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Article

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Ekonomický časopis

Provided in Cooperation with:
Slovak Academy of Sciences, Bratislava

Reference: Mališká, Lenka/Križko, Jakub (2020). The link between fiscal decentralization and ethnolinguistic fragmentation of the population in OECD countries. In: Ekonomický časopis 68 (4), S. 340 - 359.
https://www.sav.sk/journals/uploads/0426171604%2020%20Malicka-Krizko%20+%20SR.pdf.

The Link between Fiscal Decentralization and Ethnolinguistic Fragmentation of the Population in OECD Countries[1]

Lenka MALIČKÁ – Jakub KRIŽKO***

Abstract

In this paper, authors propose a unique merged index of the ethnolinguistic fragmentation of the population to examine the relationship between fiscal decentralization and ethnolinguistic fragmentation. The initial hypothesis, based on the Decentralization Theorem, assumes a positive relationship. The basic dynamic panel data model covers a sample of 35 OECD countries in period 2000 – 2017, the reduced sample covers 26 OECD countries, excluding countries with the lowest income inequalities. Here the stronger effect of ethnolinguistic fragmentation on fiscal decentralization is expected. The research involves different types of fiscal decentralization (spending, revenue and tax decentralization). Estimation results are confronted with estimations employing alternative indices of ethnic and linguistic fragmentation, previously used in researches. Findings support the initial hypothesis in the case of the spending decentralization on both samples. The confrontation with indices of ethnic or linguistic fragmentation shows significant effect of ethnic fragmentation. In the case of the reduced sample, results do not support the expectation of stronger effect of ethnolinguistic fragmentation on fiscal decentralization.

Keywords: *population diversity, ethnolinguistic fragmentation, decentralization theorem, fiscal decentralization, panel data*

JEL Classification: H73, H77

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[1] The paper is published within project VEGA No. 1/0806/18 and APVV-18-0368.

Introduction

The term of ethnolinguistic fragmentation of population covers two individually identified dimensions of the population heterogeneity. First, it describes the ethnic diversity in the country, and second, it expresses the linguistic structure of the population. Inherently, the term of ethnolinguistic fragmentation of population emphasizes their mutual interconnection.

The basic idea about a positive relationship between ethnolinguistic fragmentation of the population in the country and its fiscal decentralization has its origin in the Decentralization Theorem introduced by Oates (1972). Here, the higher the heterogeneity of preferences is, the higher the rate of decentralized decision-making should be so that the eventual welfare loss might be reduced. Higher ethnolinguistic fragmentation of the population within the country creates the spirit of deeper heterogeneity of the population's preferences. The rate of population heterogeneity (preferences heterogeneity) might diminish by decreasing the size of analysed population, considering more homogenous groups of inhabitants at the local level, with more homogenous preferences (Belmonte, Dell'Anno and Teobaldelli, 2018). Generally, local preferences might vary across the country. In the case of uniformly provided public goods, it is not possible to design public policies that correspond to the preferences of the local median voter (Tranchant, 2010). According to the recommendations about carrying out basic public finance functions, given by Musgrave (1959) or Oates (1972; 1999), the local level of government has the best information about local preferences and has the highest potential for matching the provisioning of local public goods with local preferences. However, at a glance, a contradictory hypothesis could be found in the empirical evidence. At the local level of government, the majority constraint, stressed also by Alesina, Baqir and Easterly (2000), negatively influences the provisioning of local public goods. It might cause deeper ethnic (or racial) segregation and thus a deterioration of economic conditions and poor quality of local public goods (Easterly and Levine, 1997; Alesina, Baqir and Easterly, 1999). It is often accompanied by lower economic performance (Labart, 2010).

In recent times of evident migration of the population (covered in the monitored period) and in times, when ethnic and linguistic minorities claim their right of self-determination, the increase of ethnic and linguistic fragmentation of the population might lead to the increase of the heterogeneity of preferences across the population. According to the Decentralization theorem (Oates, 1972; 1999), to avoid welfare losses in localities with different preferences on public goods, certain responsibilities and powers of public government should be decentralized. It initiates the increase of the fiscal decentralization rate. The aim of the

paper is to determine whether in recent times the real development of the fiscal decentralization degree in OECD countries supports the hypothesis about a positive relationship between ethnolinguistic fragmentation and fiscal decentralization. The motivation of the choice of the sample of countries resists in the obvious accentuation of the fiscal decentralization by the OECD (e.g. Taxing Powers of State and Local Governments published by the OECD, 1999).

The paper is organized in the following manner. After the introduction, the review of the most relevant literature is given. It is supplemented by methods and data used in the research, where basic concepts of measuring the ethnolinguistic fragmentation and fiscal decentralization are presented, too. It is followed by empirical evidence and discussion. The paper ends with a conclusion and references.

1. State of the Art

Determinants of fiscal decentralization are analysed in Panizza (1999), Letelier (2005), Bodman et al. (2009), Bodman and Hodge (2010), Canavire-Bacarreza and Martinez-Vazquez (2012) or Maličká and Martinková (2018). Panizza (1999) searches for the effect of ethnic fragmentation on fiscal centralization, finding its negative effect. The obtained results confirm his supposition about positively correlated benefits of decentralization with the variance in demands for publicly provided goods (Panizza, 1999, p. 98). In this connection Letelier (2005, p. 160) mentions the expected positive relationship between population diversity and fiscal decentralization, giving support based on the results of his panel. Bodman et al. (2009) provide an investigation concerned with fiscal decentralization determinants on a panel including a subsample of OECD countries. One of their hypotheses focuses on the proposition that fiscal decentralization will be higher in countries that are more ethnically divided (Bodman et al., 2009, p. 8). A positive impact of ethnic diversity on the rate of fiscal decentralization is observed, even in the case of fiscal decentralization's various measures. Tranchant (2010) tests a hypothesis that the greater the distance between the ethnic background of the group and that of the rest of the population, the larger the beneficial impact of fiscal decentralization (Tranchant, 2010, p. 55). In fact, in his panel model he employs the indicator of fiscal decentralization as explanatory variable of ethnic conflict and observes an inverse relationship between them. Canavire-Bacarreza and Martinez-Vazquez (2012) evaluate the population diversity primarily on the basis of geographical fragmentation of the country and also by ethnic fragmentation. Their results show that the higher the geographical fragmentation of the country or ethnic fragmentation are, the higher the rate of

fiscal decentralization in the country is. Belmonte, Dell'Anno and Teobaldelli (2018) analyse the influence of an attitude toward ethnic diversity on tax morale in centralized and decentralized constitutions. They find that worsened tax morale connected with a higher aversion to ethnic diversity is more evident in heterogeneous but centralized countries. This effect decays in decentralized countries with more homogenous communities.

As mentioned by Labart (2010), a huge body of the empirical research focusing on ethnolinguistic fragmentation of the population analyses its relationship with the economic growth. The majority of the results show an inverse linkage between higher rates of ethnolinguistic fragmentation and economic performance. The question about the relationship between fiscal decentralization and ethnolinguistic fragmentation of the population is not examined explicitly, but many researches are highlighted for their contribution in measuring the ethnolinguistic fragmentation. One of the most important is the research of Easterly and Levine (1997), in which they focused on the relationship between fiscal decentralization and poverty in countries of Sub-Saharan Africa. They observed a negative relationship between the ethnic diversity of the population and the outcome of public policies. High ethnic diversity (accompanied by heterogeneity of preferences) created difficulties in making decisions about public goods provisioning and about stimulating the economy. This has an inhibitive effect on overall economic growth of the country. Alesina, Baqir and Easterly (1999) confirm the connection between ethnic heterogeneity and provisioning of local public goods in American cities, metropolitan areas and districts. They conclude that more ethnically diverse localities have higher expenditures and higher deficits per capita, but lower expenditures on merit goods such as education or roads. Additionally, higher expenditures are financed by intergovernmental transfers. Here, the rate of expenditure or revenue decentralization increases, but local public goods are not financed by local taxes. Yao (2007) searches for the relationship between fiscal decentralization and poverty reduction with an emphasis on the sample of Sub-Saharan African countries with higher ethnolinguistic fragmentation of the population. He concludes that the desirable (inverse) impact of fiscal decentralization on poverty reduction is less evident in countries with high population heterogeneity. Pal and Roy (2010) employ the index of ethnolinguistic fragmentation as a control variable in analysing the impact of fiscal decentralization on enforcement of democratic institutions in Indonesia. Their implicit results show lower local expenditures in jurisdictions with a higher degree of ethnic fragmentation. Neyapti (2010) analyses the impact of fiscal decentralization on various macroeconomic categories on a panel of 16 countries. He uses the index of ethnolinguistic fragmentation defined by Easterly and Levine

(1997). His results show the reductive effect of ethnolinguistic fragmentation on achieving economic gains of fiscal decentralization in the area of expenditure. Manzoor (2013) stresses the fiscal decentralization and its impact on poverty in Pakistan, which is one of the most ethnically heterogeneous country. He discusses the Decentralization Theorem (Oates, 1972) and the role of ethnic conflict introduced by Easterly and Levine (1997) or Alesina et al. (2003), which presents an obstruction in effective redistribution and public good provisioning. Lapointe (2016) investigates the influence of ethnolinguistic fragmentation of the population in the province of Québec (Canada) on the results of referendum. He employs a unique index expressing the proportion of English and French speaking population. In this research, the results show that higher ethnolinguistic fragmentation supports the propensity to secession, and conversely, lower fragmentation accompanied by the loyalty to group identity is connected by lower propensity to secession.

2. Methods and Data

2.1. Measurement of Ethnolinguistic Fragmentation and Fiscal Decentralization

As Bossert, D'Ambrosio and La Ferrara (2011) note, the index of ethnolinguistic fractionalization (or fragmentation, often labelled as *ELF*) is universally used to measure ethnic diversity. Easterly and Levine (1997) stressed the selection of methods focusing on measuring the ethnic diversity of the population. As the most complex, they recommend the indicator measuring the degree of ethnic fragmentation of population published in the Soviet *Atlas Narodov Mira* in 1964. It expresses the probability that two randomly selected individuals will belong to different ethnolinguistic groups of population. Alesina, Baqir and Easterly (1999; 2000) emphasise the ethnic dimension of the population (at the expense of the linguistic aspect of the problem) on the sample of localities in the USA. The evident racial diversity of the country and a common language spoken throughout the area sufficiently explain their abstraction from the linguistic dimension of the problem.

However, a caveat might be raised on the basis of the observed increase of Latino and Korean population since 1990s. Index of ethnic fragmentation – a decreasing transformation of the Herfindahl concentration index, used by Easterly and Levine (1997) or Alesina, Baqir and Easterly (1999; 2000), is expressed by the formula (eq. 1) where $Race_i$ presents a share of inhabitants belonging to race *i*:

$$ETHNIC = 1 - \sum_i \left(Race_i \right)^2 \tag{1}$$

The higher the index, the more fragmented the country. Since then, the index has been widely employed in an empirical research and certain nominal differences are observable, e.g. in Robalino, Picazo and Voeteberg (2001), Neyapti (2010) or Pal and Roy (2010). Regarding the fact that the index of ethnic fragmentation does not address the possibility that two randomly selected individuals will belong to different linguistic groups, but to the same race, Alesina et al. (2003) make an important distinction between ethnic, linguistic and religious diversity of the population. An example of such a situation might be found in the conditions of Belgium, where German, French and Dutch speaking communities live. Alesina et al. (2003) create adjusted indices: index of ethnic, linguistic and religious fragmentation, with the following formal formula (eq. 2), where s_{ij} is a share of the group i (i = 1, …, N) on the population in country j:

$$FRACT_j = 1 - \sum_{i=1}^{N} s_{ij}^2 \tag{2}$$

Later, Letelier (2005) uses index applied to ethnic diversity and the concomitant indicator presenting the probability that two randomly selected people from a country will not belong to the same ethnic or linguistic group. Bossert, D'Ambrosio and La Ferrara (2011) construct a generalized index of ethnolinguistic fractionalization and compare it to the indices of ethno-linguistic fractionalization, ethnic polarization and peripheral diversity.

In the current research, beside the basic source of data – Atlas Narodov Mira (1964), the Encyclopædia Britannica (2019), CIA World Factbook (2020) and data collected by the project Ethnologue (2019) are used. Alesina et al. (2003) enlarges the database of indices for many more countries in comparison with *Atlas Narodov Mira*. Labart (2010) presents a ranking of countries with regards to each ethnolinguistic fragmentation index including also indices according to Fearon (2003).

In this research, indices of ethnic (*EF*) and linguistic fragmentation (*LF*), proposed by Alesina et al. (2003) are employed. The additional merged arbitration index of ethnolinguistic fragmentation (noted *maxF*) is introduced to the research to capture the non-zero absolute difference between *EF* and *LF*. It is constructed on the basis of the maximum value chosen from the *EF* and *LF* indices, as it is expressed in formula (eq. 3):

$$\max F = \begin{cases} EF \text{ if } EF > LF \\ LF \text{ if } EF < LF \end{cases}, \text{ or } \max F = \max\left(EF,\ LF \right) \tag{3}$$

The *maxF* eligibility is supported by respecting the highest degree of diversity of the population without regarding its origin (ethnic or linguistic). To illustrate the problem, Table 1 displays values of *EF* and *LF* in selected countries. If the absolute difference among *EF* and *LF* is low (near zero), the ethnicity might be determined by the linguistic affiliation (e.g. Belgium or Luxembourg). In the case of high absolute difference (e.g. Bolivia or Columbia), the divergence between the *EF* and *LF* is observable. Even if the *maxF* index omits the origin of the diversity, it preserves its most perceptible feature.

A significant part of authors in the field of fiscal decentralization tend to measure the fiscal decentralization as revenue and expenditure decentralization (e.g. Panizza, 1999; Canavire-Bacarreza and Martinez-Vazquez, 2012 and many others). They are computed in the following manner. For the expenditure (or spending) decentralization (*sd*), the indicator presents a subnational expenditure as a percentage of total expenditure. The revenue decentralization (*rd*) presents a subnational revenue as a percentage of total revenue. The widely used tax decentralization indicator (*taxd*), proposed e.g. in Stegarescu (2005), is computed as a share of subnational tax revenue on total subnational revenue.

T a b l e 1

Comparison of *EF* and *LF*, Absolute Differences, *maxF* of Selected Countries

Country	*EF*	*LF*	Absolut difference	*maxF*
Cambodia	0.2105	0.2104	0.000025	0.2105
Fiji	0.5479	0.5479	0.000033	0.5479
Nigeria	0.8505	0.8503	0.000114	0.8505
South Korea	0.0020	0.0021	0.000115	0.0021
Moldova	0.5535	0.5533	0.000156	0.5535
Italy	0.1145	0.1147	0.000163	0.1147
Czechia	0.3222	0.3233	0.0011	0.3233
Slovakia	0.2539	0.2551	0.0012	0.2551
Switzerland	0.5314	0.5441	0.0127	0.5441
Belgium	0.5554	0.5409	0.0145	0.5554
Luxembourg	0.5302	0.6440	0.1137	0.6440
Bolivia	0.7394	0.2240	0.5156	0.7394
Columbia	0.6014	0.0193	0.5821	0.6014
The Philippines	0.2385	0.8360	0.5974	0.8360
Madagascar	0.8791	0.0204	0.8587	0.8791

Source: Own processing based on data published in Alesina et al. (2003)

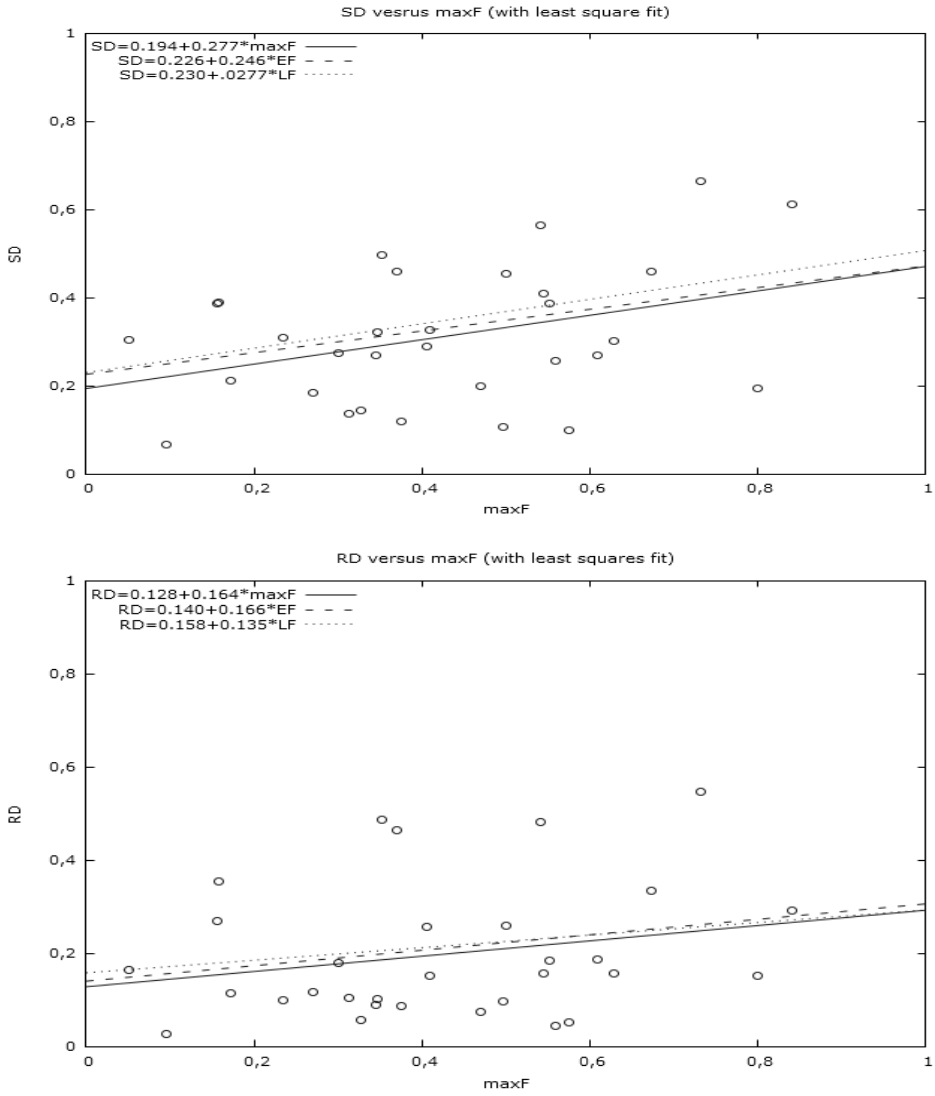
2.2. Theoretical Assumptions of the Model

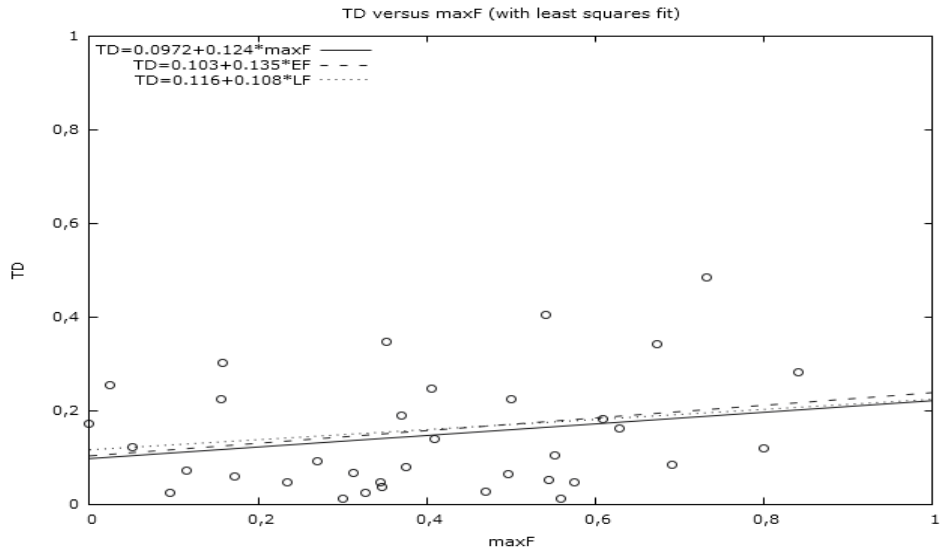
The hypothesis about a positive relationship between ethnolinguistic fragmentation and fiscal decentralization is examined using a regression analysis. The positive linear relationship is expected. However, the ambiguity about the positive relationship between the ethnolinguistic fragmentation of the population and fiscal decentralization is observed in the research (e.g. Bodman et al., 2009;

Tranchant, 2010, found positive effect, Letelier, 2005, found negative effect; Canavire-Bacarreza and Martinez-Vazquez, 2012, found both positive and negative effect). Figure 1 projects the relationship between the ethnolinguistic fragmentation of the population (*maxF*) and various types of fiscal decentralization (*sd*, *rd* and *td*) of 35 OECD countries in the period 2000 – 2017. Least square fits are displayed also for the ethnic fragmentation (*EF*) and linguistic fragmentation (*LF*).

F i g u r e 1

Ethnolinguistic Fragmentation and Fiscal Decentralization Rates in 35 OECD Countries





Source: Own processing.

Regarding the empirical evidence presented by Easterly and Levine (1997), Alesina, Baqir and Easterly (1999; 2000) or Yao (2007), the potential interaction of ethnolinguistic fragmentation and Gini index is also examined. They suppose that countries with higher ethnic fragmentation suffer from higher income inequalities. Thus, the sample of 35 OECD countries is reduced to 26, excluding countries with the lowest Gini index (less than 30%, 2000 – 2017 average). Stronger positive influence of ethnolinguistic fragmentation on the fiscal decentralization degree is expected on the reduced sample of OECD countries.

To control for the fiscal decentralization, variables expressing the demographic (total population, population growth) and macroeconomic conditions (GDP per capita growth, inflation rate, unemployment rate, public debt, public deficit, economy openness, income inequalities, general government revenue) in countries are involved in the estimations. The dummy variable for federal states is introduced to estimations. The selection of control variables is inspired by the related literature (e.g. Panizza, 1999; Letelier, 2005; Bodman et al., 2009; Belmonte et al., 2018). Their characterisation, source of data and expectations about their impact on fiscal decentralization are listed in the appendix.

2.3. Data Description and Estimation Techniques

This research covers 35 OECD countries in the period 2000 – 2017, excluding Lithuania due to its date of the OECD accession (Lithuania joined the OECD in 2018). Data on ethnic and linguistic groups of OECD countries' population

are extracted from the CIA World Factbooks (CIA, 2020). Indices of ethnic (*EF*) and linguistic fragmentation (*LF*) are computed at the base of a decreasing transformation of the Herfindahl concentration index for the period 2000 – 2017. In the case of missing proportions of ethnic or linguistic groups' abundance (usually are denominated in %, in certain cases are data only of nominal nature), the representation of groups is employed proportionally to the Herfindahl index up to the forthcoming census. After computing the Herfindahl indices, the merged index of ethnolinguistic fragmentation *maxF* is expressed as maximum of observed values. Macroeconomic and demographic data are derived from the OECD database (OECD, 2020a). Fiscal data on central, state and local government expenditure, revenue and tax revenue are derived from the OECD Fiscal Decentralisation database (OECD, 2020b). Spending and revenue fiscal decentralization rates are computed as share of items in question (expenditure or revenue) of subnational (state and local) government on general government (general government is the sum of central, state and local level). Tax decentralization rate is computed as share of subnational government tax revenue on subnational government revenue. Data on Gini index are extracted from the CIA World Factbooks (CIA, 2020). Finally, the unbalanced panel dataset of 35 countries for the period 2000 – 2017 is put together. Due to missing observations on some countries' variables, the sample size varies across estimations.

Panel data estimations (also used by e.g. Bodman and Hodge, 2010 or Canavirre-Bacarreza and Martinez-Vazquez, 2012) focus on the relationship between the ethnolinguistic fragmentation of the population and fiscal decentralization. The dynamic panel data model with the Generalized Method of Moments estimator, proposed in Blundell and Bond (1998) (known as GMM system estimator), is employed to the estimation. As mentions Baltagi (2005, p. 135), many economic relationships are dynamic in nature. In estimation equations, described in Baltagi (2005) or Roodman (2009), dynamic relationships are characterized by the presence of a lagged dependent variable among regressors (see eq. 4)

$$y_{it} = \alpha y_{i,t-1} + x'_{it}\beta + \varepsilon_{it} \quad i = 1,\ldots,N;\ t = 1,\ldots,T \tag{4}$$

where $y_{i,t-1}$ is a lagged dependent variable, x'_{it} is a vector of regressors and ε_{it} is an error component model (see eq. 5)

$$\varepsilon_{it} = \mu_i + \nu_{it} \tag{5}$$

where $\mu_i + \nu_{it}$ is the usual fixed effects decomposition of the error term (Blundell and Bond, 1998, p. 117); μ_i captures fixed effects and ν_{it} idiosyncratic shocks (Roodman, 2009, p. 100). These two error components are independent of each other and among themselves (Baltagi, 2005, p. 135). The use of dynamic

panel data model based on the GMM is reasoned precisely in Roodman (2009). He describes cases, when the difference or system GMM estimators are appropriate. From those mentioned in (Roodman, 2009, p. 99 – 100), in this research the small length of time-series (*T*) and large number of cross-sectional units (*N*) operates side by side with the dynamic dependent variable, linear relationship, fixed individual effects and the potential lack of exogeneity of regressors. This gave the incentive to employ a dynamic panel data approach applying the GMM framework.

In this research, the dynamic character of the dependent variable (*FD*) corresponds to the problem of fiscal persistence described e.g. in Cassette and Patty (2010) or Veiga and Veiga (2007). In the field of public budgets, the volume of fiscal categories of previous budget period are often mirrored in the current budget period. Assumption about the linear relationship described in Roodman (2009) matches the expectation of linear and positive relationship between the fiscal decentralization and ethnolinguistic fragmentation of the population. Next, heterogeneous countries in the sample might vary in the dependent variable (fixed individual effects). Additionally, according to Cassette and Patty (2010), as well as Roodman (2009), the use of GMM system estimator might deal with the endogeneity in the model. It is often applied when the number of periods is lower than number of cross-sectional units. When deliberating over the first difference GMM estimator (Arellano-Bond) or system estimator (Blundell-Bond), Roodman (2009, p. 87) states, that the Blundell-Bond estimator allows the introduction of more instrument and can dramatically increase the efficiency by augmenting the Arellano-Bond estimator at the base of additional assumption, that first differences of instrument variables are uncorrelated with the fixed effects. Although Baltagi (2005) sees the things improving for the Arellano-Bond estimator as *T* increases, Roodman (2009), beside the higher precision, emphasizes the reduction of the finite sample bias in case of Blundell-Bond estimator.

In dynamic panel model using the GMM system estimator, the post-estimation statistics is concerning on the validity of instruments used in estimations. It is evaluated mainly by the Sargan test and Arellano-Bond test, eventually Wald test (Roodman, 2009). Sargan test for over-identifying restrictions (with null hypothesis of all instruments valid) serves to examine whether instruments are not correlated with residuals. Tests proposed by Arellano and Bond (1991) consist in 1st and 2nd order autocorrelation test statistics. The Arellano-Bond autocorrelation test (null hypothesis of no autocorrelation) serves to examine whether residuals from the first-differenced estimating equation are not second-order correlated (Cassette and Patty, 2010, p. 177). Finally, the Wald test for overall significance (or joint significance of the regressors with null hypothesis of no

significance) serves to evaluate if explanatory variables involved to the estimation are significant (Roodman, 2009).

In this research, the formula of the estimated relationship is following:

$$FD_{it} = \sum_{j=1}^{p} \alpha_j FD_{it-1} + \sum_{k=1}^{L} \beta_k X_{k,it} + \gamma \; fragmentation + \varepsilon_{it} \qquad (6)$$

where FD_{it} is a dependent variable of cross-sectional unit *i* at the time *t*. FD_{it-1} is lagged dependent variable, $X_{k,it}$ is a vector of control variables, $fragmentation$ is an independent explanatory variable capturing the effect of the population fragmentation and ε_{it} is an error component model.

The effect of ethnolinguistic fragmentation indicator is examined separately on three types of fiscal decentralization (measured as *sd*, *rd* and *taxd*). Additionally, to compare the variable of ethnolinguistic fragmentation of the population to its alternatives used in previous empirical evidence, the effect of ethnic and linguistic fragmentation on fiscal decentralization is also examined separately.

3. Results and Discussion

Results of estimations for 35 OECD countries are displayed in Table 2. Fragmentation of the population based on ethnolinguistic fragmentation merged variable (*maxF*) is compared to variable of ethnic fragmentation (*EF*) and linguistic fragmentation (*LF*). All variables of population fragmentation are explanatory variables of fiscal decentralization (dependent variable) measured in three manners, spending (*sd*), revenue (*rd*) and tax decentralization (*td*). Final estimations include only statistically significant control variables.

In the case of the spending decentralization (*sd*), findings support the hypothesis, that higher population heterogeneity might induce higher differences in preferences, so local governments should refine them respecting local specifics. In this case, central government could not assure the maximum welfare. Welfare losses might be eliminated by provisioning of public goods by local governments (Decentralization Theorem, Oates, 1972 and 1999).

This counts in favour of higher fiscal decentralization rates. In praxis, some examples of customized local provision of a public good, with respect on local preferences, could be found. E.g., it could be a local school (local means established by the local government, local jurisdiction), where the language of ethnic or linguistic minority is applied respecting national standards of education. Other example could be a theatre of local importance, which focuses on ethnic or linguistic minority's culture. Such an activity of local governments mirrors in

the expenditure side of their budgets and might cause higher levels of spending decentralization.

In the case of revenue decentralization (*rd*), the merged index of ethnolinguistic fragmentation (*maxF*) is not statistically significant, while in the case of ethnic fragmentation (*EF*) the relationship is significantly positive. In the case of tax decentralization (*td*), presented estimations suffer from not satisfying the Sagan over-identification test. In the case of linguistic fragmentation of the population (*LF*), results of regressions show positive, but statistically insignificant effects.

The statistical significance and the positive sign of the coefficient of the lagged dependent variable (FD_{t-1}) matches the given expectation about the fiscal persistence. Similarly, control variables emulate expectations given at the base of empirical evidence. In all estimations the negative sign of the Gini index (*gini*) variable's coefficient is observed. It matches the expectations, when in high-income countries societies promote equalization of wealth (Wallis and Oates, 1988). Fiscal redistribution is provided by the central government level (Freinkman and Plekhanov, 2005). With increase of income inequalities (or regional disparities), the rate of fiscal decentralization decreases. The relationship between the openness of economy (*trade*) and fiscal decentralization is negative. More open economies tend to be less decentralized. According to Letelier (2005), a large proportion of taxes from international trade (import and export tariffs and related duties) is concentrated in the central government's budget. These findings correspond also with results of Bodman et al. (2009), who made a research of fiscal decentralization determinants on the subsample of OECD countries, too. The effect of federal constitution (*fedcon*) on fiscal decentralization variables is positive in accordance with the pattern of Lijphart (1984), confirmed by Fisman and Gatti (2002), Bodman et al. (2009) or Belmonte et al. (2018). Federal countries tend to be more decentralized. However, this variable is not statistically significant in all estimations.

Results of estimations for 26 OECD countries (reduced sample) are displayed in Table 3, which is constructed similarly to Table 2. In this case, the relationship between the merged index of ethnolinguistic fragmentation (*maxF*) and spending decentralization (*sd*) is again significantly positive. In other forms of fiscal decentralization (*rd* and *td*) this relationship is not statistically significant. Confronting the models employing the *maxF* and *EF,* the ethnic fragmentation variable is statistically significant in the case of spending and revenue decentralization (*sd* and *rd*). Index of linguistic fragmentation is significantly positive only in case of spending decentralization (*sd*), while in the estimations of 35 OECD countries it was insignificant.

Table 2

Results of Regression for 35 OECD Countries

Fragmentation expression	***maxF***			***EF***			***LF***		
FD expression	*sd*	*rd*	*taxd*	*sd*	*rd*	*taxd*	*sd*	*rd*	*taxd*
FD (*t*-1)	0.8165 (<0.0001) ***	0.8854 (<0.0001) ***	0.9362 (<0.0001) ***	0.7662 (<0.0001) ***	0.8665 (<0.0001) ***	0.9200 (<0.0001) ***	0.8459 (<0.0001) ***	0.8616 (<0.0001) ***	0.9461 (<0.0001) ***
const	0.1113 (0.0011) ***	0.0472 (0.0143) **	0.0227 (0.0855) *	0.1459 (0.0001) ***	0.0562 (0.0091) ***	0.0293 (0.0565) *	0.1008 (0.0027) ***	0.0599 (0.0061) ***	0.0214 (0.0843) *
gini	–0.0021 (0,0026) ***	–0.0010 (0.0511) *	–0.0004 (0.1624)	–0.0025 (0.0008) ***	–0.0010 (0.0471) **	–0.0005 (0.1119)	–0.0017 (0.0141) **	–0.0010 (0.0438) **	–0.0003 (0.1742)
trade	–0.0002 (0.0049) ***	–0.0001 (0.0157) **	–0.0001 (0.0606) *	–0.0003 (0.0030) ***	–0.0001 (0.0055) ***	–0.0001 (0.0523) *	–0.0001 (0.0264) **	–0.0001 (0.0161) **	–0.0001 (0.0720) *
fedcon	0.0361 (0.0077) ***	0.0182 (0.0181) **	0.0064 (0.2127)	0.0380 (0.0050) ***	0.0200 (0.0226) **	0.0068 (0.1999)	0.0305 (0.0130) **	0.0220 (0.0223) **	0.0054 (0.2568)
fragmentation	0.0464 (0.0137) **	0.0120 (0.1501)	0.0067 (0.2846)	0.0600 (0.0252) **	0.0160 (0.0543) *	0.0110 (0.1705)	0.0236 (0.1159)	0.0031 (0.7227)	0.0004 (0.9363)
AdjR2	0.5538	0.4642	0.3700	0.5768	0.4778	0.3837	0.5034	0.4218	0.3067
Test for AR(1) errors	0.0981	0.0030	0.0174	0.0967	0.0028	0.0169	0.1022	0.0036	0.0190
Test for AR(2) errors	0.2553	0.4089	0.7645	0.2613	0.4064	0.7610	0.2678	0.4033	0.7676
Sargan over-identification test	0.9849	0.0217	0.0000	0.9999	0.3663	0.0000	0.9138	0.6898	0.0000
Wald (joint) test:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Dynamic panel regression using the GMM- system estimator (equations in levels). Coefficients and p-values in parentheses are displayed. *** notes 0.01 significance level, ** 0.05 and * 0.1.

Source: Own processing.

Table 3
Results for 26 OECD Countries

Fragmentation expression	***maxF***			***EF***			***LF***		
FD expression	*sd*	*rd*	*taxd*	*sd*	*rd*	*taxd*	*sd*	*rd*	*taxd*
FD (*t*-1)	0.8565 (<0.0001) ***	0.8832 (<0.0001) ***	0.8465 (<0.0001) ***	0.8030 (<0.0001) ***	0.8719 (<0.0001) ***	0.8305 (<0.0001) ***	0.8947 (<0.0001) **	0.8761 (<0.0001) ***	0.8383 (<0.0001) ***
const	0.0740 (0.0107) **	0.0345 (0.1009)	0.0424 (0.0878) *	0.1060 (0.0075) ***	0.0405 (0.0826) *	0.0495 (0.0709) *	0.0553 (0.0290) **	0.0365 (0.0847) *	0.0454 (0.0801) *
gini	–0.0015 (0.0456) **	–0.0006 (0.2530)	–0.0010 (0.1682)	–0.0018 (0.0431) **	–0.0007 (0.2643)	–0.0010 (0.1524)	–0.0010 (0.1107)	–0.0006 (0.2643)	–0.0010 (0.1844)
fedcon	0.0334 (0.0493) **	0.0235 (0.0039) ***	0.0204 (0.0610) *	0.0382 (0.0273) **	0.0238 (0.0050) ***	0.0201 (0.0640) *	0.0252 (0.0499) **	0.0248 (0.0033) ***	0.0022 (0.0603) *
trade	–0.0001 (0.0222) **	–0.0001 (0.0033) ***	–0.0001 (0.0137) **	–0.0002 (0.0405) **	–0.0001 (0.0031) ***	–0.0001 (0.0300) **	–0.0001 (0.1018)	–0.0001 (0.0469) **	–0.0001 (0.0376) **
fragmentation	0.0415 (0.0690) *	0.0157 (0.1062)	0.0180 (0.1069)	0.0542 (0.0928) *	0.0160 (0.0870) *	0.0219 (0.1186)	0.0252 (0.0165) **	0.0143 (0.1093)	0.0169 (0.1137)
AdjR2	0.6187	0.5623	0.4507	0.6168	0.5648	0.4712	0.6446	0.5600	0.4506
Test for AR(1) errors	0.2148	0.0167	0.0411	0.2097	0.0172	0.0382	0.2174	0.0173	0.0387
Test for AR(2) errors	0.5267	0.3158	0.7304	0.7679	0.3078	0.7261	0.5285	0.3268	0.7283
Sargan over-identification test	0.9591	0.0400	0.8738	0.9999	0.2395	0.9872	0.6478	0.1538	0.9550
Wald (joint) test:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Dynamic panel regression using the GMM - system estimator (equations in levels). Coefficients and p -values in parentheses are displayed. *** notes 0.01 significance level, ** 0.05 and * 0.1.
Source: Own processing.

Returning to the supposition of Easterly and Levine (1997), Alesina, Baqir and Easterly (1999; 2000) and Yao (2007), that countries with higher ethnic fragmentation suffer from higher income inequalities and thus stronger positive influence on the fiscal decentralization degree is expected, the supposition is not satisfied. In fact, data show, that there is no correlation between the ethnolinguistic fragmentation and Gini index in the sample of 26 EOCD countries (also ethnic and linguistic fragmentation variables are not correlated with the Gini index). Additionally, the statistical significance of the Gini index variable (*gini*) is reduced, what might coincide with the reduction of the basic sample of countries right at the base of this variable. Expectations about the control variables' impact on fiscal decentralization are satisfied and obtained results conform with those displayed for the sample of 35 OECD countries.

Conclusion

The initial hypothesis that countries with higher population diversity tend to be more decentralized is widely examined by the empirical research. Expressing the population diversity or heterogeneity of its preferences, income inequalities are often employed. However, certain demographic or geographic circumstances might also influence the level of fiscal decentralization in the country. Beside the role of geography in determining the fiscal decentralization (e.g. Canavire-Bacarreza and Martinez-Vazquez, 2012; Wu, Ye and Li, 2019), the ethnic and linguistic structure of the population is considered. Higher the number of ethnic or linguistic groups within the country, higher the ethnic or linguistic fragmentation of the population. Higher fragmentation signalizes higher population heterogeneity. It deepens the heterogeneity in preferences, too. The majority constraint followed by the central government does not allow authorities (government) to respect all individual (mean local) needs. Consequently, this is one of the key reasons why the fiscal decentralization is promoted.

Crucial goal of this paper is to determine the impact of both ethnic and linguistic fragmentation of the population, expressed by one indicator labelled as merged index of ethnolinguistic fragmentation, on fiscal decentralization in OECD countries. In empirical evidence, the indicator of ethnolinguistic fragmentation (or fractionalization) is widely used, but studying its contents reveals that often only the ethnic aspect is covered in it. Although Alesina et al. (2003) make a distinction between ethnic, linguistic and even religious diversity of the population, in this paper the merged index of ethnic and linguistic fragmentation is proposed. It is computed as the maximum observed from the pair of ethnic and linguistic fragmentation indicators, which are computed as a decreasing transformation of the Herfindahl concentration index (as propose Easterly and Levine,

1997 or Alesina, Baqir and Easterly, 1999 and 2000). This approach partially eliminates the situation that two randomly selected individuals will belong to different linguistic groups, but to the same race (e.g. Luxembourg) or to different ethnic groups, but the same language is spoken (e.g. USA).

In the empirical evidence (e.g. Panizza, 1999; Freinkman and Plekhanov, 2005; Bodman et al., 2009; Tranchant, 2010), the positive relationship between ethnic (often noted ethnolinguistic) fragmentation and fiscal decentralization is mostly observed, in accordance with expectations. This research examines the impact of the merged index of ethnolinguistic fragmentation on various types of fiscal decentralization on the sample of 35 OECD countries and the reduced sample of 26 OECD countries (reduced on the basis of exclusion of countries with the lowest values of the Gini index) in the period 2000 – 2017. The obtained results of the dynamic panel data estimations are compared to those observed by employing separately the index of ethnic and linguistic fragmentation of the population. In the case of ethnolinguistic and ethnic fragmentation of the population, their impact on spending decentralization is significantly positive. Increase of the ethnolinguistic or ethnic diversity of the population mirrors in the increase of correspondent population heterogeneity and might induce higher differences in preferences. Local governments should refine them respecting local specifics in accordance with the promotion of fiscal decentralization in Decentralization Theorem (Oates, 1972; 1999). The fortified effect of explanatory variable on fiscal decentralization in the case of reduced sample of 26 OECD countries is not observed, inconsistently with the assumptions of Easterly and Levine (1997), Alesina, Baqir and Easterly (1999; 2000) or Yao (2007).

Recently, a massive wave of migration ended mostly in the EU member states. Many of them are also members of the OECD. In fact, it is possible, that in many of these countries the current evidence of ethnic and linguistic groups will not be refreshed up to the next census. But over the time, the population structure might change. The assimilation of migrants might increase the ethnic, linguistic and religious fragmentation of the population in these countries. On the other hand, currently many of ethnic and linguistic minorities claim their right of self-determination. Central and local governments will face the challenge to answer incoming specific needs connected with increasing heterogeneity of the population. Afterwards, the further re-examination of the relationship between the ethnolinguistic fragmentation of the population and fiscal decentralization might be relevant. But, in accordance with results of this research and with results of many previous researches, where the positive relationship between the ethnolinguistic fragmentation and fiscal decentralization is observed, with increasing ethnolinguistic fragmentation of the population governments should anticipate increased demand for local public goods.

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Appendix

Variable	Label	Explanation	Source	Expectation
Spending decentralization	*sd*	Share of subnational expenditure on general government expenditure	OECD	Dependent variable
Revenue decentralization	*rd*	Share of subnational revenue on general government revenue	OECD	
Tax decentralization	*td*	Share of subnational tax revenue on total subnational revenue	OECD	
Ethnic fragmentation	*EF*	a decreasing transformation of the Herfindahl concentration index	CIA	(+)
Linguistic fragmentation	*LF*	a decreasing transformation of the Herfindahl concentration index	CIA	(+)
Merged index of ethnolinguistic fragmentation	*maxF*	Maximum of EF and LF	Own	(+)
Population	*pop*	Country size, number of inhabitants	OECD	(–)
Population growth	*popg*	Population growth	OECD	(–)
GDP per capita growth	*gGDPpc*	real GDP per capita growth	OECD	(+) in high income countries
Income inequalities	*gini*	Gini Index	CIA	(–)
Unemployment rate	*unmp*	Unemployment rate	OECD	(–)
Inflation rate	*infl*	CPI	OECD	(–)
Public debt	*debt*	General government debt	OECD	(–)
Public deficit	*deficit*	Net lending/ net borrowing	OECD	(–)
Openness	*trade*	Export as % GDP + Import as % GDP	OECD	(–)
Government total revenue	*revGDP*	General government revenue as % GDP	OECD	(–)
Federal constitution	*fedcon*	Dummy variable, value 1 if country is a federation, otherwise 0.	CIA	(+)

Source: Own.