications of language diversity for the degree of decentralization. Moreover, it again helps validate the RAI data as useful measures of decentralization. I follow Michalopoulos (2012) and use the number of languages with at least 1,000 speakers in a country. I log-normalize the variable, replace the fractionalization measure with it and re-estimate the baseline specifications. The OLS and 2SLS results for this exercise are presented in Table S10. The coefficient estimate is statistically significant across all columns.

[13]Similar to fractionalization in construction, polarization takes the value 1 when there are two groups of equal size and is also available at differing levels of aggregation.

[14]To account for the small sample of countries when splitting the sample, I introduce a dummy variable for the New World and an interaction between that and fractionalization, the results remain qualitatively the same.

[15]When using the older Fearon (2003) or Alesina et al. (2003) measures, the results are far weaker, which is expected as they do not account for the depth of divisions and the Fearon (2003) measures does not account for linguistic distance.

[16]I have also replicated the main results using the traditional sub-national expenditure and revenue measures of decentralization from the Government Finance Statistics. The results are qualitatively unchanged but statistically insignificant. As noted in Section 2, the previous literature has produced mixed results on this relationship with these data and this is likely due to the deficiencies of the fiscal measures, which is discussed throughout.

6 | CONCLUSION

This paper has provided evidence that ethno-linguistic fractionalization is an important causal factor in the decentralization of fiscal and borrowing decision making. Moreover, I have shown that the Hooghe et al. (2016) measures of fiscal autonomy are adequate and valid measures of decentralization by comparing the control variables with the sign and significance found in the previous literature using older measures of decentralization. These results add to a long literature on decentralization and diversity (Dreher et al., 2018; Garrett & Rodden, 2003; Oates, 1972; Panizza, 1999; Rodden, 2004; Sambanis & Milanovic, 2014). The results also have implications for the literature strand that examines the role of the depth of cleavages across groups and their impact on economic outcomes (Alesina et al., 2003; Desmet, Weber, & Ortuño-Ortín., 2009; Laitin & Posner, 2001; Desmet et al., 2012). Whilst instrumenting for fractionalization is not new (Ahlerup, 2010; Casey & Owen, 2014), it is however new to the decentralization literature which typically treats fractionalization as an exogenous variable.

In summary, the results show that fractonalization where the divisions are finer, more numerous and less distinct drive the degree of decentralization. No effect is found for the deep ancestral cleavages that were formed thousands of years ago. The results remain robust to a variety of controls and across two measures of decentralization. To address endogeneity concerns, an instrumental variable methodology is used, which involves instrumenting fractionalization with the settlement dates of anatomically modern human life, and the results similarly persist.

Whilst it now seems clear that fractionalization causes more decentralization, a further exploration into the channels of impact would be especially useful to the literature. Future work may also consider short-term changes in diversity and how this affects sub-national authority. More generally, a reasonable interpretation of the results would indicate as the world continues to become a more globalized and open place, countries will become more decentralized in response to the permutation and spread of ethno-linguistic groups.

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