



## Immigration, ethnic fractionalization, and the fiscal burden in the OECD

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**Abstract.** This study considers the impact of immigration and ethnic diversity on government spending in 31 OECD countries over 25 years and compares the marginal effects for expenditures and revenues to approximate the fiscal burden. Results suggest that ethnic fractionalization, not immigration itself, has a negative impact on spending in the OECD. On the whole immigrants tend to contribute more in taxes than they cause in expenditures, at least relative to the averages for the population as a whole, but this effect is reversed for immigrants from poorer countries.

**Keywords.** immigration; ethnic diversity; fractionalization; government revenues; government expenditures.

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### 1. Introduction

Immigration continues to be a salient and contentious issue in most countries. Dempster et al. (2020) examine studies of global sentiment, and report that in 26 of 27 countries surveyed, more respondents wanted immigration into their countries reduced rather than increased. These same surveys, however, find that a plurality, and sometimes even a majority, remain in the “conflicted middle.” They recognize the economic value of immigrants, but they are hesitant about cultural and linguistic differences and also worry about labor market competition from immigrants and its effect upon wages.

In addition to concerns about employment competition for native workers, there is also concern about the fiscal burden of immigration for the public sector. Immigrants may increase the costs of education and other government services, particularly if they are from poorer countries, and the tax revenue they generate may take a generation to make up for it. Dustmann and Frattini (2014) estimated the marginal effects of immigration on the government budget, both in revenue and expenditures in the UK and concluded that immigrants from member states of the European Economic Area, particularly those from Eastern Europe, contributed a net fiscal surplus. However, they found that immigrants from other, poorer regions were a net fiscal burden, at least for the first generation.

Increased immigration may lead to a greater need for certain types of government spending, even though immigrants are often excluded from receiving benefits from the social safety net.

Immigration also directly increases the population of a country, and without an equal increase in government spending would lead to a decline in spending per capita. But immigration is also the chief source of rising ethnic diversity in many countries, and there is a literature arguing that voters are less likely to support many government services, and the taxes that pay for them, when they perceive those services being reallocated to other ethnic groups. Of course, it may depend on the type of service, with less support for education, redistribution, and public infrastructure, and more support for policing and public safety.

Member states of the Organization for Economic Cooperation and Development (OECD) govern only 13% of the world's population, but host over half of the world's foreign-born residents and make up most of the countries surveyed for global sentiment. Even Eastern Europe, which has far more emigrants than immigrants, is host to more than 20 million foreign-born residents (Parker, 2020). The average income in these countries is almost three times that of the rest of the world, and they tend to have democratic governments that protect civil liberties and consider the preferences of voters when setting spending levels. These countries have other characteristics as well that help make them desirable destinations for migrants, and as a result they host four times as many foreign-born residents per capita as the rest of the world.

In this study, we examine annual aggregate data for 31 OECD countries from 1995 to 2019, looking for evidence in country-level data that immigration alters government spending per capita. We also consider whether ethnic diversity, which we measure with the index of ethnic fractionalization, could be a better indicator of the impact.

In the next section, we review some of the literature on how immigration and ethnic fractionalization may affect government spending. In section 3, we discuss our data and its sources, and we explain our regression approach. In section 4, we report our results. These results begin with a comparison between OLS, between-country estimates, and both fixed and random effects. Checking for consistency due to the correlation between immigration and fractionalization, we then use the random effects model to consider the differential effects of immigration on revenue and three broad categories of government spending. In section 5, we check our estimates for robustness, and we report estimates for marginal revenues and expenditures per immigrant. Section 6 concludes the study.

## **2. The economic and fiscal impact of immigration**

Many studies find that the benefits of immigration exceed its costs for most recipient countries. For example, Edwards and Ortega (2017) estimated a substantial economic impact for the US, as unauthorized immigrants contributed over 3% to GDP and would have contributed almost 5% if existing immigrants were legalized and more easily able to switch jobs. Docquier et al. (2013) found that immigration into OECD countries increased the wages of less-educated natives and did not decrease native wages overall. Using bilateral migration data for 194 countries, Ortega and Peri (2009) found that migration increases the differences in income per capita between origin

and host countries, and also increases employment in host countries without crowding out native-born workers.

Nonetheless, there is significant opposition to immigration in recipient countries. Card et al. (2009) noted that although trade and migration have similar economic effects, public opposition to immigration is much stronger than it is for trade since it includes potential externalities on natives. Using the European Social Survey, individual attitudes appear to be based mostly on these “compositional amenities,” especially for less-educated natives. Can part of this anti-immigrant sentiment come from the fiscal burden that immigrants might create for the government?

## **2.1 Fiscal costs of immigration**

Even if immigration increases GDP for the host country, and even if more native workers may benefit from immigration than are harmed by it, there may still be other costs that lead to economic harm and political opposition. Jaime-Castillo et al. (2016) referred to this as the fiscal burden model, and using data from the European Social Survey found that anti-immigrant attitudes are strongly associated with the availability of social welfare benefits. Based on a study of three Latin American countries, Noy and Voorend (2016) argued that immigration causes a conflict between the specific rights of citizens and the social rights granted by the state to all residents.

Immigrants pay taxes and contribute to social welfare systems, and increased immigration may lead to a greater need for certain types of government spending even though immigrants are often excluded from receiving benefits from the social safety net. Some types of spending may be for nonrival public goods that do not increase with population, while other public goods may be congestible, e.g., roads and highways that become crowded as the population grows.

Smith and Edmonston (1997) reported estimates of the net fiscal burden of immigrants in both California and New Jersey, with public expenditures rising in excess of revenues for state and local governments. This was because immigrants tend to have more children and thus need more public education services, and because immigrants tend to be poorer than average and thus pay less in taxes to regional governments and receive more in income transfers. However, immigrants tend to pay more to the federal government than they receive back, and they and their children earn more income over time. It also depends on the origin country, as immigrants from Europe and Canada are more likely to provide a net fiscal surplus than immigrants from Central America.

Two decades later, a careful follow-up analysis that relied on accounting for age cohorts over time and the marginal costs of public goods estimated that immigrants in the US imposed a substantial fiscal burden, in the first, second, and even third generations (National Academies of Sciences, Engineering, and Medicine, 2017). The primary costs were for educating immigrant children and supporting impoverished retirees, while immigrants between the ages of 25 and 65 more than paid for themselves through their taxes. Orrenius (2017) objected that this study estimated of the fiscal cost of immigrants by assigning average government spending per capita

to them. Because a significant share of this cost comes from congestible public goods, the marginal cost of an immigrant was likely much lower, and the fiscal burden reversed. They noted, however, that education spending is the primary exception.

Hanson (2005) argued that low-skill immigrants in the US hurt a state's fiscal balance because they contribute less to tax revenues and their families put a heavy demand on public services, and this would be felt most in states with a stronger social safety net. Furthermore, public opposition to immigration in the US appeared to fit the fiscal burden model, in that the 1996 federal welfare reform act, which made it harder for immigrants to access the social safety net, reduced the opposition to immigration from higher-skilled native workers. However, Lee and Miller (2000) argued that the fiscal consequences of immigration should be too small to matter, relative to other costs and benefits, in setting immigration policy. They did note that immigration has distributional consequences between different levels of government, and between local levels when their immigration levels are different.

Auerbach and Oreopoulos (1999) estimated the fiscal impact of immigrants via a generational accounting method; in the long run immigrants reduce the fiscal burden for natives, they found, but in the short run they may add to it. A generational accounting study of immigrants in Austria found an overall positive fiscal balance (Mayr, 2005). Hansen et al. (2017) examined the impact of immigrants into Denmark and found that immigrants from developed economies tended to have a positive fiscal impact, while immigrants from poorer countries had a negative impact that diminished by the second generation.

Dustmann et al. (2010) reported that immigrants into the UK from Eastern Europe were much less likely to receive welfare benefits or live in social housing than native residents. Still, almost half of Europeans surveyed believed that new immigrants benefit more than they are taxed (Dustmann and Frattini, 2014), and only 8% believe they should have access to those benefits before their first full year of residence. In their study of immigration into the UK, Dustmann and Frattini carefully accounted for taxes, housing costs, and non-congestible public goods, and estimate that immigrants from the European Economic Area (EEA) countries contribute more to the fiscal balance than native workers, while immigrants from non-EEA countries tend to contribute less.

## **2.2 Immigrants and fractionalization**

Immigration is the chief source of rising ethnic diversity in many countries, and there is a significant literature arguing that voters are less likely to support many government services, and the taxes that pay for them, when they perceive those services being reallocated to other ethnic groups. Salient ethnic differences may undermine social cohesion and trust, particularly trust of the government itself. Of course, it may depend on the type of service, with less support for education, redistribution, and public infrastructure, and more support for policing and public safety.

After developing an index of fractionalization to measure ethnic, linguistic, or religious diversity

(Alesina et al., 2003), Alesina and Ferrara (2005) found significant international evidence that ethnic diversity reduces public support for funding the public sector. In sub-Saharan Africa, ethnic fractionalization – also called fragmentation in the literature – is associated with reduced public infrastructure, fewer years of schooling, and political instability (Easterly and Levine, 1997). Jofre-Monseny et al. (2016) studied immigration in Spain prior to the Great Recession and found municipalities with greater concentrations of immigrants were less likely to increase public spending that benefited immigrants.

Alesina et al. (2001) argued that the greater diversity of the United States relative to other OECD countries helps to explain why there is less public support for a European-style welfare state. The reluctance of voters to support public spending that may benefit other ethnic groups is relatively prominent in the US (Rugh and Trounstone, 2011), particularly as diversity rises over time, once cross-sectional differences are accounted for (Hopkins, 2009). Sunding and Zwane (2004) found that ethnic fractionalization was negatively correlated with support for local public goods in California. Mohanty et al. (2005) found that health care expenditures in the US were substantially lower for immigrants, at least before the Affordable Care Act was passed.

Diversity may lead to a rebalancing of public expenditures from public infrastructure to other goods such as public safety, which may or may not change total expenditures overall (Lee et al., 2016). Highfill and O'Brien (2015) examined the effect of ethnic diversity on nine categories of municipal spending in a 2002 cross-section of 417 US cities and found that the effects depended on the category of spending, and on whether diversity was measured narrowly and broadly. Alvarado and Creedy (1998) examined immigration in Australia and found that it increased social spending per capita. A study of immigrants in the EU-15 found they took sick leave more often, and used relatively more social welfare benefits (Rasmussen, 1997).

National-level data has some advantages. Trounstone (2013) notes that the correlation between government spending and ethnic diversity may be complicated at the local level by a type of Tiebout (1956) sorting, in which people with conservative racial views tend to prefer living in homogenous communities. Even after accounting for that, however, voters responded to increased ethnic diversity in their community by reducing their support for public expenditures, particularly when they believe that spending benefits minorities.

While the children of immigrants may lead to rising demand for education, Cutler et al. (1993) argued that voter preferences have a much larger effect on US public education spending per student. Poterba (1997) found that public school funding declined when the ethnic diversity of students exceeded that of the elderly in their states. Figlio and Fletcher (2012) found similar evidence.

In a study of US county-level data from the 2000 Census, Ajilore (2006) found that ethnic diversity leads to lower education spending per student. Coen-Pirani (2011) estimated that education spending in California is almost a quarter less than it would have been without the increased immigration of the last several decades. In a study of the effect on immigration on schools in Spain, Tanaka et al. (2018) found that immigration led to a large increase in public school enrollment accompanied by a shift of native schoolchildren into private schools and a

reduction in public school funding. In a cross-country study, Davide (2008) found that immigrant children led to more upper-income parents placing their children into private schools, declining tax revenues, and more crowding in public schools. Mavisakalyan (2011) argued that cross-sectional studies were appropriate because expenditure and immigrant shares don't respond quickly over time; he analyzed a cross section of 82 countries and found that immigration leads to reduced public school funding and thus increases private school enrollment.

Stichnoth and van der Straeten (2013) updated the evidence from cross-country studies, subnational studies, surveys, and experiments, and concluded the evidence was mixed, and the issue more complicated. The political climate, among other things, tended to matter, and a reduced lack of support from voters did not always translate into less spending. Schaeffer (2013) went further and performed a meta-analysis of 172 different empirical studies to evaluate the evidence. The evidence, they found, tended to support the hypothesis that ethnic diversity reduced social cohesion and support for spending on public goods more often than not, but it depended on many other factors.

### **3. Model and data**

The above literature review suggests two competing possibilities. On one hand, immigrants pay taxes and receive some government services. If those services are non-congestible public goods, we should expect to see a marginal expenditure on immigrants that is lower than the average cost of those services for the existing native population. If certain transfer payments are unavailable to immigrants, however, then those marginal costs might be very low. However, some services may be more expensive to provide to immigrants, due to language, cultural barriers, or even pre-existing health and educational deficits for immigrants from much poorer countries. This approach assumes that the OECD countries continue to provide immigrants with the similar levels of government services on the margin.

On the other hand, the OECD countries tend to be democracies in which voters may have some say on the level of government services provided, and if those voters are less willing to provide public services to a population that becomes ethnically more diverse, then we should see a reduced level of spending on the margin that is independent of the actual cost of providing those services. Both of these competing possibilities could be simultaneously true, and so our task is to decide which should be given greater weight. We do this through regressions for government expenditures and revenues that considers the impact of immigrant shares and ethnic fractionalization, and then calculating the implied marginal expenditures and revenues of an additional immigrant.

**Table 1.** OECD Data, average 1995-2019, Part 1.

Country	General Government Share of GDP					Frac Index (F)	2017 Dollar PPP GDP Per Capita (INC)	Unemp. rate (U)
	EXP	SOC	HED	OTH	REV			
USA	37.9	7.4	14.0	16.5	32.6	0.488	\$53,538	5.7
Australia	37.6	10.1	12.3	15.2	34.7	0.222	\$42,757	6.0
Japan	37.3	14.5	10.2	12.6	31.6	0.017	\$37,616	4.0
Rep. Korea	28.0	4.8	7.4	15.7	29.7	0.064	\$30,691	3.7
Israel	44.6	11.1	12.2	21.3	40.7	0.356	\$33,737	8.7
Switzerland	32.9	12.9	7.0	13.0	32.8	0.350	\$61,709	4.0
Norway	46.3	17.5	13.0	15.8	56.2	0.126	\$60,216	3.8
Iceland	46.3	9.2	15.0	22.1	46.3	0.028	\$46,086	3.9
Germany	46.6	20.0	10.9	15.7	45.0	0.174	\$46,428	7.3
France	54.7	22.5	13.2	19.1	51.1	0.147	\$41,461	9.6
Italy	48.8	18.6	10.8	19.4	45.6	0.100	\$42,337	9.9
Belgium	52.1	18.2	13.0	20.9	50.1	0.585	\$46,101	7.8
Netherlands	44.7	16.0	11.5	17.2	43.0	0.272	\$50,000	4.8
Luxembourg	41.6	17.0	9.8	14.9	43.5	0.298	\$102,100	4.3
UK	40.7	14.9	11.6	14.1	37.0	0.380	\$41,356	6.0
Ireland	36.2	12.7	10.2	13.4	33.5	0.158	\$55,630	8.3
Denmark	53.8	23.3	14.3	16.3	54.2	0.141	\$50,854	5.7
Greece	49.1	16.5	9.6	22.9	42.6	0.138	\$31,069	14.5
Spain	42.0	14.9	9.9	17.2	38.2	0.649	\$36,367	16.7
Portugal	45.8	15.4	12.4	17.9	41.0	0.155	\$30,800	8.4
Austria	51.5	20.8	12.6	18.1	49.1	0.217	\$49,791	5.0
Sweden	52.6	21.3	13.2	18.2	52.6	0.205	\$45,263	7.3
Finland	52.7	22.3	12.9	17.5	53.1	0.135	\$43,193	9.8
Poland	44.2	17.0	9.8	17.3	40.3	0.055	\$21,648	11.3
Hungary	49.3	15.7	10.5	23.1	44.5	0.193	\$23,799	7.6
Czechia	42.7	12.5	11.8	18.4	39.7	0.295	\$31,160	5.9
Slovakia	43.5	14.4	10.3	18.8	38.9	0.244	\$22,367	13.2
Estonia	37.8	11.5	11.1	15.2	38.0	0.475	\$25,320	9.2
Latvia	37.8	11.7	9.5	16.6	35.8	0.564	\$20,323	12.5
Lithuania	37.3	11.7	11.0	14.6	34.6	0.301	\$22,753	11.5
Slovenia	47.6	17.8	12.7	17.1	44.4	0.242	\$30,967	6.8

Our regression model is:

$$\ln\left(\frac{X_{i,t}}{N_{i,t}}\right) = \beta_0 + \beta_1\left(\frac{I_{i,t}}{N_{i,t}}\right) + \beta_2 F(I)_{i,t} + \beta_3\left(\frac{YI_{i,t}}{N_{i,t}}\right) + \beta_4\left(\frac{PI_{i,t}}{N_{i,t}}\right) + \sum_{j=1}^6 \gamma_j Z_{i,t} + \gamma_t t + e_{i,t}$$

where  $X_{i,t}$  is real public revenue or expenditure for country  $i$  in year  $t$ ,  $N$  is the total resident population, and the primary variables of interest are:  $I$ , the stock of foreign-born residents;  $F(I)$ , the index of ethnic fractionalization, itself an implicit function of  $I$ ;  $YI$ , the number of immigrants below the age of 18; and  $PI$ , the number of immigrants from poor, less-developed countries. Both  $YI$  and  $PI$  are subsets of  $I$ . In addition,  $Z$  is a vector of income and demographic variables that affect government spending per capita.

Our dataset is a balanced panel for 31 countries, out of the 38 OECD member states, for 25 years from 1995 to 2019. General government revenue (*REV*) and expenditures (*EXP*) are reported by the OECD as a share of GDP. There is a multi-year gap in revenue for both Iceland and Japan, which we interpolated using the UNR-WIDER dataset (United Nations University, 2021).

Total expenditures are divided into categories based on the classifications of the functions of government, or COFOG (United Nations, 1991). On average, the largest spending shares are for social protection, public services, health care, education, and economic affairs, a function which includes spending on items such as agricultural support programs and government support for energy production, transportation, and communication. Spending on other functions includes the functions of national defense, public order and safety, environmental protection, housing and community amenities, and the combination of recreation, culture, and religion. We group these into three broad categories: social expenditures (SOC), health and education (HED), and all other (OTH) expenditures. The first is primarily transfer payments, the second investments in human capital, and the third is presumably dominated by the provision of public goods.

These shares are reported in Table 1 by country, averaged over the 1995-2019 sample period. In this table, we also report 2019 GDP per capita (*INC*), measured in 2017 international dollars that adjust for inflation and purchasing power parity (PPP), and the average unemployment rate (*U*) over the sample period. These latter two variables come from World Bank (2021).

Finally, Table 1 shows the average value for the index of fractionalization, which is essentially the probability that two randomly selected individuals in any population are from different groups (Alesina et al., 2003). The Historical Index of Ethnic Fractionalization (*F*) comes from the Harvard Dataverse (Drazanova, 2019). This index is calculated as:

$$F_{i,t} = 1 - \sum_{k=1}^K (s_{i,t,k})^2,$$

where  $s_{i,t,k}$  is the population share of ethnic group  $k$  in country  $i$  and year  $t$ , out of  $K$  total ethnic groups identified in that country. Essentially, it is a reverse Herfindahl–Hirschman Index of ethnic concentration, scaled over the unit interval  $[0, 1]$ .

The number of foreign-born residents for each country are estimated and reported quintennially by the UN (United Nations, 2019). We interpolate for the years in between and divide by population to estimate the stock of foreign-born immigrants (*I*). Because the UN estimates include both origin and destination countries, as well as age groups, we are able to estimate the number of immigrants each country receives from less-developed countries as well as the number of immigrants younger than 18. These latter two variables are also divided by the country's total population to get the number of poor (*PI*) and young (*YI*) immigrants residing in each country.

The control variables are in the vector  $Z = [\ln(INC), U, Y/N, E/N, R/N, \ln(N)]$ , and they all come from World Bank (2021). Table 2 reports the mean values for most of these variables by country and averaged over the sample period.

Of course,  $\ln(INC)$  is the log of real GDP per capita, adjusted for inflation and PPP. The *INC* variable was already used to convert the government spending shares into total government

spending, and if government spending shares are invariant to per-capita income, the coefficient for this variable should be equal to one. The unemployment rate ( $U$ ) should be higher during recessions that increase the demand for government services for native and foreign-born residents alike.

Demographic variables include: the ratio  $Y/N$ , the share of total population below the age of 18;  $E/N$ , the elderly share of the population over the age of 65; and  $R/N$ , the rural share of the population. We expect that a higher share of children should increase the demand for education as well as for social support services, a higher share of elderly should increase spending on pensions and health care; and a more rural population should increase the average costs of many government services. Finally, we include  $\ln(N)$  to help capture any scale effects due to a larger population, particularly for non-congestible public goods.

**Table 2.** OECD Data, average 1995-2019, Part 2.

Country	Millions		Percentage of Population					
	Total Pop (N)	Total Immig (I)	Immig (I/N)	Young Imm (YI/N)	Poor Imm (PI/N)	Elderly (E/N)	Young (Y/N)	Rural (R/N)
USA	299.98	40.80	14.0	1.6	1.3	13.0	20.0	20.0
Australia	21.29	5.49	26.0	2.4	1.0	13.0	20.0	15.0
Japan	127.16	1.98	2.0	0.2	0.1	22.0	14.0	14.0
Rep. Korea	48.76	0.67	1.0	0.1	0.1	10.0	18.0	19.0
Israel	7.24	1.91	27.0	2.5	1.9	10.0	28.0	8.0
Switzerland	7.68	1.96	25.0	3.5	1.4	16.0	16.0	26.0
Norway	4.79	0.49	10.0	1.5	1.2	16.0	19.0	22.0
Iceland	0.31	0.03	9.0	1.9	0.1	12.0	22.0	7.0
Germany	81.99	9.69	12.0	1.0	0.4	19.0	14.0	24.0
France	63.66	7.05	11.0	1.0	1.1	17.0	19.0	22.0
Italy	58.59	4.26	7.0	0.9	0.4	20.0	14.0	32.0
Belgium	10.72	1.48	14.0	1.7	1.5	17.0	17.0	3.0
Netherlands	16.41	1.77	11.0	1.2	0.7	15.0	18.0	16.0
Luxembourg	0.50	0.18	36.0	4.4	0.1	14.0	18.0	13.0
UK	61.76	6.52	10.0	1.2	1.0	17.0	18.0	19.0
Ireland	4.28	0.58	13.0	2.6	0.1	12.0	21.0	39.0
Denmark	5.50	0.48	9.0	1.2	0.7	16.0	18.0	14.0
Greece	10.88	1.17	11.0	1.4	0.3	19.0	15.0	25.0
Spain	44.02	4.20	9.0	1.2	0.2	17.0	15.0	22.0
Portugal	10.37	0.75	7.0	1.0	2.7	18.0	16.0	41.0
Austria	8.31	1.24	15.0	1.6	0.3	17.0	16.0	41.0
Sweden	9.30	1.32	14.0	1.7	1.6	18.0	18.0	15.0
Finland	5.31	0.22	4.0	0.7	0.4	17.0	17.0	17.0
Poland	38.21	0.73	2.0	0.2	0.0	14.0	17.0	39.0
Hungary	10.05	0.40	4.0	0.5	0.1	16.0	16.0	32.0
Czechia	10.39	0.34	3.0	0.2	0.1	15.0	16.0	26.0
Slovakia	5.40	0.14	3.0	0.3	0.0	13.0	17.0	45.0
Estonia	1.35	0.23	17.0	0.6	0.0	17.0	17.0	31.0
Latvia	2.19	0.36	16.0	0.5	0.0	17.0	16.0	32.0
Lithuania	3.22	0.18	6.0	0.3	0.1	16.0	17.0	33.0
Slovenia	2.03	0.23	11.0	0.8	0.2	16.0	15.0	48.0

#### 4. Regression results

We begin by comparing approaches to our regressions. Table 3 reports these regression results for total expenditures ( $\ln(EXP/N)$ , the log of total real general government expenditures per capita) as the dependent variable. We estimate four regressions: Ordinary Least Squares (OLS) of pooled data in column 1, a purely cross-sectional Between Country (BC) regression in column 2, a country-specific Fixed Effects (FE) regression in column 3, and a country-specific Random Effects (RE) regression in column 4. Some studies argue that cross-section datasets are more appropriate for a study such as this because expenditure and immigrant shares change slowly over time (Mavisakalyan, 2011), while other studies argue that cross-sectional differences should be removed to better account for changes over time (Hopkins, 2009). It is clear from the first three columns of this table that some of the results may depend on this.

The OLS estimate of pooled data in column 1 of Table 3 provides the basic multivariate correlation embedded in the entire panel dataset containing both cross-sectional and over-time variation. The OLS estimates of pooled data are usually criticized because they do not control for unobservable country characteristics that could potentially bias the estimated coefficients. Since expenditures, immigration shares, and fractionalization indices change slowly over time, column 2 shows the BC estimates with a purely cross-sectional regression that uses average data for each country over all years, eliminating the within-country variation with just one observation per country.

To control for country-specific unobservable characteristics, we then use two different panel data methods. If the unobserved effects are correlated with the error term of the regression, then FE in column 3 is appropriate, but if the unobserved effects are uncorrelated with the error term of the regression, then RE in column 4 are appropriate. The FE regression is essentially an OLS regression on the pooled data with country-specific dummy variables appended, and as is conventional in the literature these dummy estimates are not reported to save space. The information exploited in the FE estimation exploits only the over-time or within variation of the data, as the cross-sectional variation is absorbed by the set of country specific dummy variables. The estimates reported in column 3 are thus the opposite of those reported in column 2, in that they only show the effects of within-country variation over time.

As columns 2 and 3 show, most of the variation in the data is contained in the over-time or within dimension. We consider then whether the statistically significant FE results in column 3 hold when combined with cross-sectional variation in a pooled regression that controls for unobserved cross-sectional heterogeneity. In other words, will the results of column 3 stay similar if the relevant covariates happen to change only slowly? To answer that question, we report the results of a random effects regression in column 4, an approach that exploits the full information in the dataset while at the same time controlling for unobservable country characteristics. This is our preferred specification. In a sense, the RE estimates are a weighted average of the between and within regressions in columns 2 and 3, thus nicely summarizing the information contained in the dataset.

**Table 3.** OLS, between, fixed effects & random effects regressions.

Dependent Variable is $\ln(EXP)$ , with standard errors				
Variables	(1) OLS	(2) BC Between	(3) FE Fixed Effects	(4) RE Random Effects
<i>I/N</i> Immigrant Shr.	-0.227* (0.128)	0.381 (0.843)	-0.442** (0.217)	-0.244 (0.180)
<i>F</i> Fractionalization	-0.216*** (0.037)	-0.257 (0.202)	-0.302*** (0.101)	-0.264*** (0.083)
<i>YI/N</i> Young Imm. Shr.	4.383*** (1.183)	15.630 (9.386)	-3.795*** (0.846)	-3.286*** (0.828)
<i>PI/N</i> Poor Imm. Shr.	6.035*** (0.865)	7.271 (5.008)	0.299 (1.200)	0.970 (1.142)
$\ln(INC)$ Income	1.190*** (0.024)	1.387*** (0.168)	0.825*** (0.047)	0.902*** (0.035)
<i>U</i> Unemployment	1.876*** (0.146)	2.609** (1.153)	1.072*** (0.117)	1.164*** (0.111)
<i>Y/N</i> Young Pop.	1.230*** (0.303)	1.757 (1.921)	-1.855*** (0.405)	-1.320*** (0.354)
<i>E/N</i> Elderly Pop.	2.646*** (0.277)	2.614 (1.872)	0.536 (0.376)	0.738** (0.306)
<i>R/N</i> Rural Pop.	-0.061 (0.055)	0.014 (0.289)	-0.334* (0.188)	-0.394*** (0.143)
$\ln(N)$ Scale	-0.034*** (0.004)	-0.045** (0.020)	0.002 (0.072)	-0.017 (0.015)
<i>T</i> Trend	-0.006*** (0.001)	-	0.001 (0.002)	-0.0004 (0.001)
<i>C</i> Constant	-3.336*** (0.272)	-5.564*** (1.747)	-	0.410 (0.443)
<i>Observations</i>	775	775	775	775
<i>R</i> <sup>2</sup>	0.910	0.934	0.864	-

Note: Significance \*\*\* at 1%, \*\* at 5%, \* at 10%.

#### 4.1 Baseline results for total expenditures

The OLS regression in Table 3 suggests there is enough variation in the pooled data, as shown by the statistical significance of many of the covariates. Total expenditures do not seem to increase together with immigration; in fact, the coefficient on immigration (*I/N*) is negative and statistically significant at 10%, but given caveats on the potential endogeneity bias discussed above, we prefer not to place much weight on the point precision of this result. The

fractionalization index ( $F$ ) seems to be negatively correlated with total expenditures, while the shares of both young immigrants ( $Y/N$ ) and poor immigrants ( $PI/N$ ) seem to move together with total expenditures. These effects do not hold up once we account for the endogeneity bias in columns 3 and 4 by controlling for unobserved heterogeneity.

In the control variables, the results appear to make intuitive sense. Government expenditures per capita increase with income, unemployment, the share of young people in the population, and the share of elderly people. The coefficient on income is greater than one, consistent with Wagner's Law that the government's share of economic activity rises with income (Wagner, 1890), but the size of this coefficient appears to be biased upwards in the OLS model. There even appears to be a negative scale effect, so that the larger countries (e.g., the USA) spend less per capita, and the time trend in spending is negative.

The results in column 2 illustrate that most of the variation is within countries, not between. The coefficient for income elasticity is even larger, as is the coefficient for the unemployment rate. Similarly, the scale effect appears to be driven by between-country differences, not changes over time. All other coefficients in this regression are statistically insignificant.

Column 3 shows the within-country estimates. In contrast with Column 2, more estimated coefficients are statistically significant at conventional levels. In particular, immigration, fractionalization, and the share of young immigrants all display negative correlation with total government expenditures per capita. The coefficient on income remains significant and positive, but appears to be significantly less than one, and the correlation between unemployment and expenditures is also significant but smaller once the between-country variation is removed. A greater share of young people in the population has a negative coefficient, as does the effect of rural population share, but the scale and trend effects disappear.

Column 4 displays the random effects estimates which nicely summarize the information in the data uncontaminated by unobserved heterogeneity. The share of immigrants in the population does not correlate positively with total government expenditures per capita and is therefore unlikely to be a source of expansion of the welfare state as feared. Fractionalization, however, has a negative and statistically significant coefficient, as does the share of young immigrants, the share of young people in the population, and the share of rural residents. The coefficient for income elasticity remains statistically significant and positive, but less than one, suggesting that government spending in this sample does not keep pace with economic growth. The coefficient for the unemployment rate remains positive and mostly unchanged from the fixed effects model. There does not seem to be a population scale effect, and nor do poor immigrants appear to pose a significant burden on public finances.

**Table 4.** Alternative random effect regressions.

Dependent Variable is $\ln(EXP)$ , with standard errors				
Variables	(1)	(2)	(3)	(4)
<i>I/N</i> Immigrant Shr.	0.162 (0.143)			
<i>F</i> Fractionalization		-0.286*** (0.084)		-0.275*** (0.082)
<i>YI/N</i> Young Imm. Shr.			-2.792*** (0.703)	-2.675*** (0.699)
<i>PI/N</i> Poor Imm. Shr.			0.273 (1.101)	0.572 (1.097)
$\ln(INC)$ Income	0.974*** (0.032)	0.928*** (0.033)	0.948*** (0.032)	0.917*** (0.033)
<i>U</i> Unemployment	1.187*** (0.112)	1.163*** (0.111)	1.178*** (0.112)	1.165*** (0.111)
<i>Y/N</i> Young Pop.	-0.789** (0.342)	-1.139*** (0.351)	-0.948*** (0.340)	-1.230*** (0.348)
<i>E/N</i> Elderly Pop.	0.950*** (0.309)	0.686** (0.286)	0.998*** (0.286)	0.889*** (0.286)
<i>R/N</i> Rural Pop.	-0.222 (0.136)	-0.441*** (0.145)	-0.188 (0.131)	-0.368*** (0.141)
$\ln(N)$ Scale	-0.015 (0.016)	-0.018 (0.016)	-0.013 (0.015)	-0.015 (0.015)
<i>T</i> Trend	-0.002** (0.001)	-0.001 (0.001)	-0.002** (0.001)	-0.001 (0.001)
<i>C</i> Constant	-0.564 (0.409)	0.154 (0.423)	-0.302 (0.392)	0.194 (0.416)

Note: Significance \*\*\* at 1%, \*\* at 5%, \* at 10%.

#### 4.2 The sensitivity of covariates

Immigration is correlated with fractionalization. More precisely, the four variables of interest (*I/N*, *F*, *YI/N*, and *PI/N*) are positively correlated with each other, with correlation coefficients of 0.39 between *I/N* and *F*, 0.33 between *I/N* and *YI/N*, and 0.37 between *I/N* and *PI/N*. Given this correlation, is it possible that the inclusion of all four variables is biasing the coefficient for immigration towards zero?

Table 4 shows the random effects model for expenditures per capita for four alternative specifications of these four variables. In the first, only *I/N* is included. In the second, only *F* is included. In the third, only *YI/N* and *PI/N* are included. In the last, only *I/N* is excluded. The results are consistent with each other, and with the results reported in column 4 of Table 3. The immigrant share of population does not have a statistically significant effect on expenditures per capita in

these regressions, while both fractionalization and the share of young immigrants both have a negative effect. Other coefficients remain largely unchanged, except that the coefficient on the time trend becomes statistically significant (and negative) when F is excluded, and the rural share becomes insignificant.

#### **4.3 Results for government revenue**

In the first column of Table 5, we show the results of a random-effects regression for general government revenue. Once again, immigration is uncorrelated with the fiscal variable, while fractionalization shows a negative correlation. The quantitative size of the fractionalization coefficient is roughly half the size estimated for total expenditures.: -0.149 in column 1 of Table 5 versus -0.264 in column 4 of Table 3). Young immigrants are associated significantly with a reduction of revenue.

Other effects are mostly similar. The income elasticity is estimated to be positive but less than one, while the unemployment rate seems to have a positive effect, *ceteris paribus*. This seems counterintuitive, but it is only a quarter of the size of the coefficient for expenditures and may be the consequence of the combined contributions of employees and employers to unemployment insurance programs. A larger share of young people has a marginally negative coefficient, while the population share of elderly has a larger and more significant positive coefficient and a more rural population has a negative one, possibly the result of taxes on savings accumulated in retirement and pension funds. Finally, there appears to be both a negative scale effect and a negative time trend.

#### **4.4 Results for different types of expenditures**

Columns 2, 3 and 4 of Table 5 report the random-effect regression results of covarying immigration and fractionalization on three different types of expenditures. Using the spending functions reported by the OECD, we divide these into social protection expenditures (SOC), health and education expenditures (HED), and all other expenditures (OTH).

Among the covariates of social spending in column 2, we can see that immigration is not statistically significant whereas fractionalization, the share of young immigrants, the share of young population, and the share of poor-country immigrants are all negatively and significantly correlated. The levels of real per-capita income and the share of elderly both co-move positively with social spending, as expected.

For health and education expenditures, which are an approximation of human capital investments, the covariates are shown in column 3.

**Table 5.** Random effect regressions for different fiscal variables.

Dependent Variables: (1) Total Revenue; (2) Social Expenditures; (3) Health + Education; (4) Other				
Variables	(1) REV	(2) SOC	(3) HED	(4) OTH
<i>I/N</i> Immigrant Shr.	0.152 (0.139)	-0.116 (0.249)	-0.125 (0.187)	-0.628** (0.262)
<i>F</i> Fractionalization	-0.149** (0.066)	-0.356*** (0.118)	0.002 (0.086)	-0.255** (0.118)
<i>YI/N</i> Young Imm. Shr.	0.507 (0.611)	-3.717*** (1.080)	-0.822 (0.865)	-4.477*** (1.264)
<i>PI/N</i> Poor Imm. Shr.	-0.104 (0.852)	-5.025*** (1.510)	4.384*** (1.191)	2.905* (1.714)
<i>ln(INC)</i> Income	0.920*** (0.028)	0.779*** (0.051)	0.940*** (0.036)	0.941*** (0.049)
<i>U</i> Unemployment	0.251*** (0.083)	1.898*** (0.146)	0.171 (0.116)	1.204*** (0.169)
<i>Y/N</i> Young Pop.	-0.450* (0.272)	-2.975*** (0.486)	-2.536*** (0.368)	-0.782 (0.519)
<i>E/N</i> Elderly Pop.	1.707*** (0.232)	1.753*** (0.414)	-0.406 (0.319)	0.287 (0.453)
<i>R/N</i> Rural Pop.	-0.272** (0.116)	-0.252 (0.210)	-0.510*** (0.148)	-0.272 (0.198)
<i>ln(N)</i> Scale	-0.059*** (0.015)	0.009 (0.029)	-0.019 (0.016)	-0.026 (0.019)
<i>t</i> Trend	-0.002** (0.001)	0.005*** (0.002)	0.002 (0.001)	-0.006*** (0.002)
<i>C</i> Constant	0.006 (0.357)	0.554 (0.648)	-0.941** (0.460)	-0.885 (0.621)

Note: Significance \*\*\* at 1%, \*\* at 5%, \* at 10%.

Once again, the immigrant share of population is not significantly correlated, but the coefficient for both ethnic fractionalization and the share of young immigrants are also not statistically significant. However, a larger share of immigrants from poorer countries is positively related to spending on health and education, and the difference with social protection spending is notable. Both a younger population and a more rural population are inversely associated with health and education expenditures, while the income effect remains significant but less than one.

Finally, column 4 of Table 5 has a negative and significant coefficient for the share of immigrants on all other expenditures, as does ethnic fractionalization and the share of young immigrants. The coefficient for the share of poor-country immigrants is marginally positive. Other expenditures are also significantly associated with higher per-capita income and a higher unemployment rate, but not with the demographic variables or the country population. There does appear to be a negative time trend.

## 5. Interpreting the results

How can we interpret these results? Our first task is to determine whether our estimated coefficients are robust to specification. We then use our estimated coefficients to calculate the marginal effects of an additional immigrant on government revenues and expenditures, in order to determine whether or not immigrants are a fiscal burden on OECD countries.

### 5.1 Robustness

The results presented in Tables 3, 4, and 5 do not take into account either the strong inertial behavior of total government expenditures (or revenue) from year to year or the possibility that some or all of the covariates may themselves be endogenously explained by the dependent variable.

The strong inertia in government spending is well known and is present in our dataset, as about 72% of current year expenditures can be explained by the previous year's expenditure. Excluding the lagged dependent variable may lead to apportioning explanatory power to variables that may not truly have it.

The dynamic panel estimation procedure of Arellano and Bond (1991) is an econometric specification that helps control for both inertia in the dependent variable and also controls for the endogeneity of the set of right-hand side covariates. The second lags of the right-hand-side covariates act as instruments, and the first lag of the dependent variable is included as a right-hand-side regressor. Table 6 presents the results from the Arellano-bond regressions. Instead of just the level of real government expenditures per capita, the dependent variable can be thought of as a quasi-first difference of these expenditures, i.e.,  $\ln\left(\frac{EXP_t}{N_t}\right) - 0.72 \ln\left(\frac{EXP_{t-1}}{N_{t-1}}\right)$ , across all four columns.

Column 1 of Table 6 includes all four of our variables of interest. Column 2 excludes all but immigration, column 3 excludes all but fractionalization, and column four includes only young and poor immigrant ratios. These results stay qualitatively similar to the ones presented so far. The coefficient for immigration is negative but insignificant, regardless of whether the other three variables are excluded, while fractionalization is negative and statistically significant either way. Both the share of young immigrants and the share of poor-country immigrants have statistically insignificant coefficients, whether or not immigration rates and fractionalization indices are included.

For the remaining control variables, there are some differences. The income elasticity remains positive and significant but is much smaller, while the effect of the unemployment rate reverses sign. The share of young people has a negative coefficient that is consistently significant, while the share of elderly is either insignificant or marginally significant at the 10 percent level. Rural shares are insignificant in the Arellano-Bond estimates, as are scale effects and time trends.

As a second way to deal with inertia in the lag dependent variable (and the lack of independence across different observations over time), we tried to run regressions in which the time dimension is collapsed, averaging observations every five-year period for each country, i.e., 1995, 2000, 2005, 2010, and 2015 only. This was especially relevant given how the annual number of foreign-born residents was interpolated from quinquennial statistics. Unfortunately, since most of the variation in our dataset is within countries in the time dimension (recall the insignificance of between regressions in Table 3), this procedure simply drops too much information by the side, preventing us from estimating the covariates on the right-hand side with any degree of precision at conventional statistical levels. We make those regressions available upon request but do not include them here, given space constraints.

**Table 6.** Arellano & Bond dynamic panel regressions.

Dependent Variable: Total Expenditures, with standard errors				
Variables	(1)	(2)	(3)	(4)
$\ln(EXP)_{-1}$ Lag Dep. Var.	0.711*** (0.031)	0.721*** (0.030)	0.715*** (0.030)	0.722*** (0.030)
$I/N$ Immigrant Shr.	-0.195 (0.261)	-0.106 (0.183)		
$F$ Fractionalization	-0.320*** (0.117)		-0.275** (0.111)	
$Y/N$ Young Imm. Shr.	1.033 (1.168)			1.285 (0.953)
$P/N$ Poor Imm. Shr.	0.738 (1.193)			1.146 (1.132)
$\ln(INC)$ Income	0.138*** (0.050)	0.149*** (0.047)	0.138*** (0.046)	0.169*** (0.048)
$U$ Unemployment	-0.356*** (0.120)	-0.364*** (0.117)	-0.372*** (0.116)	-0.334*** (0.120)
$Y/N$ Young Pop.	-1.716*** (0.370)	-1.466*** (0.339)	-1.635*** (0.343)	-1.398*** (0.330)
$E/N$ Elderly Pop.	-0.596 (0.387)	-0.752** (0.379)	-0.575 (0.379)	-0.694* (0.376)
$R/N$ Rural Pop.	-0.365 (0.235)	-0.163 (0.218)	-0.315 (0.229)	-0.162 (0.217)
$\ln(N)$ Scale	0.011 (0.088)	-0.067 (0.082)	-0.040 (0.078)	-0.080 (0.077)
$T$ Trend	0.002 (0.002)	0.002 (0.002)	0.002 (0.001)	0.001 (0.002)
$C$ Constant	1.943*** (0.638)	1.747*** (0.597)	1.955*** (0.600)	1.534** (0.611)

Note: Significance \*\*\* at 1%, \*\* at 5%, \* at 10%.

Another concern with our previous results is that there could be non-independence among some observations. This could be due, for example, to autocorrelation. In fact, we know already that this is the case given the high degree of inertia present in the dependent variable --and the high correlation of the dependent variable with many of the right-hand side covariates. Furthermore, the residuals of our previous regressions may also be affected by heteroskedasticity across the different cross-sections (countries). Therefore, correction of the variance-covariance matrix of residuals may be warranted to account for the potential for non-independence of observations across time and space and the consequent effect on residuals and standard errors in the variance-covariance residuals matrix.

In Table 7, we show the results of our regressions using Huber-White sandwich robust standard errors (Huber, 1967; White, 1980), a method equivalent to clustering by state. We run these regressions for total expenditures and revenues, as well as for our three general categories of expenditures. Our most important previous conclusions remain qualitatively similar, but in several instances the level of statistical significance falls below the 10% level.

**Table 7.** Random effect regressions with robust standard errors.

Variables	Dependent variables				
	(1) EXP	(2) REV	(3) SOC	(4) HED	(5) OTH
<i>I/N</i> Immigrant Shr.	-0.244 -0.338	0.152 -0.339	-0.116 -0.494	-0.125 -0.423	-0.628 -0.541
<i>F</i> Fractionalization	-0.264 -0.174	-0.149 -0.153	-0.356 -0.368	0.002 -0.273	-0.255 -0.22
<i>YI/N</i> Young Imm. Shr.	-3.286*** -1.07	0.507 -1.162	-3.717** -1.894	-0.822 -1.305	-4.477 -2.806
<i>PI/N</i> Poor Imm. Shr.	0.97 -3.158	-0.104 -2.612	-5.025* -3.055	4.384 -2.704	2.905 -4.015
<i>In(INC)</i> Income	0.902*** -0.094	0.920*** -0.104	0.779*** -0.139	0.940*** -0.0875	0.941*** -0.121
<i>U</i> Unemployment	1.164*** -0.188	0.251 -0.275	1.898*** -0.259	0.171 -0.211	1.204*** -0.331
<i>Y/N</i> Young Pop.	-1.32 -1.143	-0.45 -1.164	-2.975 -2.254	-2.536*** -0.929	-0.782 -1.392
<i>E/N</i> Elderly Pop.	0.738 -0.773	1.707** -0.723	1.753 -1.25	-0.406 -0.846	0.287 -0.972
<i>R/N</i> Rural Pop.	-0.394** -0.17	-0.272 -0.23	-0.252 -0.457	-0.51 -0.344	-0.272 -0.274
<i>In(N)</i> Scale	-0.017 -0.017	-0.059** -0.028	0.009 -0.043	-0.019 -0.027	-0.026 -0.023
<i>t</i> Trend	-0.001 -0.003	-0.002 -0.003	0.005 -0.006	0.002 -0.004	-0.006* -0.003
<i>C</i> Constant	0.41 -1.233	0.00559 -1.404	0.554 -1.815	-0.941 -1.102	-0.885 -1.465

Note: Significance \*\*\* at 1%, \*\* at 5%, \* at 10%.

Important qualifications need to be made. In general, across all regressions in Table 7, the sandwich procedure increases standard errors to account for a reduction in the effective number of independent observations and the consequent increase in noise in the estimates implied by the loss of degrees of freedom. In general, the variable most affected by the loss of precision in the estimates is ethnic fractionalization, which loses its statistical significance at conventional levels in all regressions compared to the case presented before when adjustment was not made for the non-independence of observations. Additionally, other variables also lose their statistical significance at conventional levels, including young and old population shares in column 1; fractionalization, unemployment, young and elderly population shares in column 2; young and elderly population shares in column 3; poor immigrant and rural shares in column 4; and poor immigrant and young population share in column 5.

Nonetheless, our conclusions about the effect of immigration on the fiscal burden of immigration are not substantially altered. Given that most of the variation we rely upon to estimate the covariates in this dataset is within countries over time, we expect we could recover the statistical significance of our coefficient estimates with a longer dataset. Such a dataset would help overcome the problem of the clustering of certain observations for each country. When properly accounted for, those clusters of correlated observations reduce the precision of the estimates by effectively reducing the degrees of freedom available.

## 5.2 The fiscal burden of immigration

How do our regression results translate into an estimate of the fiscal burden of immigration? The essential problem is that we cannot separate out what countries should spend to address the costs of public services from what they choose to spend, and that choice in a democratic society is affected by that society's view of immigration and ethnic difference. We can, however, estimate the observed marginal revenue and marginal expenditure of an immigrant, and compare those to the average revenue and average expenditure of the existing population.

We assume that a country's ethnic fractionalization is an implicit function of the share of foreign-born residents. In a separate random-effects regression, we estimate a marginal coefficient of  $F'=0.747$ . Then using the reported point estimates from our random-effects regressions, we calculate the first derivative for both revenue and total expenditures. The marginal effect of an immigrant (*MEI*) is:

$$MEI_{i,t} = \frac{dX_{i,t}}{dI_{i,t}} = \frac{X_{i,t}}{N_{i,t}} \left[ 1 + \beta_I \left( 1 - \frac{I_{i,t}}{N_{i,t}} \right) + \beta_F F' \left( 1 - \frac{I_{i,t}}{N_{i,t}} \right) \right]$$

where  $\beta_I$  and  $\beta_F$  are the random effects point estimates for  $I/N$  and  $F$ . We calculate these marginal effects for each observation in our sample, and then compare them to the observed revenue and expenditure per capita.

For the entire sample, the marginal government expenditure per immigrant averages around \$4,600 per year, compared to an average expenditure per capita of \$7,100. The average ratio of marginal to averages is 61%. If we instead use the coefficients from our Arellano-Bond estimates in Table 6, marginal expenditures per immigrant average out to 62% of the average expenditure.

The marginal government revenue per immigrant averages around \$7,400 per year, or about 104% of the average revenue per capita. Because the marginal revenue exceeds the marginal cost, our estimates suggest that immigrants are not likely to be a fiscal burden, at least not in general.

By relying on the fact that  $\partial N/\partial I = \partial I/\partial YI = \partial I/\partial PI = 1$ , as  $I$  is a subset of  $N$  and both  $YI$  and  $PI$  are subsets of  $I$ , we can also derive the marginal effect per young immigrant ( $MEYI$ ) as:

$$MEYI_{i,t} = \frac{dX_{i,t}}{dYI_{i,t}} = \frac{X_{i,t}}{N_{i,t}} \left[ 1 + \beta_I \left( 1 - \frac{I_{i,t}}{N_{i,t}} \right) + \beta_F F' \left( 1 - \frac{I_{i,t}}{N_{i,t}} \right) + \beta_{YI} \left( 1 - \frac{YI_{i,t}}{N_{i,t}} \right) \right]$$

For young immigrants, the estimated marginal expenditure is estimated to be -263% of total expenditures per capita, a result that is perhaps consistent with research findings that voters reduce educational spending when more immigrants are in schools (e.g., Tanaka et al., 2018; Davide, 2008; Mavisakalyan, 2011). In. Using the Arellano-Bond estimates, the marginal expenditure comes out higher, but the coefficient for  $\beta_{YI}$  was statistically insignificant. In contrast, the estimated marginal revenue per young immigrant averages around 154% of average government revenue per capita.

We can also derive the marginal effect per poor-country immigrant ( $MEPI$ ) as:

$$MEPI_{i,t} = \frac{dX_{i,t}}{dPI_{i,t}} = \frac{X_{i,t}}{N_{i,t}} \left[ 1 + \beta_I \left( 1 - \frac{I_{i,t}}{N_{i,t}} \right) + \beta_F F' \left( 1 - \frac{I_{i,t}}{N_{i,t}} \right) + \beta_{PI} \left( 1 - \frac{PI_{i,t}}{N_{i,t}} \right) \right]$$

The estimated marginal expenditure per poor-country immigrant averages 157% of total expenditures per capita, or 135% with the Arellano-Bond estimates, while the estimated marginal revenue per poor-country immigrant averages 93% of total expenditures per capita. This suggests that immigrants from poorer emerging economies – those officially labeled as less developed economies by the World Bank – may be the exception, that fiscal revenues government receive from them or because of them are outweighed by the fiscal cost of the government services they receive. While immigrants in general are not likely to be a fiscal burden for the OECD countries, those from poor countries appear to be.

## 6. Conclusion

In this study, we examined government revenue and expenditures for 31 OECD countries over 25 years, in an effort to determine whether immigration created a significant fiscal burden, and whether growing ethnic diversity – as measured by the index of ethnic fractionalization – led to

less support for public goods. These two effects are potentially contradictory; the immigration rate is correlated with fractionalization, but it is also correlated with the share of school-age and poorer immigrants. To better capture this, we calculate the marginal effects of immigrants in general, as well as the marginal effects of both young and poor immigrants.

Results over time from a fixed effects model are different from the cross-section regression of country means. Just because countries with a greater share of immigrants may have more government spending per capita does not mean that more immigrants will lead to more spending. We try to capture both of these effects with a random effects model. We find that immigration alone is not a statistically significant explanatory variable for spending, but may be significant in the presence of other immigration-related variables. Ethnic fractionalization, in particular, does appear to have a consistently negative effect on spending.

In addition to comparing revenue and total expenditures, we look at three general categories of government spending. A rising share of immigrants appears to only reduce government expenditures on social protection, health, and education spending is removed. Fractionalization, on the other hand, appears to reduce both all expenditures except those on health and education. Immigrants from poorer countries appears to be associated with less spending on social protection but more spending in other areas, while young immigrants are associated with less spending in all areas.

Consistent with the findings of Dustmann and Frattini (2014), among others, our estimates suggest that immigrants do not impose a fiscal burden for OECD countries on average. Instead, they appear to contribute more to the government's fiscal budget than native residents, and they absorb fewer expenditures. We find, however, that immigrants from less-developed economies are the exception. Their marginal government revenues tend to be smaller than average, and their marginal government expenditures are larger.

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