The fiscal impact of immigration in the United States: Evidence at the local level*

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Preliminary - Comments are welcome.

Abstract

This paper studies the causal impact of immigration on provision of locally provided public goods using US county-level data from 1990 to 2010. We uncover substantial heterogeneity in fiscal effects depending on the skill levels of immigrants and across locations in the US. The inflows of high-skilled immigrants result in an increase in per capita expenditures at the local level, while the inflows of low-skilled immigrants have the opposite effect. This is mainly due to the asymmetric impact different types of immigrants have on locally generated per capita revenues. Movements in per capita property, sales and income taxes, trace movements in per capita income and housing prices in response to immigrant inflows. This results in change of both the level and composition of per capita expenditures, because intergovernmental transfers do not fully offset the changes in own revenues. While the federal government smooths out the shock to local revenues to some extent, state governments may exacerbate it due to spatially correlated immigration shocks. The fiscal impacts substantially differ across US counties due to differences in terms of the type of immigrants they receive. There is some evidence that the impact of second-generation immigrants on local public finances is more positive than that of the first-generation.

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1 Introduction

A defining feature of immigration is that it affects multiple aspects of the destination country, differently from other dimensions of globalization. To design an optimal migration policy, it is crucial to know the impact of immigrants through each and every channel. From an economic point of view, immigrants affect the destination country's: labour markets; welfare state (through fiscal effects); markets of goods and services (through changes in prices, production patterns, trade, FDI, innovation); housing market; etc.[1] The academic migration literature in economics has devoted a great deal of attention to the labor market channel. Yet other economic effects are also very important. In particular the fiscal impact of immigration – by which we mean the impact of immigration on public (tax) revenues, provision of public goods and services and in general the size of the welfare state – is at least as important.[2] In this paper we estimate the fiscal impact of immigration in the United States at the local (county) level.

Fiscal impacts are key to understand the political and policy response to immigration. Voters care about disposable income (income net of taxes) as well as public goods and services that enter the utility function. Immigration can affect both tax rates and the quality and quantity of goods and services provided by the government. Several papers on attitudes towards immigrants show that voters take these effects into account when they form an opinion about immigration.[3] Individuals, especially high-income ones, are concerned that they might pay higher taxes as a consequence of (low-skilled) immigration.[4] Voters also worry about overcrowding of schools, hospitals and public transportation when immigrants arrive (Hainmueller and Hiscox, 2010). At the same time, both tax payers and governments realize that immigration can make a positive net contribution to the fiscal health of a country, for example in contexts characterized by population aging.[5]

Yet not many academic papers focus on fiscal effects. In the case of the United States, some analyses follow an accounting methodology and evaluate the fiscal impact of immigrants by calculating their use of public services and contribution in terms of tax revenues.[6] The literature also comprises works that use macroeconomic models to simulate the effect of immigration on governments' revenues and expenditures (Storesletten, 2000). These studies are insightful and have contributed a great deal to our understanding of fiscal effects. However the approaches used require a multitude of assumptions – such as to what extent immigrants increase the cost of public goods like roads – and some of the indirect fiscal effects of immigration through other channels (labor, housing and capital

[1] From a non-economic point of view, immigrants can bring cultural, security/crime and political changes.

[2] The recent influential report on immigration by the U.S. National Academies of Sciences, Engineering, and Medicine (NASEM, 2016) devotes 2 chapters to the labor-market channel, 3 chapters to fiscal effects and 1 chapter to all other economic impacts.

[3] Importantly, public opinion polls show that fiscal effects are "more important for individuals' assessments of immigration policies than concerns about wages or employment" (Dustmann and Frattini, 2014). The reason might be that fiscal effects impact everybody while labor market effects are more concentrated.

[4] See Dustmann and Preston (2005), Hanson et al. (2007), Facchini and Mayda (2009).

[5] See Börsch-Supan et al. (2019) and Mayda (2019).

[6] See Borjas (1994), Smith and Edmonston (1997), Auerbach and Oreopoulos (1999), Auerbach and Oreopoulos (2000) and NASEM (2016).

markets[7]) may not be taken into account. Importantly, no study *estimates* the effect of immigration on public finances in the United States.

In this paper we carry out the first analysis in the literature of the *causal* impact of immigration on public revenues and spending at the local level in the United States. We investigate the effect of overall immigration as well as low-skilled and high-skilled immigrants. We use detailed U.S. county-level data in the period 1990-2010 and estimate the effect of immigration using instrumental variables for overall, low-skilled and high-skilled immigrants as in Mayda et al. (2022). The reduced-form approach accounts for both direct and indirect fiscal effects. We can observe local public revenues and spending disaggregated by type (as in Feler and Senses (2017)), which allows us to shed light on the mechanisms of impact. Related to this, one important question is to what extent the local fiscal effects of immigration are offset by adjustments that involve the state and federal levels of government, i.e. intergovernmental transfers. Our highly disaggregated data allows us to answer this question.

Immigration represents a labor supply shock that affects the size and composition of the local population. Composition effects can lead to changes in average per capita income at the county level, independent of any effect of immigration in the labor market. If immigrants differ from natives in terms of income, their arrival will impact the local per capita tax base (average income, consumption and housing prices) and public revenues (per capita income, sales and property taxes). Most local governments in the United States have a balanced budget requirement which means that, when immigrants arrive, policymakers need to adjust either tax rates or per capita expenditures – on locally provided public goods and services – to go back to balance.

We find that the impact of (overall) immigration on provision of public goods and services is null on net at the local level. We also uncover substantial heterogeneity in terms of the impact of immigrants with different skill levels. When we differentiate between low-skilled and high-skilled immigrants, which we define as having respectively below or at least a college education, we find that the former have a negative and significant impact on revenues and expenditures, while the latter have a positive and significant effect. Our results for low-skilled and high-skilled migrants are consistent with a framework in which tax rates do not fully adjust to immigration-induced changes in the local tax base, hence per capita government revenues and benefits are affected.[8] We also find that the fiscal effect of immigrants is unevenly distributed across counties in the United States – because some of them receive mostly low-skilled immigrants while others mostly high-skilled ones. Finally, the results are heterogeneous across generations as well, as the second-generation has a more positive fiscal impact than the foreign born.

To carry out a reduced-form analysis, there needs to be enough variation in the data. Yet, in many countries in the world, welfare states mostly work at the national level, where local fiscal revenues depend predominately on population based transfers from the national

[7]See, for example, Colas and Sachs (2020) and Clemens (2021).

[8]If tax rates fully adjusted to the arrival of low-skilled and high-skilled immigrants, respectively up and down, we would observe no significant impact on per capita tax revenues and expenditures.

level, leaving researchers with too few observations. To be able to exploit variation at the local level, localities within a country must have fiscal autonomy, which is the case for the United States. Unlike in other industrialized countries, local governments in the United States raise most of their revenues from own sources – according to our calculations, transfers from other parts of the government account, on average, for only 41 percent of county-level revenues between 1990 and 2010. Local jurisdictions rely heavily on own property tax and sales tax revenues. Fiscal autonomy on the revenue side implies that provision of public services – such as education, fire and police protection, parks and recreation, public transport, and public housing for low-income families – is also highly localized in the United States. Jurisdictions can tailor spending and service provision according to local priorities. This leads to a great deal of variation which we exploit in the empirical analysis. In particular, we look into the black box of local public finances and examine separate items of government revenues and public expenditures in terms of the impact of low-skilled and high-skilled immigrants.

On the revenue side, we find that the main results are more pronounced when we restrict attention to revenues from own sources, which exclude intergovernmental transfers. Indeed, we show that transfers to the county from the federal government partially offset the local impact of immigration. They increase when low-skilled immigrants arrive to the county but decrease (although not significantly) when high-skilled immigrants come. At the opposite extreme, transfers from local governments move in the same direction as county-level own revenues. This is consistent with immigrant flows being correlated at the local level – hence insurance cannot take place – but less so at the national level – which implies that the federal government can partly insure counties for negative fiscal shocks. These results are related to evidence from the literature that fiscal effects have uneven impacts at different levels of government, as they are on average more negative at the local level than at the aggregate level (NASEM, 2016). Our findings imply that transfers in part smooth out these uneven effects.

Still on the revenue side, we show that an important channel of impact is property tax revenues – in line with the fact that U.S. local governments rely heavily on these entries – which are negatively and positively affected by, respectively, low-skilled and high-skilled immigrants. These effects seem to work through house prices, which decrease when low-skilled immigrants arrive and increase when high-skilled immigrants come. Other taxes such as sales, income and license taxes follow the same patterns.

On the expenditure side, we find that local expenditures on education are not affected by the arrival of low-skilled or high-skilled immigrants, which suggests that transfers by other parts of the government are in part directed to this expenditure item. The arrival of low-skilled immigrants reduces expenditures on infrastructure and public welfare, while the inflow of high-skilled immigrants increases these expenditure items. Interestingly, high-skilled immigration leads to a *reduction* in "law and order" spending, which might be driven by the decrease in violent and property crime rates that this type of immigration implies, as we estimate in the data.

Overall, both on the revenue and expenditure sides, given the high degree of autonomy of regional governments, local politics can matter. Indeed, a key aspect of our analysis is to

explore whether our results are driven by *automatic* adjustments of the welfare state to the arrival of immigrants, for a given extent of redistribution, or by political-economy responses that affect the type of adjustment, composition and size of the welfare state ("preferences for redistribution"). Political considerations can determine whether policymakers decide to change tax rates vs. per capita benefits in response to immigration – these adjustment mechanisms are associated with opposite (relative) effects on rich vs. poor voters. Politics can also shape the impact of immigration on the relative weight of different items on the expenditure side (say law and order vs. education). Finally, political considerations can lead to changes in the overall extent of redistribution. A growing literature analyzes preferences for redistribution and how they are impacted by, among other factors, the arrival of immigrants. Our results speak to this literature. In particular, the negative (positive) impact of low-skilled (high-skilled) migration on public revenues and expenditures could be interpreted as driven by less (more) appetite for redistribution (as opposed to automatic adjustments of the welfare state).

An important challenge in the analysis of the link between immigration and fiscal outcomes is plausibly establishing causality. The main concern in the empirics is endogeneity driven by sorting of immigrants into specific localities, potentially as a function of the local tax rates and public goods and services (such as schools, transportation, health care, etc). We address this issue by employing a shift-share IV estimation strategy which passes stringent robustness tests. We use a modified version of the Card instrument (first introduced by Altonji and Card (1991) and Card (2001)), which we adjust to make skill-specific. We leverage the different timing and size of the *national* inflow of low-skilled and high-skilled immigrants by country of origin and apportion them to the local level using the 1980 shares of immigrants from each country of origin across U.S. counties (as in Mayda et al. (2022)). We show that the instrument-predicted changes in immigrant shares over the period of analysis (between 1990 and 2010) do not predict changes in our main outcome variables in a previous period (between 1980 and 1990) (as in Autor et al. (2013)). We confirm the robustness of our results when we control for lagged changes in outcome variables (between 1980 and 1990) as in Dix-Carneiro et al. (2018): this specification is another way to address concerns about pre-existing trends in local public revenues and spending that could be correlated with (future) migration shocks. We also find that the initial (1980) shares, in particular those with the highest Rotemberg weights, are exogenous and not correlated with pre-treatment trends (following Goldsmith-Pinkham et al. (2020)). Finally, we confirm our results using the aggregate shock representation (in our case the national migration inflows by country of origin), following Borusyak et al. (2022).

The rest of the paper is organized as follows. In Section 2 we review the literature on the impact of immigration from a public finance point of view. Next, in Section 3, we develop the theoretical framework of the paper, under the alternative scenarios of the *tax adjustment model* and the *benefit adjustment model*. Section 4 describes the data on immigration and local public finances and the basic correlations we find. Next, Section 5.1 presents the OLS results, while Sections 5.2 and 5.3 discuss the identification strategy and IV results. We present estimates of the impact of immigration on additional outcome variables in Sections 6. Section 7 focuses on the role of second generation immigrants and Section 8 concludes.

2 Related literature

Our paper is directly related to the literature on the fiscal impact of immigration, as well as to papers that analyze the political-economy link between immigration and the welfare state. We will focus first on the former literature which Dustmann et al. (2017) divide into two broad groups of articles, depending on whether they follow a "static" or a "dynamic" approach.

Static analyses of the fiscal effects of immigration compare the current impact of immigrants and natives taking into account their use of public services and contribution in terms of tax revenues. These papers adopt an accounting methodology based on public accounts information, for each item of expenditures and revenues, as well as group-specific weights for immigrants vs. natives. Analyses of this type have focused on Norway (Bratsberg et al. (2010) and Bratsberg et al. (2014)), Sweden (Hansen and Lofstrom (2003); Ruist (2014)), Germany (Riphahn (2004)), the United States (Borjas (1994)), and the United Kingdom (Dustmann et al. (2010); Dustmann and Frattini (2014)). On the other hand, dynamic analyses of the fiscal effects of immigration are forward looking as they take into account both the current and future impact of immigration. This type of papers calculate the net present value of the stream of future taxes and expenditures over the entire life-cycle of a given cohort or flow of immigrants. This is done either through calibration of a general equilibrium overlapping generations model (as in Storesletten (2000) for the United States, and Storesletten (2003) for Sweden) or by using generational accounting techniques (as in Auerbach and Oreopoulos (1999), Auerbach and Oreopoulos (2000) for the U.S., Chojnicki (2013) for France, Collado et al. (2004) for Spain, Mayr (2005) for Austria, and Javdani and Pendakur (2014) for Canada).

Considering how important fiscal effects are, the academic literature is not large. In his review paper Vargas-Silva (2015) explains that, since most of the literature on fiscal effects employs an accounting approach, which requires "implicit and explicit assumptions which are highly questionable", it has not attracted the interest of academic economists, "as it comes across as just an 'accounting' exercise."[9] In our paper we use a different methodological approach as we *estimate* the fiscal impact of immigration by using variation at the local level in the United States. We are able to do so since data on public revenues and expenditures are available for the United States at a very disaggregate level; and, more importantly, local governments in the United States have taxing authority and public expenditure independence, unlike in other countries.

Our paper is also related to articles in the political economy literature that analyze the link between immigration and the welfare state. Razin et al. (2002) develop a theoretical model of the long-run impact of immigration on the redistribution carried out by the welfare state. Their main prediction is that, in the presence of a fiscal leakage from the native to the foreign-born population, low-skilled immigration may lead to lower redistribution,

[9]Vargas-Silva (2015) notes: "A significant share (probably the majority) of the analysis on this topic has been conducted by government departments or policy oriented organizations such as think tanks and pressure groups." For a review of the literature on fiscal effects of immigration, see also Dustmann et al. (2017); and NASEM (2016).

although migrants naturally support greater transfers. Other papers analyze the impact of immigration on the size of the welfare state ("preferences for redistribution") both from a theoretical and empirical point of view. Facchini et al. (2016) find that "preferences for redistribution" are negatively affected when immigrants are low-skilled, especially in localities where natives are high-skilled. Other contributions show that "preferences for redistribution" are negatively affected by the greater racial and ethnic heterogeneity of the population that immigration implies (Luttmer (2001); Alesina and Ferrara (2005); Alesina et al. (2018); Alesina et al. (2019)).[10] The results of this literature are relevant for our analysis since the effects we estimate at the local level can be driven by either *automatic* adjustments of the welfare state to the arrival of immigrants, for a given extent of redistribution, or by political-economy responses that affect the size of the welfare state.

Our analysis is also inspired by the literature on welfare-state drivers of attitudes towards immigrants, for example Dustmann and Preston (2007), Hanson et al. (2007), Facchini and Mayda (2009). Using data from the British Social Attitudes Survey, Dustmann and Preston (2007) show that welfare-state considerations are more important than wages or employment concerns in driving public opinion on immigration. Focusing on the United States, Hanson et al. (2007) find that public finance concerns negatively affect attitudes of American voters towards (low-skilled) migration, in particular high-income voters, who fear they will end up paying higher taxes. Facchini and Mayda (2009) find support for this prediction in a cross-country setting: Rich individuals are more opposed to immigration, relative to poor ones, in countries that receive low-skilled migrants, while the opposite is true in countries where skilled migrants arrive. This is consistent with the tax adjustment model. On the other hand, Hainmueller and Hiscox (2010) find evidence that, in states with high fiscal exposure, poor (rich) respondents are more (less) averse to low-skilled immigration than they are elsewhere. This is consistent with the benefit adjustment model. In practice, both adjustment mechanisms may be at work. Given our data, most of our analysis is on the benefit adjustment model, for which we find supporting evidence. Some of our results (on property tax rates) are also consistent with tax rates adjustments by local governments.

Finally, a paper which is closely related to ours is Feler and Senses (2017). The authors study the impact of globalization on the size of the government by analyzing the effect of trade-induced income shocks on local government finances and the provision of local public services. The results show evidence that the trade and income shocks constrain local resources, mainly due to a relative decline in housing prices and business activity and, in the absence of sufficient intergovernmental transfers, lead to a relative deterioration in the quality of local public services (such as education, public safety, public transportation, public housing and public welfare). The main difference between our paper and Feler and Senses (2017) is the type of shock considered. While in the latter paper trade shocks affect local public finances through changes in factor returns, in our analysis the first order impact of immigration on the welfare state is through changes in the number and composition of participants in the welfare state. In the case of immigration, there might be

[10] See also Giuliano and Tabellini (2020).

an impact on factor returns as well (through the labor market), but this is not necessarily the main channel.

3 Theoretical framework

To guide the empirical analysis of the effect of immigration on local public revenues and expenditures, we consider a two-factors two-goods Heckscher-Ohlin model of a small open economy, augmented with a redistributive welfare system (as in Dustmann and Preston (2005) and Facchini and Mayda (2009)).[11] We use this framework to predict the fiscal impact of a change in the number of low- and high- skilled immigrants. An important insight of the model is that a change in the skill composition of the population affects the per capita tax base and is enough to generate a fiscal response, even in the absence of any adjustment to immigration in the labor market: This is important since there is still debate in the literature whether there is any impact of immigration on wages and employment rates. The model can easily be extended to incorporate labor-market adjustment, or other extensions.

Assume low-skilled (L_L) and high-skilled labor (L_H) are combined using a constant returns to scale technology $y_i = f_i(L_L, L_H)$ to produce output $i \in 1, 2$. Good 1 is the numéraire and p is the price of good 2. The economy is populated by N native workers and M immigrant workers. Each worker is endowed with one unit of either low-skilled or high-skilled labor. The total supply of each type of labor is:

$$L_j = N_j + M_j \quad j \in \{L, H\} \tag{1}$$

In the benchmark case, we assume a diversified production and abstract away from the impact of immigration on the labor market. With both goods produced in the economy, "factor price insensitivity" holds so that factor returns are not affected by immigration. w_j is the prevailing pre-tax wage rate, with $w_H > w_L$, and $c_i(w_L, w_H)$ is the unit cost function for good i. The factor-market equilibrium condition for each type of labor is:

$$L_j = y_1 \frac{\partial c_1(w_L, w_H)}{\partial w_j} + y_2 \frac{\partial c_2(w_L, w_H)}{\partial w_j} \quad j \in \{L, H\} \tag{2}$$

Perfect competition implies that firms earn zero profits in equilibrium:

$$1 = c_1(w_L, w_H) \tag{3}$$

$$p = c_2(w_L, w_H) \tag{4}$$

The welfare system is assumed to be redistributive: the government levies a flat income tax rate τ, which is accompanied by a lump sum per capita transfer (or benefit) b. The transfer is intended to capture the provision of public services, which are assumed to be

[11] The main difference between our model and previous ones is that we derive the separate impact of low-skilled vs. high-skilled immigrants.

accessible to migrants and natives alike. Consistent with the balanced budget requirements commonly imposed on local governments in the U.S., the government budget constraint is assumed to be binding:

$$\tau(w_L L_L + w_H L_H) = b(N + M) \tag{5}$$

The arrival of immigrants impacts the budget constraint by changing the tax base ($w_L L_L + w_H L_H$) and the number of people eligible for benefits ($N + M$). The fiscal response that follows requires an adjustment of tax rates and/or per capita benefits, the magnitude and direction of which depend on the skill composition of immigrants. We model two types of adjustment of the welfare state separately.

Specifically, we start from an initial equilibrium without immigrants and keep the number of natives constant. We first assume that, faced with an inflow of immigrants, the government only adjusts the tax rate to balance the budget, keeping per capita transfers constant (the *tax adjustment model*). Totally differentiating the budget constraint (5) at the initial equilibrium, we obtain:

$$\hat{\tau} = d\pi_L(1 - \frac{n_L}{\phi_L}) + d\pi_H(1 - \frac{n_H}{\phi_H}) \tag{6}$$

where $\pi_L = \frac{M_L}{N+M}$ and $\pi_H = \frac{M_H}{N+M}$ are the shares of low-skilled and high-skilled immigrants relative to total population, respectively. The percentage change in the tax rate, $\hat{\tau}$, depends on the change in the share of low- and high-skilled immigrants ($d\pi_j$); the income share of low- and high-skilled labor ($n_j = \frac{w_j L_j}{\sum_i w_i L_i}$ $\sum_j n_j = 1$); and the share of workers of skill j ($\phi_j = \frac{L_j}{\sum_i L_i}$ where $\sum_j \phi_j = 1$). The effect of low-skilled immigration on the tax rate $(1 - \frac{n_L}{\phi_L})$ is positive because the share of low-skilled workers in the initial population (ϕ_L) is larger than their share in the initial GDP (n_L). Conversely, the effect of high-skilled immigrants on the tax rate $(1 - \frac{n_H}{\phi_H})$ is negative, since the population share of high-skilled workers (ϕ_H) is smaller than their income share (n_H).[12] Note that the prediction that low (high) skilled immigrants will result in an increase (decrease) in tax rates, in the absence of any benefit adjustment, derives entirely from compositional changes in the population.

Next, we consider the *benefit-adjustment model*, in which the welfare state adjusts only by changing per capita benefits, while keeping tax rates constant. Totally differentiating the budget constraint (5) at the initial equilibrium, we obtain:

$$\hat{b} = d\pi_L(\frac{n_L}{\phi_L} - 1) + d\pi_H(\frac{n_H}{\phi_H} - 1) \tag{7}$$

The effects of low- and high-skilled immigration on the per capita benefit in the benefit-adjustment model are of the same magnitude but in the opposite direction compared to the effects on the tax rate in the tax-adjustment model. Specifically, low-skilled immigration will imply a decrease in the per capita benefit, while high-skilled immigration will produce

[12] In a more general setting with immigrants present in the initial equilibrium, the qualitative implications are the same but the marginal effect of low- and high-skilled immigrants are also a function of the initial share of immigrants.

an increase.[13]

Equations (6) and (7) motivate our empirical approach: The arrival of low-skilled immigrants results in a fiscal deficit by reducing the average income and hence, the local per capita tax base. This requires that the government either increases tax rates or decreases per capita benefits to bring the budget back to balance. Exactly the opposite is true for high-skilled immigrants who create a fiscal surplus by improving the local per capita tax base. The government can either decrease tax rates or increase per capita transfers until the surplus goes down to zero. The impact of an increase in the *overall* share of immigrants ($d\pi = d(\frac{M}{N+M})$) is simply the sum of the skill-specific effects weighted by the change in the population share of immigrants of each skill type, relative to the overall change ($\frac{d\pi_j}{d\pi}$). Depending on the type of immigrants who arrive and the associated marginal effects, the overall effect can be positive or negative.

Extensions

We consider several extensions of the benchmark case by allowing for labor market effects of immigration, for progressive tax rates and for taxes other than those applied to income (e.g. sales and property taxes). The main insights of the model continue to hold with minor changes in the elasticity expressions.

In the benchmark version of the model we abstracted away from the impact of immigration on wages and focused solely on changes in the per capita tax base driven by skill composition effects. The first extension we consider is to incorporate labor market impacts of immigration, by dropping the assumption of diversified production. We now start from an equilibrium in which the locality is specialized in the production of only one good. This means that only one of the two zero profit conditions (either (3) or (4)) holds, implying that factor returns are not pinned down by goods' prices alone, but they also depend on factor supplies. In this case, there will be a labor market effect of immigration, assuming that immigrants and natives are not identical in terms of skill composition: Keeping everything else constant, an inflow of low-skilled immigrants will lead to a reduction of low-skilled wages and an increase in high-skilled wages, while high-skilled immigrants will have the opposite effect. If the inflow of immigrants is non–marginal (corresponding to $\Delta\pi_j$), the total remuneration of existing workers will rise ($\sum_j n_j \frac{\hat{w}_j}{\Delta\pi} \geq 0$). These gains from migration or "surplus", as in Borjas (1995), will relax the government's budget constraint. Thus, when low-skilled (high-skilled) immigrants arrive, the increase (decrease) in the tax rate in the tax adjustment model and the decrease (increase) in the transfer in the benefit adjustment model will be less (more) pronounced.[14]

[13]Note that (5) implies that the per capita benefit b is also equal to per capita tax revenues, which is consistent with what we observe in the data. Hence equation (7) also gives predictions about the change in per capita tax revenues, as a function of the arrival of immigrants, which is what we observe in the data, besides per capita benefits.

[14]On the other hand, a *marginal* inflow of immigrants ($d\pi_j$) will leave the total remuneration of the existing labor force unchanged – since workers are paid the value of their marginal product – and have no effect on the redistribution carried out by the welfare state. This means that, although wages adjust,

The model can easily be extended to incorporate progressive income taxes, by modifying (5) as $\tau(\gamma w_L L_L + w_H L_H) = b(N + M)$ where $\gamma < 1$, in order to capture lower tax rates for low-income workers. In this case, (6) and (7) are the same as before, except for the fact that the denominator of n_j is adjusted because of γ.[15] Similarly, other taxes such as sales and property taxes, which are important sources of revenue for local governments, can be introduced in the model. Consider the case in which local governments finance themselves entirely via sales taxes. Assume that individuals spend a certain fraction of their income on consumption goods and that this fraction is higher for low-skilled workers. The budget constraint can be written as $\tau q(\delta w_L L_L + w_H L_H) = b(N + M)$, where τ is the sales tax rate and the consumption shares of low-skilled and high-skilled workers are, respectively, δq and q, with $q < \delta q < 1$. Again, (6) and (7) are the same as before, except for the fact that the denominator of n_j is slightly modified. A similar intuition applies for property taxes.[16]

In sum, the model shows that immigration will impact the average income of the county, which in turn affects the per capita tax base and leads to adjustments in either tax rates and/or benefits. Changes in average income are driven by changes in the composition of the population (as in the benchmark model) and possibly also by adjustments in the labor market. The various extensions of the model suggest that part of the fiscal effect of immigrants can take place through other channels such as the goods and housing markets, with implications on revenues from various sources, such as income, sales and property taxes. One of the strengths of our reduced form approach over an accounting exercise is that it allows us to capture these indirect effects of immigration on the welfare state.

4 Immigration and Local Public Finances

Guided by the model, we use data on local government budgets and immigrant inflows to identify the impact of immigration on public finances and provision of public goods. Local governments in the United States are well-suited for this exercise as they have high levels of fiscal autonomy; they raise revenues from various taxes and fees to finance expenditures on locally provided public goods that are tailored towards local priorities. In this section, we introduce the data sets we use in constructing the immigration and public finance variables at the county level.

4.1 Immigration

Given our focus on the effect of immigrant *workers* through their contribution to fiscal revenues, in our benchmark specification we focus on adult immigrants who have completed

the change in the tax rate in the tax adjustment model and of the transfer in the benefit adjustment model will be the same as before (Dustmann and Preston, 2005).

[15] The arrival of immigrants may also impact preferences for the degree of progressivity of local taxes (i.e. γ) which we think of as one aspect of "preferences for redistribution".

[16] The arrival of immigrants will impact the property tax base by changing property values. Property values will depend on the local average income and the share of income spent by each group (low-skilled vs. high-skilled) on housing. While we do not separately model the housing market equilibrium, we explicitly test for this channel empirically.

their formal schooling and are potentially working and paying taxes. The total number of adult immigrants in county i at time t (M_{it}) is defined as foreign born individuals who are at least 25 years old. Low-skilled immigrants are adult immigrants who do not have a college degree (M_{Lit}) and high- skilled immigrants are those with at least a college degree (M_{Hit}). We construct the shares of immigrants by skill group at the county level as:

$$\frac{M_{jit}}{Pop_{it}} = \frac{M_{jzt}}{M_{zt}} \frac{M_{it}}{Pop_{it}} \tag{8}$$

where (M_{jzt}/M_{zt}) is the share of adult immigrants of skill level j ($j \in \{L, H\}$) in commuting zone z at time t, and (M_{it}/Pop_{it}) is the share of adult immigrants in total population of county i at time t.[17] Panel (a) of Table 1 shows the population weighted means and standard deviations of immigrant shares in 1990 and 2010. The share of (adult) immigrants increased from 5.7% to 10.6% of the total population between 1990 and 2010. The majority of immigrants in the U.S. are low-skilled. The shares of (adult) low-skilled and high-skilled immigrants in the total population were, respectively, 4.6% and 1.2% in 1990, and became 7.6% and 3% in 2010. Hence, in the period we consider, the share of immigrants, low-skilled immigrants and high-skilled immigrants increased by, respectively, 4.9, 3 and 1.8 percentage points.

The average statistics reported in Table 1, although informative, hide important heterogeneity *across U.S. counties* in terms of the change in the number and type of immigrants during our sample period. In Figures 1 and 2 we document the change in the shares of low- and high- skilled immigrants by U.S. county between 1990 and 2010. Few facts stand out: First, although on average the share of immigrants of each type has increased, the change has been both positive and negative at the county level. While several counties have experienced an increase in the share of low-skilled immigrants (e.g. Garza County, TX by 22 pp), others have faced a decline (e.g. Real County, TX by 5 pp) during this period. A similar type of heterogeneity is evident for high-skilled immigration: For example, the share of high-skilled immigrants increased by 9 pp in Santa Clara County, CA, while it decreased by 0.6 pp in Columbia County, WA. Second, while there is some overlap, in general, counties and states that experienced a large increase in the share of low-skilled immigrants are not the same as those that received a greater number of high-skilled immigrants. The increase in the latter tends to be more concentrated in urban areas, the North East, Florida and southern California and Arizona, while low-skilled immigrants have increased throughout the country, except in the Northern states of the U.S. where they have decreased.

[17] The skill composition of immigrants is available only at the commuting zone level and is constructed using IPUMS in 1990, 2000 and 2010 (Flood et al. (2020)). The total number of immigrants at the county level is from tabulations by the U.S. Census Bureau for the years 1980 (Adams (1980)), 1990 and 2000 (United States Census Bureau (2000)), and from the 5-year (2009-2013) sample of the American Community Survey for 2010 (United States Census Bureau (2010)).

4.2 Local Public Finances

Detailed information on local government budgets for every five years (those ending with 2 and 7) during 1967-2012, are from the U.S. Census Bureau's State and Local Government Finances. The dataset includes detailed revenue and expenditure information on individual local governments, including counties, cities, townships, special districts, and independent school districts. We aggregate all government records to the county level and match the two year-lead in the fiscal data (i.e. years 1982, 1992, 2002 and 2012) with the share of immigrants measured in 1980, 1990, 2000 and 2010 at the county level. Our final dataset includes 3,079 counties covering all U.S. states, except Alaska and Hawaii.

4.2.1 Revenues

In Panel (b) of Table 1 we report population weighted means and standard deviations of per capita total revenues and its main sub-categories.[18] All values are in 1999 US dollars. In 1990, total revenues in an average U.S. county were $2517 per person. About 58% ($1544) of these revenues were generated locally: mostly from property taxes, which on average account for about 43% of revenue from own sources, with the remainder sourced from sales and income taxes (about 8%), other taxes (e.g. license taxes, death and gift taxes, accounting for 2%), charges and administrative revenue (on education, hospitals, highways, etc., accounting for 33%) and revenues from liquor stores, the utility sector and insurance trust (about 14%). The remainder of revenues (on average $973) was through intergovernmental transfers, a large portion of which was from state governments ($858); transfers from the federal and other local governments were small at 5.6% and 6%, respectively. While on average per capita revenues increased between 1990 and 2010 in every category in real terms, the relative contribution of each revenue item to total (and own) revenue remained relatively stable.[19]

4.2.2 Expenditures

In Panel (c) of Table 1 we report population weighted means and standard deviations of per capita expenditures and its main sub-categories. About 90% of expenditures are general expenditures, which mainly fund public goods and service provision, and are the main focus of this paper; the remaining 10% of expenditures are devoted to liquor stores, utilities and the insurance trust sectors, and are mainly financed by dedicated revenue sources. On average, almost half of general expenditures (45% or 1122$ per capita in 1990) are allocated to public education. Spending on "law and order" (fire, police, protective inspection, corrections and judiciary) accounts for 11% of general expenditures (178$ per

[18] Precise definitions of each sub-category are included in the Appendix. Table A1 reports the share (instead of dollar value) of each budget item in (total or own) revenue and expenditure.

[19] Local governments in the U.S. differ significantly in terms of their reliance on different forms of revenue: while some counties do not collect sales and income taxes, for other counties these taxes account for over 40% of locally generated revenues. Similarly, reliance on property taxes varies from only 3% of own revenues to over 90%.

capita), while expenditures on public services such as libraries, parks and recreation, natural resources, health and hospitals, public welfare and housing and community development ("public welfare") account for 17% at $380 per capita in 1990. The remaining categories are "sanitation", "infrastructure" (air, water and highway transportation, transit subsidies, parking and public buildings), "administration" (financial administration, employment security administration, miscellaneous commercial activities, central staff services) and "other general expenditure", with each of them accounting for 5-8% of general expenditures (between about 85$ and 205$ per capita in 1990). Following the pattern for per capita revenues, per capita expenditures have increased in real terms for each category between 1990 and 2010, with, on average, little change in relative importance of each expenditure item in the budget. To conclude, note that in both 1990 and 2010, on average counties broke even, as total revenues and expenditures were very close to each other (around $2500 in 1990, and $3600 in 2010) – consistent with the balanced budget requirement.

5 Empirical Framework

5.1 OLS estimates

We model the effect of low- and high-skilled immigrants on log per capita revenues and expenditures ($\ln y_{it}$) in county i and year t as follows:

$$lny_{it} = \delta_i + \delta_t + \beta_L \frac{M_{Lit}}{Pop_{it}} + \beta_H \frac{M_{Hit}}{Pop_{it}} + \beta_x X_{z,1980} * t + \varepsilon_{it}, \tag{9}$$

where M_{Lit}/Pop_{it} and M_{Hit}/Pop_{it} are the population shares of low- and high-skilled immigrants in county i and year t. We capture slowly changing county-specific factors driving the fiscal variables by county fixed effects (δ_i), and account for any national macroeconomic trends with year fixed effects (δ_t). Instead of including contemporaneous control variables which are likely to be endogenous, we add $X_{z,1980} * t$, i.e. interactions of linear time trends with economic and demographic variables at the commuting zone level measured in 1980. The vector $X_{z,1980}$ includes the 1980 shares in the population of working age women, married individuals, African-Americans, individuals younger than 25 (youth), unemployed, those living in urban areas, as well as (real) median household income (in logs) and the "Bartik" (delta) indicator. The latter is constructed as in Bartik (1991):

$$Bartik_{zt}^{EMPL} = \ln(empl_{z1980}) + \sum_j (share_{zj,1980}^{EMPL} \, \Delta \ln(empl)_{jt}) \tag{10}$$

where $\ln(empl_{z1980})$ is the log of total employment in commuting zone z in 1980. The second term is the weighted average of industry-specific changes in (log) employment in year t, with commuting zone employment shares of each industry in 1980 ($share_{zj,1980}^{EMPL}$) used as weights. All commuting zone variables ($X_{z,1980}$) are sourced from the 1980 U.S. Census and are summarized in Panel (d) of Table 1.

In Table 2, we present estimates from variants of specification (9) with (log) per

capita revenues from own sources and (log) per capita general expenditures as dependent variables in Panels (a) and (b), respectively. In the first two columns of each panel the main explanatory variable is the population share of immigrants ($\frac{M_{it}}{Pop_{it}}$), included in specifications with and without commuting zone controls. The last two columns allow the impact of immigration to differ across immigrants of different skill level as in equation (9). In all specifications, observations are weighted by population and standard errors are clustered at the county level to account for potential correlation of errors over time.

Few clear patterns emerge. There is a negative association between the share of immigrants and locally generated per capita revenues. The association between per capita general expenditures that are used to fund local public goods and immigration is similarly negative. The estimated coefficients, while significant, are small, and hide important heterogeneity as indicated in the next two columns. There is a robust *negative* association between the share of low-skilled immigrants and both locally generated (per capita) revenues and (per capita) general expenditures. This association is *positive* and similarly robust for the share of high-skilled immigrants and per capita own revenues and general expenditures. The estimates reported in Table 2 provide *prima facie* evidence for a strong association between the shares of immigrants and the local budget. We next turn to establishing whether the basic correlations reported in this section point to a causal relationship or are driven by factors that may simultaneously impact both the share of immigrants and public finances in a locality.

5.2 Identification

There are several threats to identifying a causal link between immigration and local revenues and expenditures based on the OLS estimates. One threat is that some counties have (persistent) economic, cultural and institutional features that attract immigrants and also affect their local budget. Inclusion of county fixed effects (δ_i) address these concerns to the extent that these characteristics do not change much over time. However, it is also possible that new immigrants sort themselves into specific localities as a function of *changes* in economic and demographic factors that also affect the local budget. This would be the case if, for example, immigrants select into expanding counties which have the potential for increased quality and quantity of locally provided public goods. Accounting for these changes with the interactions of linear time trends with 1980 economic and demographic variables ($X_{z,1980} * t$), as we do in equation (9), would reduce the bias but is unlikely to fully resolve it. Importantly, there is the possibility of reverse causality between fiscal variables and immigration, which would arise if, for example, an increase in the generosity or quality of per capita benefits or a decline in tax rates in a county attracts immigrants. Using lagged immigration rates would help address this issue if there were no persistence over time in immigration inflows and local public finances, which again is not likely to be the case. Hence, estimation of a causal relationship between public finances and immigration requires an IV strategy with plausibly exogenous variation in immigration across localities.

Our instruments build on the widely used shift-share methodology (Altonji and Card (1991) and Card (2001)), which we modify to account for two distinct populations of

immigrants by skill-level as in Mayda et al. (2022). We identify exogenous variation in low- and high-skilled migrant shares in a county by leveraging variation at the *national* level in the skill distribution of immigrants by country of origin, and variation in the pre-sample distribution of immigrants by country of origin across counties. Specifically, let us define the term $sh_{c,i,80}$ as the number of foreign-born from country c, age 25 or above, living in county i in 1980, as a share of their total population in the U.S. in 1980:[20]

$$sh_{c,i,80} = \frac{M_{c,i,80}}{\sum_i M_{c,i,80}}. \tag{11}$$

The predicted number of high-skilled immigrants in county i and year t ($\widehat{M}_{Hit}$) is the aggregate number of high-skilled immigrants from country c, age 25 or above, in year t (M_{Hct}) distributed across counties using their 1980 shares ($sh_{c,i,80}$). The predicted number of low-skilled immigrants is constructed in an analogous way:

$$\widehat{M}_{Hit} = \sum_c sh_{c,i,80} M_{Hct} \quad \text{and} \quad \widehat{M}_{Lit} = \sum_c sh_{c,i,80} M_{Lct} \tag{12}$$

The instrument for the share of high-skilled immigrants in county i is the predicted number of high-skilled immigrants divided by the predicted total population ($\widehat{M}_{Hit}/\widehat{Pop}_{it}$). We define the predicted population of county i in year t as the sum of the number of natives in 1980 and the predicted number of immigrants in year t, both for all ages and in county i ($\widehat{Pop}_{it} = (N^{all}_{i,80} + \widehat{M}^{all}_{it})$, where the predicted number of immigrants of all ages ($\widehat{M}^{all}_{it}$) is constructed in a similar fashion as in equation (12) with immigrants of all ages from country c at the national level, distributed using their share in county i in 1980. Similarly, the instrument for the share of low-skilled immigrants is $\widehat{M}_{Lit}/\widehat{Pop}_{it}$, and the sum of the instruments for low- and high-skilled immigrants ($(\widehat{M}_{Lit} + \widehat{M}_{Hit})/\widehat{Pop}_{it}$) is used to instrument for the overall immigrant share.[21]

For the skill-specific instruments to work, there needs to be sufficient variation in skill intensity across immigrants from different countries of origin. That is, counties with a similar total share of immigrants as of 1980, but from different countries of origin, will experience differential variation in predicted high- and low-skilled immigrants, as long as the educational composition of immigrants differs by nationality.

5.2.1 Validity of the Instruments

The shift-share instrument has been widely used in immigration economics.[22] It usually has reasonable power because networks of existing immigrants attract new immigrants from the same country and its exclusion restriction is plausible. It is based on the assumption

[20] In order to ensure sufficient sample size we consider 15 countries (or country-groups) of origin: Mexico, Canada, Rest of Americas, Western Europe, Eastern Europe, China, Japan, Korea, Philippines, India, Vietnam, Rest of Asia, Africa, Oceania, Others. See Figure B1 in the appendix for the share of immigrants over 25 by county of origin as of 1980.

[21] We use data from the U.S. Census on national migration flows by country of origin (1990, 2000 and 2010) and county-level shares of immigrants (1980).

[22] See a review of its use and refinements in Lewis and Peri (2015).

that the distribution of immigrants across counties by country of origin 10 years prior to the beginning of the period of analysis (in 1980) is not correlated with local economic and demographic *changes*, after 1990, other than via their impact on current immigration. While we cannot investigate directly the exclusion restriction, we perform a series of tests that provide supporting evidence for it.

To address the concern that the instrument itself might be affected by reverse causality, we regress the change in the instrument-predicted immigrant shares over the sample period (1990-2000) on pre-sample changes (1980-1990) in the fiscal variables. The estimates are reported in Table 3 separately for (the change in predicted shares of), respectively, total, low-skilled and high-skilled immigrants. All estimated coefficients for (log change in per capita) own revenues and general expenditures are small and insignificant, suggesting that reverse causality is not an issue once we instrument for the immigrant shares. In Table 4 we report estimates from a slightly different exercise (as in Autor et al. (2013)) and show that the changes in our main outcome variables in the past (between 1980 and 1990) are not predicted by changes in immigrant shares in the future (in 1990-2010 and 1990-2000 in odd and even numbered columns, respectively) after we instrument. These regressions can be thought of as a falsification exercise – changes in predicted immigrant shares in 1990-2010 (or 1990-2000) should not have an effect on fiscal variables in the eighties, and they don't – and also as a pre-treatment trend exercise – being part of the treatment group, defined as a function of the change in predicted immigrant shares in 1990-2010 (or 1990-2000), is orthogonal to trends in outcome variables in the pre-treatment period. We also provide visual evidence for the validity of the instruments we construct. Figures 3a to 3c plot the change in log per capita own revenues and general expenditures between 1980 and 1990 ("pre period") against the instrument-predicted change in the overall immigrant share (Figure 3a), the low-skilled immigrant share (panel i of Figures 3b and 3c) and the high-skilled immigrant share (panel ii of Figures 3b and 3c) for the period of analysis 1990-2010. The lines are flat and the corresponding regression coefficients are close to zero and not significant. The pre-period flat lines shown in Figures 3a, 3b, and 3c suggest that there was no correlation between pre-treatment trends of per capita revenues and expenditures and the intensity of predicted high- and low-skilled immigration in the period of analysis.

An emerging literature has highlighted some of the weaknesses of the shift-share instrument approach and recommended a new set of stringent tests. One main concern is that the initial shares of the country-of-origin groups are endogenous. To mitigate these concerns, we first measure how relevant each country-of-origin share is in generating the identifying variation in the two instruments by calculating the Rotemberg weights, as in Goldsmith-Pinkham et al. (2020). Figure B3 in the Appendix shows that Mexican immigrants carry the largest weight for low-skilled immigrants, while immigrants from Other American countries excluding Mexico and Canada have the highest weight for high-skilled immigrants. As a second step, we follow again Goldsmith-Pinkham et al. (2020) and test for any correlation between the initial shares of an immigrant group and the pre-period change in the fiscal variables of interest. The results in Table A2 show no significant correlation between the initial shares and the 1980-1990 change in local per capita revenues from own sources and general expenditures for any country-of-origin

group, including the groups with the highest importance (i.e. Rotemberg weights).[23] These results alleviate the concern that immigrants from any particular country of origin group cause misspecification even if they have a high weight.

Finally, Table 5 reports the coefficients from the first-stage regression for the share of total immigrants (columns (1) and (2)), the share of low-skilled immigrants (columns (3) and (4)) and the share of high-skilled immigrants (columns (5) and (6)), estimated with and without commuting zone level controls. The F-statistics of the first stage are large and the estimated coefficients are precisely estimated with the expected signs. The predicted shares of immigrants for both skill levels as well as for overall immigration are positively correlated with the corresponding immigrant shares. Taken together, we consider these results as supportive evidence that our instruments predict well the endogenous immigration shares and satisfy the exclusion restrictions. We provide further robustness checks for the exclusion restriction at the end of Section 5.3.

5.3 2SLS estimates

This section presents the main findings of the paper on the causal association between the share of immigrants and local public finances. Table 6 reports estimates from the 2SLS specification based on exogenous variation in the share of immigrants, overall (in columns (1) and (2)) and by skill category (in columns (3) and (4)). In Panels (a) and (b) the dependent variables are the (log per capita) revenues from own sources and general expenditures, respectively. Columns (1) and (3) report estimates from specifications including county and year fixed effects. Columns (2) and (4) report estimates from our preferred specification which also includes exogenous controls at the commuting zone level as in equation (9). In our preferred specification (column (2)), the estimated coefficients are negative for own revenues and positive for expenditures, but imprecisely estimated. Their magnitude implies that the increase in the share of immigrants that took place in the 21 years between 1990 and 2010, by 4.9 percentage points, reduced own revenues by $24 per capita (measured in constant 1999 dollars), on average in a county, and increased general expenditures by $8 per capita. Accounting for both the decrease in revenues and the increase in expenditures, each immigrant who came between 1990 and 2010 led to an increase in net spending (expenditures minus revenues) of $442 per year.[24] Note that the interpretation of this number is quite different than what is calculated in accounting exercises such as in NASEM (2016): the impact we estimate on revenues includes greater/smaller tax revenues from natives; the impact we estimate on expenditures accounts for greater/smaller provision of public goods and services to natives. Hence, an increase in net spending does not necessarily imply that the arrival of immigrants increases the fiscal burden on natives. Given that we do not know the beneficiaries of the change in

[23] One exception is the estimated coefficient for own revenues for the "Other Americas" category, that is marginally significant but very small in magnitude (0.006), which we interpret as a well identified zero.

[24] We calculated $442=(24+8)*241.5/17.9, where 241.5 millions is the number of U.S. residents in 1990 and 17.9 millions is the number of (adult) immigrants who came in between 1990 and 2010. We obtain a similarly sized effect on the basis of significant coefficient estimates, when we exploit variation in low-skilled and high-skilled immigration (see below).

spending, it may well be that the entire increase in net spending is devoted to natives.[25]

The estimates for overall migration hide important heterogeneity across immigrants with different skill levels. The estimates reported in the last two columns suggest that while an increase in the share of high-skilled immigrants improved public finances in terms of both own revenues and spending, low-skilled immigrants had the opposite effect. Specifically, on average, between 1990 and 2010, an increase in low-skilled immigrants by one percent of the local population *reduced* per capita own revenues by 2.8 percent; the same change in the high-skilled immigrant share (by one percent of the local population) *increased* per capita revenues by 3.3 percent (panel (a)). These patterns are mirrored in Panel (b) for general expenditures on public services: an increase in the share of low-skilled immigrants by one percent of the local population *reduced* per capita expenditures by 1.9 percent, while the same proportional change in high-skilled immigrants resulted in an *increase* of 2.9 percent. All the estimates are significant at the 1 percent level.

In dollar terms (fixed to prices in the year 1999) our estimates imply that low-skilled immigration to the United States between 1990 and 2010 reduced county-level own revenues and general expenditures by, respectively, around $132 and $128 per capita – this implies that each low-skilled immigrant who came between 1990 and 2010 led to an increase in net spending (expenditures minus revenues) of $82.[26] At the same time, high-skilled immigration to the United States between 1990 and 2010 increased county-level own revenues and general expenditures by, respectively, $94 and $121 per capita – this implies that each high-skilled immigrant who came between 1990 and 2010 led to an increase in net spending (expenditures minus revenues) of $1069.[27] Note that a population weighted average of $82 and $1069 gives $418 for the increase in net spending due to an average immigrant.

The estimated impact of immigration on locally generated revenue and local spending reflects the equilibrium outcome following a change in the composition of the population and embodies any resulting changes in the labor or housing markets, as well as any policy response by the local government. The local government response is constrained by the balanced budget requirement, and may also reflect changes in preferences towards redistribution among voters (more on this point in the following paragraph). As outlined in our theoretical framework, local governments can respond to a decline (increase) in the tax base following an increase in the share of low- (high-) skilled immigrants, either by increasing (decreasing) tax rates, as in the *tax adjustment model* or by decreasing (increasing) per capita spending, as in the *benefit adjustment model*. Our finding that per capita revenues and expenditures increase with the share of high-skilled immigrants and decrease with the share of low-skilled immigrants is consistent with the *benefit adjustment*

[25] This is in contrast to the calculation of accounting exercises such as NASEM (2016), where, based on assumptions, the authors calculate the amount of per-capita government revenues and spending for each group (natives and immigrants) separately. This way they can calculate the net fiscal contribution for each group.

[26] We calculated $82 = (132 - 128) * 241.5/11.8$, where 241.5 millions is the number of U.S. residents in 1990 and 11.8 millions is the number of (adult) low-skilled immigrants who came in between 1990 and 2010.

[27] We calculated $1069 = (121 - 94) * 241.5/6.1$, where 241.5 millions is the number of U.S. residents in 1990 and 6.1 millions is the number of (adult) high-skilled immigrants who came in between 1990 and 2010.

model.[28] It is important to note that this finding cannot be interpreted as evidence against any adjustment in tax rates. It is possible that local governments increase (decrease) tax rates as per capita revenues decline (increase); our results suggest that adjustments in tax rates do not *fully* offset changes in the local tax base.[29] To summarize, we can only observe the workings of the benefit adjustment model. Our empirical results can only provide indirect evidence on the tax adjustment model. To the extent per capita revenues and expenditures change, we know that tax rates do not *fully* adjust, but they may partly adjust.

Our results can also be interpreted in political-economy terms. From this point of view, we would expect that the arrival of low skilled immigrants decreases "preferences for redistribution" while the inflow of high-skilled immigrants increases them. In other words, low-skilled immigrants should negatively affect the willingness of voters to have a sizeable welfare state, while high-skilled immigrants should have the opposite effect. In our simple theoretical framework, the government has two policy tools to carry out the adjustment of the welfare state to the arrival of immigrants. To pin down the size of the welfare state, we assumed that the government only uses one tool and keeps the other one fixed. This allowed us to consider automatic adjustments of the welfare state to the arrival of immigrants, for given preferences for redistribution. Note that, in practice, the government can use both tools at the same time, say both increase tax rates and decrease per capita benefits when low-skilled migrants arrive. This is still consistent with a fixed size of the welfare state, as the two changes have opposite effects and compensate each other in terms of preferences for redistribution. Next, we can account for political-economy changes that alter the size of the welfare state, by allowing the government to use the two tools for the following two objectives: target a larger or smaller size of the welfare state and balance the budget constraint. In this case, a situation in which the government both decreases tax rates and per capita benefits corresponds to lower preferences for redistribution. Instead, a situation in which the government both increases tax rates and per capita benefits corresponds to greater preferences for redistribution. To operationalize these points – in other words to be able to differentiate between automatic adjustments of the welfare state vs. political economy changes – we need to observe tax rates, which we only do in one specific case in the next Section. We postpone this discussion to when we discuss that result.

5.3.1 Robustness

In this subsection, we provide additional support for the validity of the identification strategy and reliability of the IV results. In Table 7 we report estimates from our benchmark specification in long-differences and with controls for changes in outcome variables in

[28] Because of the binding budget constraint, per capita tax revenues are equal to the "per capita benefit" of the theoretical framework, so both the revenues and expenditures regressions provide evidence on the benefit adjustment model.

[29] We are unable to explicitly test for the extent of tax rates adjustment because of lack of time-varying county level data on income, property and consumption tax rates. In the next section we provide some indicative evidence using "effective" property tax rates as a proxy.

the pre-treatment period, as in Dix-Carneiro et al. (2018). Specifically, we first replicate the main results by estimating a long-difference specification, between 1990 and 2010, where we regress the log-change of, respectively, per capita (log) own revenues and general expenditures on the instrumented change in immigrant shares (see columns (1), (3), (5) and (7)). Next we add the pre-treatment log change of the respective fiscal variables, between 1980 and 1990, as an additional control (see columns (2), (4), (6) and (8)). This exercise is another way to address concerns about pre-existing trends in local public revenues and spending that could be correlated with (future) migration shocks. Our main results are robust. In line with the estimates from our preferred specifications in Table 6, overall immigration has a small and insignificant impact, the low-skilled immigrant share reduces per capita revenues and expenditures and the high-skilled immigrant share increases them.

To provide further evidence on the identification of a causal effect, we follow Borusyak et al. (2022) and estimate a "shock-level regression" *at the country-of-origin level*. Borusyak et al. (2022) show that, under the assumption that the aggregate shocks (the "shifts") are exogenous, identification of a causal effect can be achieved without assuming that the initial shares are exogenous. In our case, the aggregate shocks are the migration inflows from 15 different country-of-origin groups over 3 time periods. To convert the data from the county-level to the shock-level, we weight the dependent variable (fiscal outcomes), as well as the controls, by the 1980 county-specific immigration shares of a given country of origin. We then sum across all counties for every year and obtain time-varying country-of-origin specific dependent and control variables. So, for example, "Mexican per-capita general expenditures" are the average per-capita general expenditures of counties where Mexicans went the most in 1980. Table A3 in the Appendix presents the estimates of the shock-level regressions, where we include country-of-origin and year fixed effects. Due to the small sample size, the estimated coefficients have large standard errors but most of them are significant and they are similar in magnitude to the estimates in Table 6.

Finally, in Table 8, we carry out a series of additional robustness checks and report estimates with own revenues and general expenditures in Panels (a) and (b), respectively, as dependent variables. After replicating the main results in column (1), we check the sensitivity of our estimates to modifying the instruments by fixing the population in the denominator of immigrant shares at their 1980 values; using time-varying population weights; clustering standard errors at the state level; and introducing state-specific time trends in the specification. Our findings are very robust, both in terms of signs and significance levels, as well as magnitude of the estimated effects.

5.3.2 Heterogenous effects across counties

The results so far are for the "average" county in the United States. However, the pattern of heterogeneity depicted in Figures 1 and 2 point to potential inequities across taxpayers in different localities. Some counties mostly receive high-skilled immigrants, who increase average income, revenues and expenditures in services, while others mostly receive low-skilled immigrants, who have the opposite effects. Figures 4 and 5 emphasize this point by showing the estimated local impact of immigration on revenues and expenditures, based on the observed changes in high and low-skilled immigrant shares *at the county*

level. For example, during the 1990-2010 period a county like Valley, MT experienced a decline in low-skilled immigrants by 1 percent of the local population with a slight increase in the high-skilled immigrant share by 0.02 pp. As a result, the estimated fiscal impact of immigration on this county was positive (and significant) at 2.9 percent for revenues and 1.9 percent for expenditures. This is in contrast to a county like Presidio, TX which experienced a significant increase in the share of low skilled immigrants (by 9.7 percent) and a small increase in the share of high skilled immigrants (by 0.9 percent). This corresponds to a decrease in revenues and expenditures by 24 percent and 15 percent, respectively. Second, while Figures 4 and 5 point to a large number of counties adversely affected by immigration (dark blue), the average percent decrease in per capita revenues in a county depicted as dark blue is 4.7 percent. These changes, while negative, are small in 1999 dollar terms at about $73 per capita.

Importantly, while locally generated funds are the most important source of revenue for most localities (at about 58 percent in 1990), federal and state governments have an important role to play, especially in the context of such heterogeneity across counties in terms of impact and response. As we described earlier, the transfers from the state and federal governments are based on formulas that take into account overall population and the share of poor, both of which may be directly impacted by immigration. Potentially the impact on total per capita revenues, as well as on expenditures on certain budget items, are much smaller if the local governments are insured to some extent by the state and federal governments. The heterogeneity depicted in the two Figures highlights the potential role that this type of insurance – through intergovernmental transfers within and across states – takes place. It is an empirical question to what extent such transfers occur. In the next section, we explicitly examine the impact of immigration on separate revenue and expenditure items to understand the channels through which immigration impacts public finances, and empirically assess the role of transfers in smoothing out any such impact.

6 Unpacking the Channels

The arrival of immigrants will impact the county budget and the provision of locally provided goods and services in various ways. If immigration results in a change in the local tax base, either due to differences in immigrants' income relative to natives or through the labor market or housing market channels, per capita government revenue will be impacted. Under the balanced budget constraint that is an institutional requirement for most localities in the U.S., any such change in local revenues will be reflected in a change in per capita expenditures, unless the local government alters tax rates or the federal and state governments provide some level of insurance through intergovernmental transfers. Any change in expenditures will impact the supply of certain public services, both in terms of quantity and quality. It is also possible that immigrants alter the cost and demand for public service provision. Next, we will shed light on these mechanisms by analyzing different items on the revenue and expenditure sides.

6.1 Revenue Items

In this section we look in detail at the revenue side of the fiscal equation. We do this by separately examining the association between immigration and various components of locally sourced revenues in Tables 9a and 9b, and by extending our analysis to total revenue and intergovernmental transfers in Table 9c. Given the robust heterogeneous impact of low- and high-skilled immigrants we document in previous sections, we focus the rest of our analysis on specifications that include the immigrant shares by skill type.

Our benchmark results, which we reported in Table 6, focused on per capita revenues *from own sources*. These revenues are derived from various types of taxes and charges, which we separately relate to immigration in specifications reported in Table 9a. Locally generated revenues are made up of general revenues (column (2)) and revenues from utilities, insurance and liquor stores (column (8)). General revenues are the most relevant for this paper, as they are the ones that mainly fund locally provided public goods and services. More than half of own revenues comes from locally levied taxes (column (3)), which are sourced from property taxes (column (4)), sales, income and license taxes (column (5)) and other taxes (column (6)). Charges and administrative revenue (column (7)) constitute the remainder of general revenues. The regressions in Table 9a broadly paint the same picture as before. The arrival of low-skilled immigrants results in a reduction of all sources of general (per capita) revenues, while the arrival of high-skilled immigrants results in an increase. For example, an increase in low-skilled immigrants by one percent of the local population reduces per capita tax revenues by 2.2 percent, while the same increase in high-skilled immigrants results in an increase by 2.5 percent. In terms of the magnitude and precision of the estimates, we find that the positive impact of high-skilled immigrants is more pronounced and significant for per capita property taxes, other taxes, as well as charges and administrative revenues; the negative effect of low-skilled immigrants seems to mainly derive from their impact on per capita sales, income and license taxes, and on other taxes.

Tax revenues are jointly determined by tax rates and the tax base, both of which could change in response to immigration. The arrival of immigrants will impact the tax base if they cause a change in average income in a county. This would mechanically be the case if the income of immigrants is different than that of the incumbents. In addition, immigration can have an impact on the tax base through its labor market effect. The standard labor economics model predicts that immigrants should improve the wage and employment outcomes of complementary types of workers and worsen those of workers with similar types of skills (see, for example, Borjas (1999) and Borjas (2014)). Other models point out that economies may absorb the arrival of immigrants through alternative adjustment mechanisms, such as changes in the quantities produced in an open economy (Burstein et al. (2020)) or through specialization in different tasks (Peri and Sparber (2009)), in which case wages and employment rates of similarly skilled workers do not necessarily decrease (and may even improve).[30] What matters for local revenues is the tax

[30]The empirical literature on the labor-market impact of migration is extensive and has been reviewed in a number of recent papers (see Borjas (2014), Lewis and Peri (2015) and Peri (2016)).

base which reflects the combined *aggregate* effect (i.e. whether immigration produces an immigration surplus).

Table 9b looks at different proxies of the local tax base and how they change in response to immigration. The results are in line with our findings in Table 9a. We use the median household income and the average payroll per worker in a county, in columns (1) and (2), as two measures of the average income in a locality. We find evidence of a positive association between the average local income and high-skilled immigration, and of a negative association with low-skilled immigration.[31] This is consistent with the fact that income and sales taxes decrease and increase, respectively, with the arrival of low-skilled and high-skilled immigrants, as documented in column (5) of Table 9a.

Property taxes constitute about 43 percent of local tax revenue. If the arrival of high- (low-) skilled immigrants results in an increase (decrease) in average housing prices, this will result in a change in the property tax base. This would be the case if, for example, high-skilled immigrants increase demand for single-family homes in high performing school districts or in low-crime areas, relative to apartment buildings or rental property. At the same time, the arrival of low-skilled immigrants will have a direct effect on demand but may also impact the housing decisions of natives. While there is some evidence that immigrants, on average, increase house prices (Saiz, 2007), the existing literature does not differentiate between low- and high-skilled immigrants. We explore heterogeneous effects of the two types of immigrants on the House Price Index and the median house value in US counties.[32] We find that low-skilled immigrants drove down house prices in U.S. counties between 1990 and 2010 while high-skilled immigrants had the opposite effect, as reported in columns (3) and (4) of Table 9b. We interpret these results as being driven by the fact that both low-skilled and high-skilled immigrants increase demand for houses but low-skilled immigrants also affect supply (as they often work in the construction sector) and they may negatively affect housing values because of discrimination effects and of the fiscal effects analyzed in this paper – given that low-skilled immigrants decrease provision of public goods and services, they may reduce natives' demand for houses in their county (Boustan ,2013). The estimates are large and precisely estimated. These findings suggest that the property tax base was indeed affected by migration in a way that is consistent with our estimates of the impact on property tax revenues, as reported in column (4) of Table 9a.[33]

[31] The coefficients are precisely estimated only in the case of the positive association between the median household income and the share of high-skilled immigrants, and of the negative association between average payroll per worker and the share of low-skilled immigrants.

[32] The House Price Index is provided by the Federal Housing Finance Agency and measures changes in single-family home values based on data from all 50 states and over 400 American cities that are aggregated to the county level using transaction sales based weights. The median house value is provided by the U.S. Census and measures the median house value reported by respondents in the county.

[33] In the literature, Lutz, Molloy, and Shan (2010) describe various channels through which the housing market impacts tax revenues. The most important one is the property tax channel, which is a function of property values (the price of real estate and the volume of real estate transactions) and local government tax policies – policymakers adjust the effective tax rate to offset some or all of the decline in revenue. The decline in property values also has a secondary effect on local revenues through its impact on consumption. Since housing is the most important component of wealth for many households, a relative decline in home values tends to suppress homeowners' perceived wealth and their consumption of goods

Tax revenues are also determined by tax rates, which may change in response to immigration. For example, local governments could respond to the arrival of low-skilled immigrants by increasing tax rates in order to meet the balanced budget requirement. Alternately, the arrival of low-skilled immigrants could alter preferences for redistribution and lead to *reductions* in tax rates in order to shrink the size of the welfare state. While, due to data availability, we cannot explicitly test this mechanism in a comprehensive manner, in column (5) of Table 9b we provide some suggestive evidence in the case of property tax rates. We construct a measure of median effective property tax rates by dividing median reported property taxes by median house values (at the commuting zone level from the U.S. Census). We find that an increase in the share of low-skilled immigrants has increased median property tax rates levied in a commuting zone, which is broadly consistent with the predictions of the *tax adjustment model* in Section 3.[34] However we know that the adjustment of tax rates does not fully offset the change in the tax base – given our robust finding of changes in both per capita revenues and expenditures in response to immigration. In addition, the fact that property tax rates increase with the arrival of low-skilled immigrants is consistent with a fixed size of the welfare state, as the two changes are in opposite directions and compensate each other in terms of preferences for redistribution. However, ideally, to provide robust evidence on the political economy channel, we would want to look at different types of tax rates (income, sales and property tax rates) which we cannot do, given lack of data.[35].

As outlined in Section 3, locally generated revenues depend on the composition of the population and on the level of local economic activity, both of which may be directly impacted by the arrival of low- and high skilled immigrants. For example, if low-skilled immigrants are on average poorer than the local population, this will result in a decrease in local average income, with possible spillovers to the house prices in the area, which will result in a decline in per capita revenues from income, sales and property taxes. Given the binding budget constraint that most local governments face, the outcome is either higher tax rates (as in the *tax adjustment model*) or a decline in (quality or quantity of) public goods provision (as in the *benefit adjustment model*), unless intergovernmental transfers increase to make up for some of the decrease in per capita revenues generated locally. Since the transfers from state and federal governments are in general a function of locality's population and poverty rates measured during Census years (Suarez Serrato and Wingender, 2014), some degree of insurance against declines in revenues due to immigration is to be expected. How much of the loss in per capita revenues these transfers insure against, in practice, is an empirical question.

Related to the previous point, what ultimately matters for the local government, in terms of the budget constraint, is "total revenues", which is the sum of "revenues

and services, which further reduces local sales tax revenues. For evidence on the relationship between housing prices and local government budgets, see Lutz, Molloy, and Shan (2010); Chernick, Langley, and Reschovsky (2011); Alm, Buschman, and Sjoquist (2014); and Cromwell and Ihlanfeldt (2015).

[34]Our result is consistent with Lutz (2008), who reports that policy makers offset about 60 percent of house price changes by adjusting the effective tax rate: As house prices decline, policymakers increase the effective tax rate (often by delaying downward adjustments in property assessments).

[35]In work in progress we investigate the political economy channel in alternative ways

from own sources" and total intergovernmental transfers. The estimates in column (1) of Table 9c show that our results are somewhat less pronounced when we look at total revenues (as opposed to revenues from own sources which are shown in column (2)): the coefficient on high-skilled immigrants is smaller and not significant, while the coefficient on low-skilled immigrants does not change significantly. In addition, column (4) shows that transfers from the federal government *increase* with the arrival of low-skilled immigrants but decrease (although not significantly) when high-skilled immigrants come. On the other hand, transfers from the state decrease significantly for both types of immigrants (column (5)) while transfers from local governments move in the same direction as county-level own revenues (column (6)). This is probably due to the fact that immigrant flows are highly correlated at the local level – hence insurance cannot take place – but less so at the national level – which implies that the federal government can partly insure counties for negative fiscal shocks. This is an important point, since there is evidence from the literature that fiscal effects have uneven impacts at different levels of government, as they are on average more negative at the local level than at the aggregate level (NASEM, 2016). We find that transfers in part offset these uneven effects.

6.2 Expenditure Items

Next, we explore the expenditure side of the fiscal equation in order to identify how various spending items are impacted differentially by the arrival of low-skilled and high-skilled immigrants. The effect of immigration on the various categories reflects a combination of supply and demand channels. Consistent with the model, given the balanced budget requirement, any change in per capita total revenues due to immigration will produce a corresponding change in per capita total expenditures. This will affect, on the supply side, the ability of local jurisdictions to pay for each type of expenditure, hence the quantity and quality of public goods and services supplied by the government. Moreover, immigrants may directly impact the price of certain services, such as child and elderly care (Cortes, 2008; Cortes and Tessada, 2011) and alter the costs for public providers. In the case of public education, per capita costs may decrease if economies of scale are prevalent in service provision or if some of the immigrants serve as teachers, nurses, custodians in public schools. Finally, some local services, especially public education, are partially funded by the state and federal government based on formulas factoring in head counts (overall population, enrollments) and per capita income. This may allow some smoothing out of the (positive or negative) impact of immigration on certain expenditure items, while the relative share of public services which rely heavily on local funds may vary more.

The arrival of low- and high-skilled immigrants might also change the demand for certain types of services. First, to the extent immigration affects (or is perceived to affect) crime rates at the local level, the demand for public safety expenditures may change correspondingly. Moreover, if low-skilled immigrants are on average poorer, the demand for public welfare expenditures may increase. Additionally, an increase in low-skilled immigrants may increase demand for public education spending, if low-skilled immigrants have more school-age kids compared to natives; or for public transportation, to the extent car ownership rates are lower for low-skilled immigrants. Second, it is possible that

preferences for different types of spending change among natives due to immigration. For example, natives may vote against funding public services that are disproportionately utilized by immigrants. The regressions reported in Tables 10a and 10b shed light on some of these mechanisms both on the supply and demand sides.

Our main regressions used, as dependent variable, "general" expenditures (see column (2) of Table 10a), which represent around 91% of total expenditures (column (1)) and finance the majority of locally provided public services. The remaining 9% of total expenditures are for liquor stores, utilities and the insurance trust sectors (column (10)). General expenditures can be divided into different types of spending, which we separately analyze. Education (column (3)) is an extremely important public service, which constitutes a large share of spending by local governments. It is noteworthy that this expenditure item is not significantly affected by the arrival of neither low- nor high-skilled immigrants. These results are in line with the fact that schools receive federal and state funding which is determined by the number and household income of the students enrolled. If the arrival of immigrants increases the number of kids enrolled in local (public) schools, the school district will receive proportionally more money from the federal government, therefore spending should not necessarily be affected on a per capita basis. It is reassuring to see that this is the case in the data. In addition, the estimates reported in column (1) of Table 10b suggest no change in students per teacher ratios in response to immigration, which is again consistent with some level of insurance provided by the federal or state governments for education spending. The two sets of results show that immigration affects neither the quantity nor quality of public education services provided by local governments.[36]

The estimates for spending on "law and order" (which consists of police, fire, corrections, judiciary and protective inspection) are reported in column (4) (Table 10a) and suggest that per capita expenditure on public safety decreases with the arrival of high-skilled immigrants, while it remains unchanged with the inflow of low-skilled immigrants. It is noteworthy that a decline in law and order spending takes place, in response to the arrival of high-skilled immigrants, despite an associated increase in per capita revenues; it is also relevant that, with low skilled immigrants, law and order expenditures remain the same, despite the associated decrease in per capita revenues. One possible explanation is related to demand for law and order services, which in turn depends on observed or perceived changes in crime rates by the voting public as immigrants arrive. To shed light on this point, in Table 10b we investigate the impact of low-skilled and high-skilled immigration on crime rates in the county of arrival. The results in columns (2)-(3) in Table 10b are not consistent with common fears that immigrants increase crime, rather the opposite. We estimate that high-skilled immigration reduced both violent and property crime rates in U.S. counties between 1990 and 2010; the impact of low-skilled immigrants on both types of crime is insignificant.[37] These findings are consistent with local authorities adjusting public

[36] On the other hand, Feler and Senses (2017) find that both education expenditures decrease and students per teacher ratios increase in response to an adverse trade shock.

[37] The existing literature focuses on the impact of overall immigration, abstracting away from any heterogeneity across low- and high-skilled immigrants. These papers find that, in the U.S., there is no significant impact of overall immigration on total crime rates, except in the case of property crimes (Butcher and Piehl, 1998; Reid et al., 2005; Wadsworth, 2010; Spenkuch, 2014).

spending on law and order in response to changes in crime rates following immigration.

Interestingly, high-skilled immigration leads to increased spending on infrastructure (column (6)), which may be driven by greater demand for transportation infrastructure (airports, highways) by high-skilled, high-income foreign-born residents, as well as by greater availability of revenues implied by the latter. We find that welfare spending decreased with the arrival of low-skilled immigrants and increased with the inflows of high-skilled immigrants. This is surprising from a demand point of view as we would expect demand for public welfare spending to, respectively, *increase* with low-skilled immigration and *decrease* with high-skilled immigration. Hence these results are likely driven by changes in public revenues induced by the arrival of low-skilled vs. high-skilled immigrants.[38]

7 Second-Generation Immigrants

Up to this point we have investigated the fiscal impact of foreign-born individuals, who are also defined as "first-generation" immigrants. In this section we extend the analysis and look at second-generation immigrants. It is important to do so for two reasons. First, second-generation immigrants are likely to differ in their fiscal impact compared to first-generation ones. Indeed, the NASEM (2016) report finds that the direct tax payments of first-generation immigrants tend to be lower than natives', while the tax contribution of second-generation immigrants is significantly larger. Similarly, in terms of fiscal transfers, the NASEM (2016) report finds that first-generation immigrants receive higher direct transfers than natives but second-generation immigrants receive smaller ones. These findings suggest that second-generation immigrants might make an overall positive contribution to the welfare state. We explore this point in our reduced-form framework which captures both direct and indirect effects (at the local level).

The second reason we look at the fiscal impact of second-generation immigrants is that their number is likely to be positively correlated with the number of foreign born at the local level. In general, parents and (adult) kids are likely to live close to each other. In the specific case of immigrants, the existence of a local community from the same immigrant background increases the likelihood that parents and (adult) kids live in the same place. It is then important to estimate the impact of first generation immigrants controlling for the effect of second-generation ones, as omitting the latter might give rise to an omitted variable bias. Importantly, this point is relevant not only in the analysis of the fiscal impact of immigration, but for any type of impact. We believe we are the first ones in the literature to make this point.

[38] It is important to point out that, while per capita dedicated spending is a key driver of service provision, it is an imperfect proxy for quantity and quality of public services. This may, for example, be due to the association between scale of population and service provision. In the case of education, higher enrollment might lead to worse quality and outcomes in public schools, even if per capita education spending remains constant, due to capacity constraints or difficulty of hiring good teachers. On the other hand larger scale may be helpful in the case of certain services that require a minimum scale of activity, such as a school library, sports field or specialized elective courses in local public schools; or certain infrastructure with high fixed cost, such as investment in an airport or highway.

We identify the presence of second-generation immigrants at the local level as follows. The U.S. Census as of 1980 as well as the American Community Survey (ACS) do not report the country of birth of a respondent's parents. For this reason, we use a *proxy* measure of second-generation immigrants which is based on information whether individuals speak a language other than English at home.[39] We calculate the share of people born in the U.S. who speak a language other than English, at the commuting zone level, and apply this share to all counties within the commuting zone. This approach introduces measurement error and could either underestimate or overestimate the presence of second-generation immigrants. Our measure does not capture second-generation immigrants from English-speaking countries, such as Canada, the United Kingdom, South Africa, etc., nor second-generation immigrants who did not learn the language of their parents. On the other hand, our measure includes individuals who speak a second language at home for reasons which are orthogonal to having foreign-born parents – for example households who lived abroad for professional reasons are more likely to speak a second language at home.

To address measurement error and at the same time instrument for second-generation immigrants, we take advantage of the fact that the Current Population Survey (CPS) reports the country of birth of the respondent's father and mother. We consider a person to be a second-generation immigrant if at least one of the parents was born outside of the U.S.. The CPS data allow us to construct an estimate of the *national* number of second-generation immigrants by country of origin. This is possible because the CPS is representative at the national level, although it is not at the local (state or commuting zone or county) levels.[40] We apportion the aggregate number of second-generation immigrants to counties using the 1970 share of first-generation immigrants by country of origin and sum across all countries of origin to obtain the predicted number of second-generation immigrants at the county level.

In the regressions we estimate the impact on fiscal variables of both first- and second-generation immigrants using the following specification:

$$y_{it} = \delta_i + \delta_t + \beta_{1st}\frac{M_{it}}{Pop_{it}} + \beta_{2nd}\frac{M_{it}^{2nd}}{Pop_{it}} + \beta_x X_{z,1980} * t + \varepsilon_{it}. \tag{13}$$

where the share (M_{it}/Pop_{it}) represents the fraction of first-generation immigrants in the population and (M_{it}^{2nd}/Pop_{it}) is the share of second generation ones. The control variables $X_{z,1980} * t$ are the same as in our baseline specification in equation (9). Our preferred specifications include these control variables (columns (2) and (4) of Table 11),

[39] People who speak more than one non-English language at home are supposed to report the language they speak most often, or the language they learned first.

[40] Note that 1994 is the first year where the CPS provides information on the country of birth of the father and the mother. In addition, the low sampling rate for some country-of-origin groups leads to large year-to-year fluctuations in the number of 2nd generation immigrants. For these reasons, we pool the years 1994 and 1995 and take the yearly average to construct the number of 2nd generation immigrants in 1990 per country-of-origin group. For the remaining years 2000 and 2010, we take the yearly average of the pooled 2000 to 2002 and 2010 to 2012 samples respectively. If a person's parents were born in different countries, we count the person as 0.5 for each country's second-generation immigrant stock.

also because they are the ones where the first stage of instruments works best, but we present the estimates without controlling for them, as well (columns (1) and (3) of Table 11). We find that second-generation immigrants have a positive and significant impact on both per-capita (own) revenues and (general) expenditures, but the latter effect is in magnitude much smaller than the former one. These findings suggest that second generation immigrants make a large, positive and significant contribution on net. Note that, once we include the second-generation immigrants, the estimates for the foreign born become negative for revenues and are insignificant for expenditures. To conclude, including second-generation immigrants allows us to investigate the impact of immigration, broadly speaking, at different time horizons. In the short run, in the first generation, the fiscal impact is negative but it turns greatly positive in the long run, through their kids. These results are similar to those reported in NASEM (2016), where the combined direct fiscal effect of first and second-generation immigrants is similar to the one of natives.

8 Conclusions

Immigration continues to be a salient political issue all over the world, even recently, when public attention is focused on the ongoing pandemic crisis. What is crucial in the debate is what role immigrants play in destination countries, during both normal and exceptional times. Immigrants affect host economies through several different channels. They impact the labor market opportunities of natives; they affect the destination countries' welfare state; they change prices of goods and especially services; they shape production patterns as well as trade and FDI flows to and from origin countries. In addition, immigrants also have impacts from a non-economic point of view, for example on culture, potentially security and crime, and politics. Several economic papers have analyzed these various dimensions. For example, the labor-market migration literature is enormous and includes contributions such as the seminal papers by Borjas (2003), Ottaviano and Peri (2012), etc. Interestingly, an equally important aspect of the economic impact of immigration, on local public finances, has not received as much attention.

The results of our paper shed light on the role that immigrants play from a public finance point of view at the *local* level. First they provide evidence that, on average, immigrants to the United States represent neither a burden nor a net contribution for public finances of local jurisdictions. These results are relevant for the "average" county in the United States. However, our findings show that there is substantial heterogeneity in terms of the effect of immigration, across skill levels, different parts of the United States and time horizons. The skill level of immigrants is a key variable, specifically the effects on local public revenues and expenditures are opposite for, respectively, low-skilled and high-skilled immigrants. This is not surprising given that the level of education affects individual income, which in turn impacts local housing markets and consumption of goods (income also affects income taxes but this source of revenue is less important at the county level). It is especially through property taxes that the opposite effects of low-skilled and high-skilled immigrants take place. Our results also show that, since arrivals of low-skilled and high-skilled immigrants vary substantially in magnitude across counties in the United States (see Figures 1 and 2), the overall impact of immigration differs greatly from a

geographical point of view (see Figures 4 and 5). Some counties experience a negative impact while other counties experience a positive one. Our estimates provide evidence that intergovernmental transfers only partially offset the local impact of immigration. Finally, the fiscal impact of immigration is more positive for the second generation, as compared to the first generation of immigrants.

9 Bibliography

Adams, T. K. (1980): "Census of Population and Housing, 1980 : Extract Data. ICPSR09693-v3. Ann Arbor, MI: Consortium for Political and Social Research," http://doi.org/10.3886/ICPSR09693.v3, (accessed on 6/8/2020).

Alesina, A. and E. L. Ferrara (2005): "Ethnic diversity and economic performance," *Journal of economic literature*, 43, 762–800.

Alesina, A., A. Miano, and S. Stantcheva (2018): "Immigration and Redistribution," Working Paper 24733, National Bureau of Economic Research.

Alesina, A., E. Murard, and H. Rapoport (2019): "Immigration and preferences for redistribution in Europe," Tech. rep., National Bureau of Economic Research.

Altonji, J. G. and D. Card (1991): "The effects of immigration on the labor market outcomes of less-skilled natives," in *Immigration, trade, and the labor market*, University of Chicago Press, 201–234.

Auerbach, A. J. and P. Oreopoulos (1999): "Analyzing the fiscal impact of US immigration," *American Economic Review*, 89, 176–180.

——— (2000): "The fiscal effect of US immigration: A generational-accounting perspective," *Tax policy and the economy*, 14, 123–156.

Autor, D. H., D. Dorn, and G. H. Hanson (2013): "The China syndrome: Local labor market effects of import competition in the United States," *The American Economic Review*, 103, 2121–2168.

Bartik, T. J. (1991): *Who Benefits from State and Local Economic Development Policies?*, W.E. Upjohn Institute.

Borjas, G. J. (1994): "The economics of immigration," *Journal of economic literature*, 32, 1667–1717.

——— (1995): "The Economic Benefits from Immigration," *Journal of Economic Perspectives*, 9, 3–22.

——— (1999): "The economic analysis of immigration," in *Handbook of labor economics*, Elsevier, vol. 3, 1697–1760.

——— (2003): "The Labor Demand Curve Is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market," *The Quarterly Journal of Economics*, 118, 1335–1374.

——— (2014): *Immigration economics*, Harvard University Press.

Börsch-Supan, A., D. Leite, and J. Rausch (2019): "Demographic changes, migration and economic growth in the Euro area," in *Prepared for the ECB Forum on Central Banking*, 17–19.

Borusyak, K., P. Hull, and X. Jaravel (2022): "Quasi-experimental shift-share research designs," *The Review of Economic Studies*, 89, 181–213.

Bratsberg, B., O. Raaum, and K. Røed (2010): "When minority labor migrants meet the welfare state," *Journal of Labor Economics*, 28, 633–676.

——— (2014): "Immigrants, labour market performance and social insurance," *The Economic Journal*, 124, F644–F683.

Burstein, A., G. Hanson, L. Tian, and J. Vogel (2020): "Tradability and the Labor-Market Impact of Immigration: Theory and Evidence From the United States," *Econometrica*, 88, 1071–1112.

Butcher, K. F. and A. M. Piehl (1998): "Recent immigrants: Unexpected implications for crime and incarceration," *Industrial & Labor Relations Review Labor Relations Review*, 51, 654–679.

Card, D. (2001): "Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration," *Journal of Labor Economics*, 19, 22–64.

Chojnicki, X. (2013): "The Fiscal Impact of Immigration in F rance: A Generational Accounting Approach," *The World Economy*, 36, 1065–1090.

Clemens, M. (2021): "The Fiscal Effect of Immigration: Reducing Bias in Accounting Estimates," .

Colas, M. and D. Sachs (2020): "The indirect fiscal benefits of low-skilled immigration," .

Collado, M. D., I. Iturbe-Ormaetxe, and G. Valera (2004): "Quantifying the impact of immigration on the Spanish welfare state," *International Tax and Public Finance*, 11, 335–353.

Cortes, P. (2008): "The effect of low-skilled immigration on US prices: evidence from CPI data," *Journal of political Economy*, 116, 381–422.

Cortes, P. and J. Tessada (2011): "Low-skilled immigration and the labor supply of highly skilled women," *American Economic Journal: Applied Economics*, 3, 88–123.

Dix-Carneiro, R., R. R. Soares, and G. Ulyssea (2018): "Economic shocks and crime: Evidence from the brazilian trade liberalization," *American Economic Journal: Applied Economics*, 10, 158–95.

Dustmann, C., G. Facchini, and C. Signorotto (2017): "Population, Migration, Ageing and Health: A Survey," *Economics without Borders*, 113.

Dustmann, C. and T. Frattini (2014): "The fiscal effects of immigration to the UK," *The economic journal*, 124, F593–F643.

Dustmann, C., T. Frattini, and C. Halls (2010): "Assessing the Fiscal Costs and Benefits of A8 Migration to the UK," *Fiscal Studies*, 31, 1–41.

Dustmann, C. and I. Preston (2005): "Is Immigration Good or Bad for the Economy? Analysis of Attitudinal Responses," *Research in Labor Economics*, 24, 3–34.

Dustmann, C. and I. P. Preston (2007): "Racial and economic factors in attitudes to immigration," *The BE Journal of Economic Analysis & Policy*, 7.

Facchini, G. and A. M. Mayda (2009): "Does the welfare state affect individual attitudes toward immigrants? Evidence across countries," *The review of economics and statistics*, 91, 295–314.

Facchini, G., A. M. Mayda, and E. Murard (2016): "Does immigration affect preferences for redistribution? Evidence across countries," in *Handbook on Migration and Social Policy*, Edward Elgar Publishing.

Feler, L. and M. Z. Senses (2017): "Trade shocks and the provision of local public goods," *American Economic Journal: Economic Policy*, 9, 101–43.

Flood, S., M. King, R. Rodgers, S. Ruggles, and J. R. Warren (2020): "Integrated Public Use Microdata Series, Current Population Survey: Version 7.0,"

Minneapolis, MN: Minnesota Population Center.", https://doi.org/10.18128/D030.V7.0, (accessed on 6/8/2020).

Giuliano, P. and M. Tabellini (2020): "The Seeds of Ideology: Historical Immigration and Political Preferences in the United States," Tech. rep., National Bureau of Economic Research.

Goldsmith-Pinkham, P., I. Sorkin, and H. Swift (2020): "Bartik instruments: What, when, why, and how," *American Economic Review*, 110, 2586–2624.

Hainmueller, J. and M. J. Hiscox (2010): "Attitudes toward highly skilled and low-skilled immigration: Evidence from a survey experiment," *American political science review*, 104, 61–84.

Hansen, J. and M. Lofstrom (2003): "Immigrant assimilation and welfare participation do immigrants assimilate into or out of welfare?" *Journal of Human Resources*, 38, 74–98.

Hanson, G. H., K. Scheve, and M. J. Slaughter (2007): "Public finance and individual preferences over globalization strategies," *Economics & Politics*, 19, 1–33.

Javdani, M. and K. Pendakur (2014): "Fiscal effects of immigrants in Canada," *Journal of International Migration and Integration*, 15, 777–797.

Lewis, E. and G. Peri (2015): "Immigration and the Economy of Cities and Regions," in *Handbook of Regional and Urban Economics*, Elsevier, vol. 5, chap. 10, 625–685.

Luttmer, E. F. (2001): "Group loyalty and the taste for redistribution," *Journal of political Economy*, 109, 500–528.

Mayda, A. M. (2019): "Comment on: Demographic changes, migration and economic growth in the Euro area," in *Prepared for the ECB Forum on Central Banking*, 20–21.

Mayda, A. M., G. Peri, and W. Steingress (2022): "The political impact of immigration: Evidence from the United States," *American Economic Journal: Applied Economics*, 14, 358–89.

Mayr, K. (2005): "The fiscal impact of immigrants in Austria–A generational accounting analysis," *Empirica*, 32, 181–216.

NASEM (2016): *The Economic and Fiscal Consequences of Immigration*, National Academies of Sciences, Engineering, and Medicine (NASEM), National Academies Press.

Ottaviano, G. I. P. and G. Peri (2012): "Rethinking the Effect of Immigration on Wages," *Journal of the European Economic Association*, 10, 152–197.

Peri, G. (2016): "Immigrants, Productivity, and Labor Markets," *Journal of Economic Perspectives*, 30, 3–30.

Peri, G. and C. Sparber (2009): "Task Specialization, Immigration, and Wages," *American Economic Journal: Applied Economics*, 1, 135–169.

Razin, A., E. Sadka, and P. Swagel (2002): "The aging population and the size of the welfare state," *Journal of Political Economy*, 110, 900–918.

Reid, L. W., H. E. Weiss, R. M. Adelman, and C. Jaret (2005): "The immigration–crime relationship: Evidence across US metropolitan areas," *Social science research*, 34, 757–780.

Ruist, J. (2014): "Free immigration and welfare access: the Swedish experience," *Fiscal studies*, 35, 19–39.

Saiz, A. (2007): "Immigration and housing rents in American cities," *Journal of urban Economics*, 61, 345–371.

Smith, J. and B. Edmonston (1997): *The New Americans Economic, Demographic, and Fiscal Effects of Immigration*, National Research Council, National Academy Press, Washington, D.C.

Spenkuch, J. L. (2014): "Understanding the impact of immigration on crime," *American law and economics review*, 16, 177–219.

Storesletten, K. (2000): "Sustaining fiscal policy through immigration," *Journal of political Economy*, 108, 300–323.

——— (2003): "Fiscal implications of immigration - A net present value calculation," *Scandinavian Journal of Economics*, 105, 487–506.

United States Census Bureau (2000): "Census of Population and Housing 1990 and 2000 (Summary Tapes 3A and 3B)," `https://dataferrett.census.gov`, (accessed on 6/8/2020).

——— (2010): "American Community Survey 5-year 2009-2013 (Table B05003)," `https://data.census.gov/cedsci/`, (accessed on 6/8/2020).

——— (2016): "2015 Cartographic Boundary File, State-County for United States, 1:5,000,000, Department of Commerce," `https://catalog.data.gov/dataset/2015-cartographic-boundary-file-state-county-for-united-states-1-5000000`, (accessed on 12/4/2017).

Vargas-Silva, C. (2015): "The fiscal impact of immigrants: taxes and benefits," in *Handbook of the economics of international migration*, Elsevier, vol. 1, 845–875.

Wadsworth, T. (2010): "Is immigration responsible for the crime drop? An assessment of the influence of immigration on changes in violent crime between 1990 and 2000," *Social Science Quarterly*, 91, 531–553.

10 Tables

Table 1: Summary statistics

	1990		2010	
	mean	sd	mean	sd
(a) Immigrants (share of population)				
Share of immigrants - over 25	0.057	0.065	0.106	0.092
Share of low-skilled immigrants	0.046	0.054	0.076	0.067
Share of high-skilled immigrants	0.012	0.012	0.030	0.028
(b) Revenue variables (per-capita)				
Total revenues	2516.7	1342.6	3685.6	2217.4
Revenues from own sources	1543.7	1156.4	2283.1	1879.9
Tax revenues	776.9	570.7	1196.4	1214.0
Property tax revenues	649.0	513.7	963.6	1136.4
Sales and income taxes	101.7	167.3	193.2	271.8
Other taxes	26.2	37.5	39.5	79.3
Total charges and admin. revenue	536.9	594.6	766.4	785.0
Utilities, insurance trust and liquors	229.8	546.8	320.3	773.2
Intergov. transfers	973.1	444.3	1402.5	754.5
Federal gov. transfers	58.2	92.6	131.7	227.9
State gov. transfers	857.9	398.3	1179.5	602.4
Local gov. transfers	57.0	73.3	91.3	136.7
(c) Expenditure variables (per-capita)				
Total expenditure	2503.8	1298.7	3643.3	2212.9
General expenditure	2256.8	1067.1	3292.3	1842.1
Education	1122.3	392.8	1528.2	923.9
Law and Order	178.7	158.2	316.9	233.3
Sanitation	83.8	83.1	138.2	118.4
Infrastructure	204.9	176.6	285.5	343.3
Public welfare	379.6	406.3	630.2	827.0
Administrative	186.9	363.7	219.2	280.4
Other	100.5	121.0	174.1	234.4
Utilities, insurance trust and liquor stores	247.0	598.3	351.0	882.7

(d) Demographic variables (share of population)

	1980	
	mean	sd
Share of urban	0.686	0.350
Share of youth	0.416	0.031
Per-capita real income (in logs)	9.944	0.145
Share of African American	0.116	0.099
Share of female	0.310	0.019
Share of married	0.449	0.029
Share of unemployed	0.030	0.008
Bartik instrument	12.788	1.671

Notes: The number of observations is 9237 and weighted by the county population. Total revenue is equal to revenue from own sources plus inter-governmental transfers. Revenue from own sources is the sum of general revenue from own sources and revenue from liquor stores, utilities, and the insurance trust sector. General revenue from own sources is the sum of total taxes and other taxes and charges. Total taxes are equal to property taxes and sales, income, and license. Total intergovern-mental transfers are the sum of transfers from the federal government, the state government and other local governments. Total expenditure is equal to general expenditure plus other expenditures on liquor stores, utilities, and the insurance trust sector. General expenditure consists of expenditure on education law and order, sanitation, infrastructure welfare, administrative, and other general expenditures.

Table 2: Local revenues and expenditures versus immigrant share
OLS estimates, U.S. Counties, 1990 to 2010

(a) Per-capita revenues from own sources (logs)

Dependent variable	Log of per-capita revenues from own sources			
	(1)	(2)	(3)	(4)
Share of immigrants	-0.677***	-0.768**		
	[0.225]	[0.318]		
Share of low-skilled immigrants			-1.693***	-1.915***
			[0.455]	[0.466]
Share of high-skilled immigrants			1.047	1.894**
			[0.644]	[0.794]
Commuting zone controls	No	Yes	No	Yes
County fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237
R^2	0.53	0.54	0.53	0.54

(b) Per-capita general expenditures (logs)

Dependent variable	Log of per-capita general expenditures			
	(1)	(2)	(3)	(4)
Share of immigrants	-0.531***	-0.471**		
	[0.185]	[0.219]		
Share of low-skilled immigrants			-1.377***	-1.178***
			[0.313]	[0.280]
Share of high-skilled immigrants			0.905**	1.166**
			[0.432]	[0.534]
Commuting zone controls	No	Yes	No	Yes
County fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237
R^2	0.69	0.70	0.69	0.70

Notes: The dependent variable in Panel A is the log of total per-capita own revenues and in Panel B it is the log of per-capita general expenditures in a county and year. The explanatory variables are equal to immigrants by skill-level as a share of the population aged 25 or above. Method of estimation is ordinary least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, the log of the average income, share of unemployed, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 3: Reverse causality analysis
OLS estimates, U.S. Counties 1980 - 1990 versus 1990 to 2010

Dependent variable	Change predicted share of immigrants 1990-2010		Change predicted share of low-skilled immigrants 1990-2010		Change predicted share of high-skilled immigrants 1990-2010	
	(1)	(2)	(3)	(4)	(5)	(6)
Log change per-capita revenues from own sources (1980-1990)	-0.001 [0.006]		-0.006 [0.004]		0.002* [0.001]	
Log change per-capita expenditure (1980-1990)		0.007 [0.012]		0.010 [0.007]		-0.002 [0.002]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3079	3079	3079	3079	3079	3079
R^2	0.46	0.46	0.64	0.64	0.76	0.76

Notes: The dependent variable in specifications (1) to (2) is the change in the share of immigrants in the population between 1990 and 2010. The dependent variable in specifications (3) to (4) is the change in the share of low-skilled immigrants in the population between 1990 and 2010. The dependent variable in specifications (5) to (6) is the change in the share of high-skilled immigrants in the population between 1990 and 2010. Method of estimation is ordinary least squares. The controls at the commuting zone level are the 1980 values of: share of men, share of married, share of African-American, share of urban citizens, the log of the average income, share of unemployed and the Bartik employment shifter described in the text. In addition, specifications (3) to (4) include as a control the change in the predicted share of high-skilled immigrants, while specifications (5) to (6) include the change in the predicted share of low-skilled immigrants as a control. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 4: Falsification tests
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Log change in per-capita revenue from own sources between 1990-1980				Log change in per-capita general expenditure between 1990-1980			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in share of immigrants (2010-1990)	-0.173				0.397			
	[0.565]				[0.644]			
Change in share of immigrants (2000-1990)		-0.074				0.292		
		[0.429]				[0.485]		
Change in share of low-skilled immigrants (2010-1990)			-1.248				1.098	
			[0.817]				[0.752]	
Change in share of high-skilled immigrants (2010-1990)			1.501				-0.791	
			[1.068]				[0.946]	
Change in share of low-skilled immigrants (2000-1990)				-1.336				1.177
				[0.909]				[0.833]
Change in share of high-skilled immigrants (2000-1990)				3.064				-1.774
				[1.948]				[1.813]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3079	3079	3079	3079	3079	3079	3079	3079
IV F-stat	107.25	42.92	16.57	55.21	107.25	42.92	16.57	55.21

Notes: The dependent variable in columns (1) to (4) is the log change of total per-capita own revenues and in columns (5) to (8) it is the log change of per-capita general expenditures between 1980 and 1990 in a county and year. The explanatory variables are equal to the change in the share of immigrants by skill-level between 1990 and 2010 as well as 1990 and 2000. Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values of: share of men, share of married, share of African- American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter as described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 5: 1st stage regression estimates of immigration shares and their instruments
OLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Share of immigrants		Share of low-skilled immigrants		Share of high-skilled immigrants	
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted share of immigrants	0.435***	0.311***				
	[0.053]	[0.045]				
Predicted share of high-skilled immigrants			0.169	-0.320**	0.869***	0.660***
			[0.138]	[0.152]	[0.078]	[0.098]
Predicted share of low-skilled immigrants			0.261***	0.295***	-0.002	0.009
			[0.051]	[0.042]	[0.021]	[0.025]
Commuting zone controls	No	Yes	No	Yes	No	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237	9237	9237
R^2	0.76	0.83	0.68	0.76	0.84	0.87

Notes: The dependent variable in specifications (1) to (2) is the share of immigrants in the total population. The dependent variable in specifications (3) to (4) is the share of low-skilled immigrants in the total population. The dependent variable in specifications (5) to (6) is the share of high-skilled immigrants in the total population. Method of estimation is ordinary least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 6: Local revenues and expenditures versus immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

(a) Per-capita revenues from own sources (logs)

Dependent variable	Log of per-capita revenues from own sources			
	(1)	(2)	(3)	(4)
Share of immigrants	-0.515**	-0.324		
	[0.253]	[0.431]		
Share of low-skilled immigrants			-1.846**	-2.786***
			[0.837]	[0.823]
Share of high-skilled immigrants			1.124	3.316***
			[0.887]	[1.094]
Commuting zone controls	No	Yes	No	Yes
County fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237
IV F-stat	67.02	47.24	17.97	26.27

(b) Per-capita general expenditures (logs)

Dependent variable	Log of per-capita expenditures			
	(1)	(2)	(3)	(4)
Share of immigrants	-0.503**	0.076		
	[0.231]	[0.356]		
Share of low-skilled immigrants			-2.479***	-1.850***
			[0.667]	[0.636]
Share of high-skilled immigrants			1.933***	2.922***
			[0.749]	[0.956]
Commuting zone controls	No	Yes	No	Yes
County fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237
IV F-stat	67.02	47.24	17.97	26.27

Notes: The dependent variable in Panel A is the log of per-capita total own revenues and in Panel B is the log of per-capita general expenditures in a county and year. The explanatory variables are equal to immigrants by skill-level as a share of the total population. Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 7: Changes in revenues and expenditures versus immigrant share with lags
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Change in per-capita revenue from own sources between 2010-1990				Change in per-capita general expenditure between 2010-1990			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in share of immigrants (2000-1990)	0.123	0.105			0.338	0.441		
	[0.516]	[0.502]			[0.410]	[0.421]		
Lag change per-capita revenues from own sources (1980-1990)		-0.244***		-0.245***				
		[0.045]		[0.044]				
Change in share of low-skilled immigrants (2010-1990)			-1.857*	-2.163**			-1.671**	-1.296
			[1.023]	[1.008]			[0.763]	[0.802]
Change in share of high-skilled immigrants (2010-1990)			2.780***	3.149***			3.035***	2.766**
			[1.043]	[1.117]			[1.041]	[1.131]
Lag change per-capita expenditures (1980-1990)						-0.354***		-0.341***
						[0.036]		[0.038]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3079	3079	3079	3079	3079	3079	3079	3079
IV F-stat	42.92	44.49	16.57	17.23	42.92	43.31	16.57	16.29

Notes: The dependent variable in columns (1) to (4) is the log change of per-capita revenues from own sources and in columns (5) to (8) it is the log change of per-capita general expenditures between 1990 and 2010 in a county and year. The explanatory variables are equal to the change in the share of immigrants by skill-level between 1990 and 2010. Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 8: Robustness: per-capita revenues, per-capita expenditures and immigrant share 2SLS estimates, U.S. Counties, 1990 to 2010

(a) Per-capita revenues from own sources (logs)

Dependent variable	Benchmark	Population fixed to 1980	Weighted by current pop.	SE clustered state-level	State-time trends
	(1)	(2)	(3)	(4)	(5)
Share of low-skilled immigrants	-2.786***	-2.491***	-2.782***	-2.786***	-2.705***
	[0.823]	[0.795]	[0.820]	[0.874]	[0.828]
Share of high-skilled immigrants	3.316***	3.040***	3.622***	3.316**	3.225***
	[1.094]	[1.060]	[1.108]	[1.479]	[1.124]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237	9237
IV F-stat	26.27	25.41	25.75	24.98	24.23

(b) Per-capita general expenditures (logs)

Dependent variable	Benchmark	Population fixed to 1980	Weighted by current pop.	SE clustered state-level	State-time trends
	(1)	(2)	(3)	(4)	(5)
Share of low-skilled immigrants	-1.850***	-1.660***	-1.929***	-1.850**	-1.752***
	[0.636]	[0.632]	[0.643]	[0.719]	[0.622]
Share of high-skilled immigrants	2.922***	2.245**	3.017***	2.922**	2.861***
	[0.956]	[0.952]	[0.953]	[1.424]	[0.971]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237	9237
IV F-stat	26.27	25.41	25.75	24.98	24.23

Notes: The dependent variable in Panel A is the log of total per-capita own revenues and in Panel B it is the log of per-capita general expenditures in a county and year. Column (1) is the benchmark specification from Table 6. Column (2) fixes the denominator of the shares to the population in 1980. Column (3) uses the current population as regression weights. In column (4) the standard errors are clustered at the state level. Column (5) include state-specific-time trends as control variables. The explanatory variables are equal to immigrants by skill-level as a share of the population aged 25 or above. Method of estimation is ordinary least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, the log of the average income, share of unemployed, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 9a: County revenue types and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Revenue from own sources	General revenues	Tax revenues	Poperty taxes revenues	Sales, inc. and license taxes	Other taxes	Total charges & admin. revenue	Utilities, insurance, liquor stores
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of low-skilled immigrants	-2.786***	-1.841*	-2.173***	-1.411	-17.435***	-6.908**	-0.946	-5.224
	[0.823]	[1.079]	[0.819]	[0.913]	[4.316]	[3.241]	[2.704]	[3.373]
Share of high-skilled immigrants	3.316***	4.204***	2.486**	2.577**	2.310	10.969***	8.082***	-3.996
	[1.094]	[1.219]	[0.992]	[1.264]	[8.976]	[2.956]	[2.291]	[3.690]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237	8525	9214	9237	9108
IV F-stat	26.27	26.27	26.27	26.27	26.32	26.27	26.27	26.20

Notes: The dependent variables are the log of the per-capita values given by the specific columns. General revenues (2) are the sum of total taxes (3) and total admin charges (7). Total taxes are equal to property taxes (4) and sales, income, and license (5) and other taxes (6). Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 9b: County-level tax bases as well as in tax rates and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Log(med.) household income)	Log (Average payroll per worker	Log(House price index)	Log (Median) house value)	Median Property Tax rate
	(1)	(2)	(3)	(4)	(5)
Share of low-skilled immigrants	-0.314	-3.478***	-5.969***	-5.917***	0.060***
	[0.760]	[1.308]	[1.245]	[1.774]	[0.023]
Share of high-skilled immigrants	1.737*	2.232	10.010***	4.069*	0.051
	[1.030]	[1.617]	[2.213]	[2.346]	[0.039]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	9200	9215	6129	8945	9237
IV F-stat	21.98	22.06	23.61	21.92	41.84

Notes: The dependent variable in columns (1) is the log of the median household income, column (2) is the log of a county-specific house price index, column (3)is the log of the median house value, column (4) is the log of the median house rent, column (5) is the log of the average payroll per worker in a county and year. Column (6) is the median effective property tax rate defined as the median reported property tax paied divided by the median reported house value in the commuting zone and year. Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 9c: Fiscal transfers and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Total revenues	Revenue from own sources	Intergov. transfers	Transfer federal gov.	Transfer state gov.	Transfer local gov.
	(1)	(2)	(3)	(4)	(5)	(6)
Share of low-skilled immigrants	-2.753***	-2.786***	-3.148**	6.971**	-3.197**	-4.857
	[0.839]	[0.823]	[1.448]	[3.060]	[1.450]	[5.539]
Share of high-skilled immigrants	1.526	3.316***	-1.004	-5.328	-4.261**	14.819**
	[1.013]	[1.094]	[1.824]	[4.685]	[2.138]	[5.778]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9237	9237	9236	8951	9236	9089
IV F-stat	26.27	26.27	26.26	25.91	26.26	26.06

Notes: The dependent variables are the log of the per-capita values given by the specific columns. Total revenue (1) is equal to revenue from own sources (2) plus intergovernmental transfers (3). Total intergovernmental transfers (3) are the sum of transfers from the federal government (4), the state government (5) and other local governments (6). Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 10a: County expenditure types and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Total expendit.	General expendit.	Education expendit.	Law and order	Sanitation expendit.	Infra-structure expendit.	Public Welfare	Admin. expendit.	Other expendit.	Utilies, insurance trust and liquor st.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share of low-skilled immigrants	-1.800**	-1.850***	-0.460	-1.265	-0.266	-1.640	-4.802**	0.160	1.790	-1.432
	[0.745]	[0.636]	[1.218]	[0.893]	[2.091]	[1.780]	[2.209]	[2.801]	[2.149]	[3.788]
Share of high-skilled immigrants	2.259**	2.922***	1.287	-4.383***	-1.747	4.722*	3.863*	-5.432	7.306**	13.437***
	[0.971]	[0.956]	[1.892]	[1.131]	[3.043]	[2.528]	[2.290]	[3.435]	[3.040]	[4.164]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9237	9237	9226	9236	9184	9235	9231	9131	9237	9205
IV F-stat	26.27	26.27	26.27	26.26	26.25	26.26	26.26	26.20	26.27	26.21

Notes: The dependent variables are the log of the per-capita values given by the specific columns. Total expenditure (1) is equal to general expenditure (2) plus other expenditures on liquor stores, utilities, and the insurance trust sector (10). General expenditure consists of expenditure on education, public safety, public welfare, transportation, interest payments and debt, parks and natural resources, sewage and solid waste management, and other general expenditures. Method of estimation is two stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 10b: Mechanism on expenditure types and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Log(students per teacher ratio)	Log (Total violent crime)	Log(Total property crime)
	(1)	(2)	(3)
Share of low-skilled immigrants	-22.425	-8.548	-2.101
	[13.752]	[6.593]	[3.599]
Share of high-skilled immigrants	2.241	-20.385***	-19.534***
	[16.792]	[4.580]	[3.644]
Commuting zone controls	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Observations	8848	8300	8593
IV F-stat	25.71	21.86	21.94

Notes: The dependent variables are given by the specific columns. In all specifications the dependent variable is in logs. Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, th elog of average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the total population of the county. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table 11: County expenditures, revenues and 1st and 2nd generation immigrants
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Log(per-capita revenues from own sources)		Log(per-capita general expenditures)	
	(1)	(2)	(3)	(4)
Share of 1st generation immigrants	-3.255***	-3.852***	-0.677*	-0.852
	[1.051]	[1.368]	[0.372]	[0.535]
Share of 2nd generation immigrants	10.825***	10.680***	0.709	2.891**
	[2.570]	[2.001]	[1.186]	[1.129]
Commuting zone controls	No	Yes	No	Yes
County fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	9237	9237	9237	9237
IV F-stat	6.42	11.71	6.42	11.71

Notes: The dependent variable in columns (1) and (2) is the log of per-capita reveues from own sources and in columns (3) and (4) is the log of per-capita general expenditures in a county and year. The explanatory variables are equal to immigrants by skill-level as a share of the total population. Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

11 Figures

Figure 1: Change in share of low-skilled immigrants between 1990 and 2010 across US counties

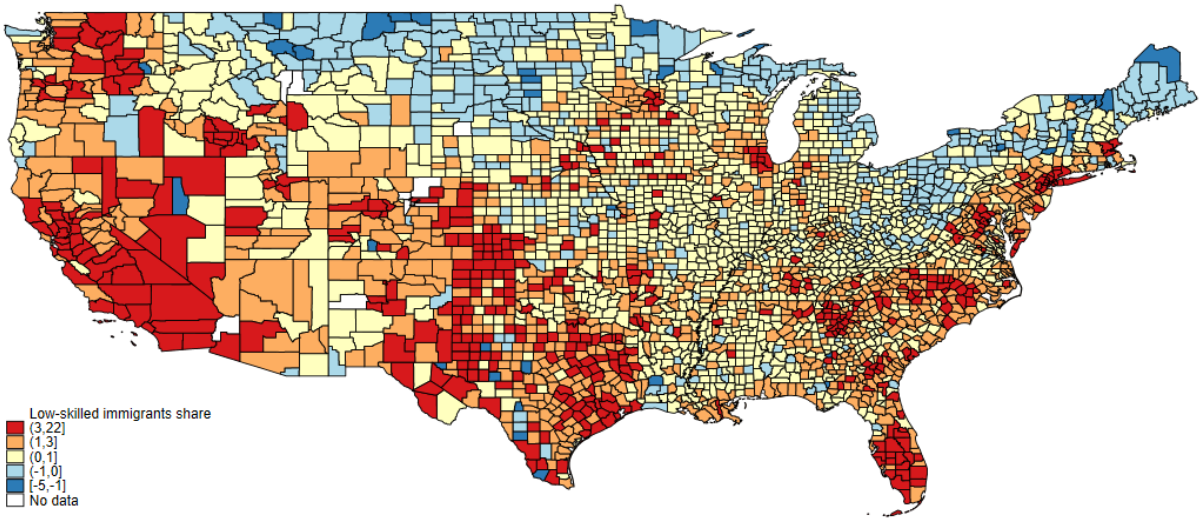


Figure 2: Change in share of high-skilled immigrants between 1990 and 2010 across US counties

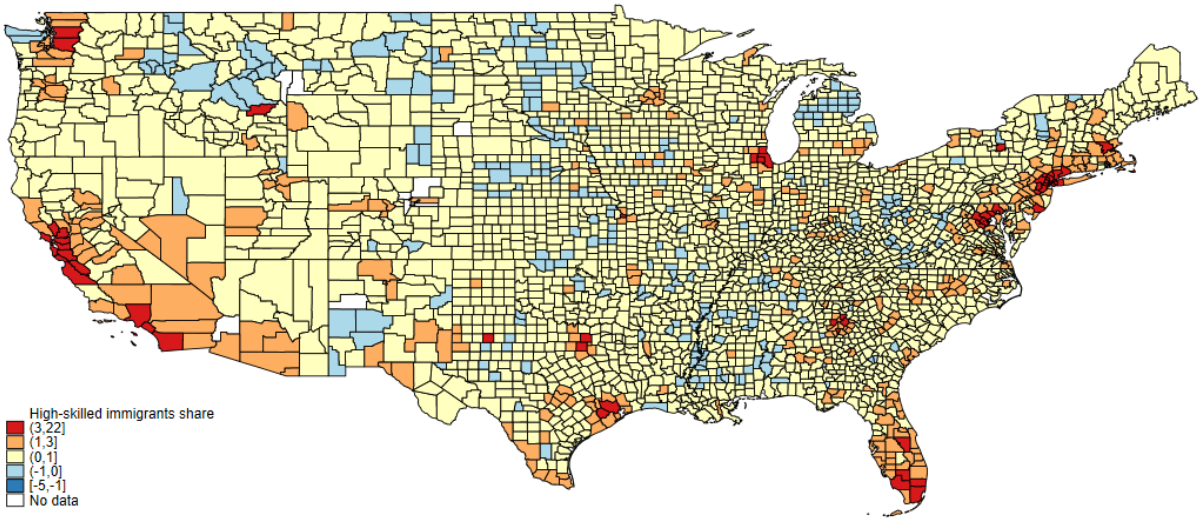
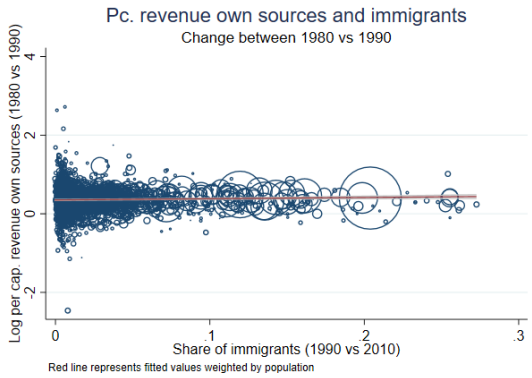


Figure 3a: The percentage of per-capita general expenditures and revenues form own sources (1980-1990) vs. the change in the predicted immigrant share (1990-2010)

(i) Per-capita revenues from own sources



(ii) Per-capita general expenditures

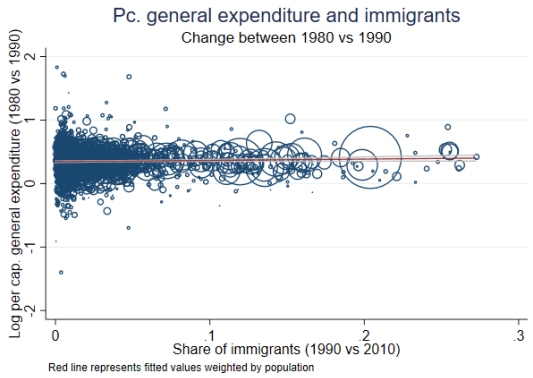
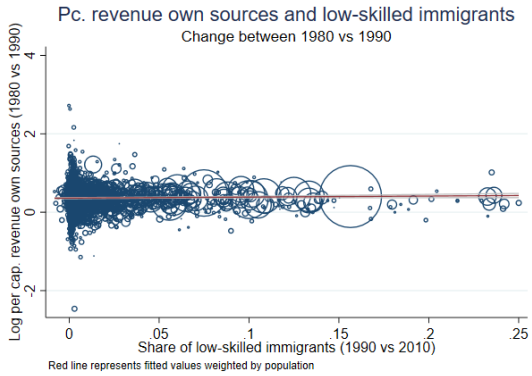


Figure 3b: The percentage change of per-capita revenues from own sources (1980-1990) vs. the change in the predicted low- and high-skilled immigrant share (1990-2010)

(i) Share of low-skilled immigrants



(ii) Share of high-skilled immigrants

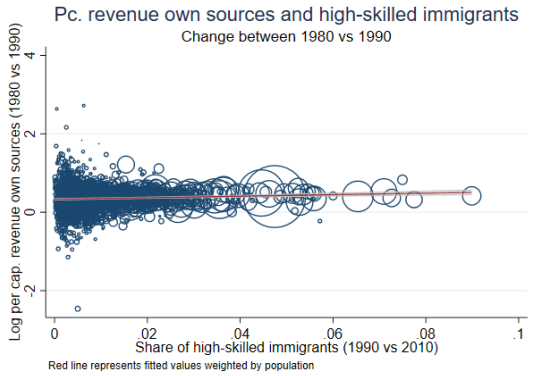
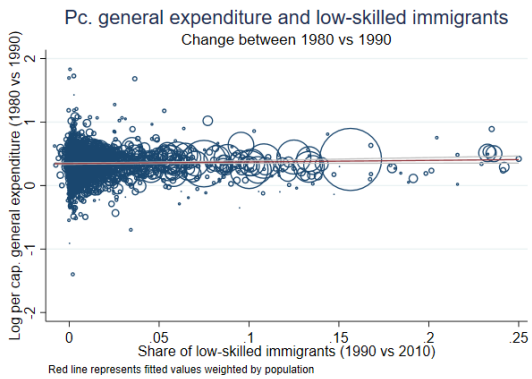
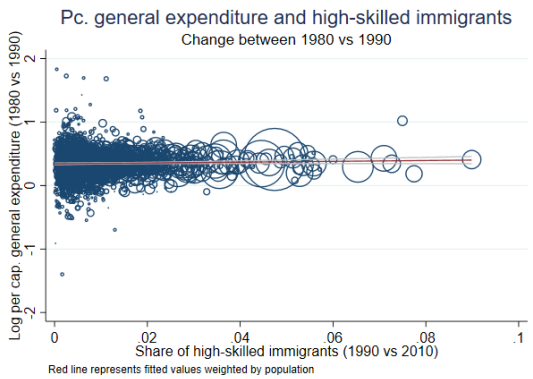


Figure 3c: The percentage change of per-capita general expenditures (1980-1990) vs. the change in the predicted low- and high-skilled immigrant share (1990-2010)

(i) Share of low-skilled immigrants

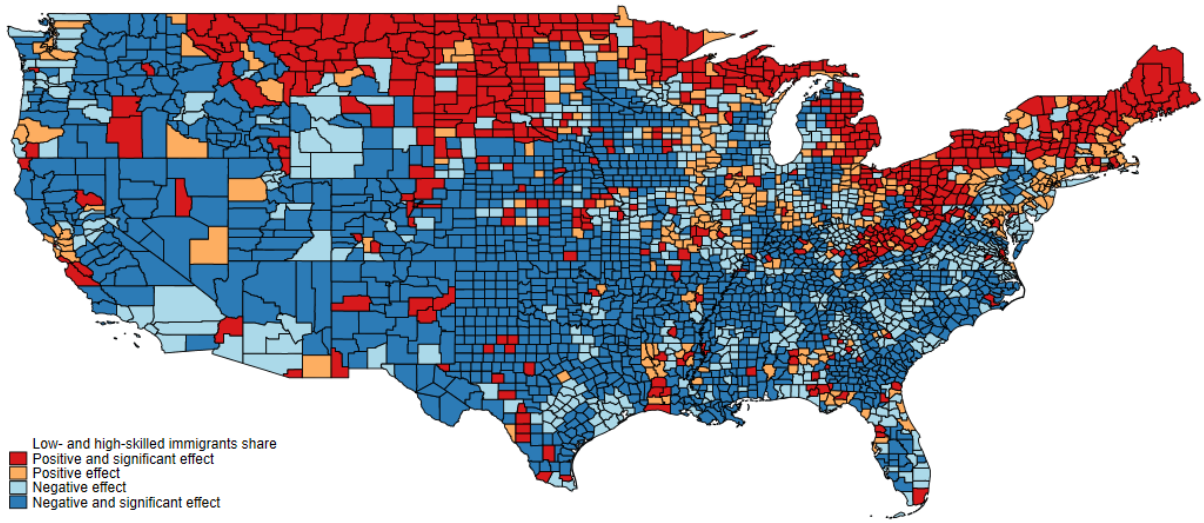


(ii) Share of high-skilled immigrants



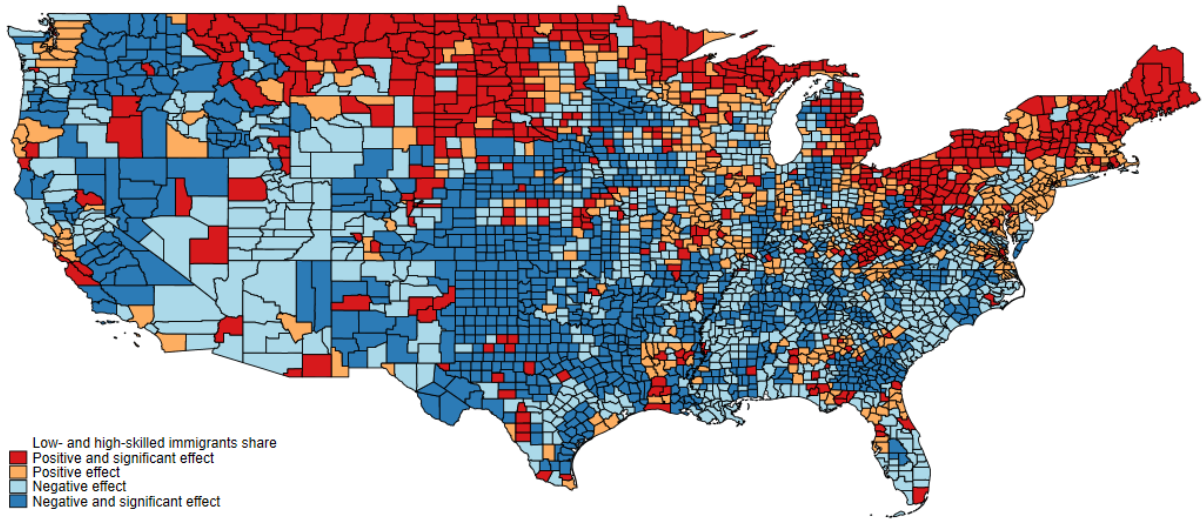
Notes: Each point represents a U.S. county weighted by its population aged 25 or above. The vertical axis shows the percentage change in the per-capita total own revenues and per-capita general own expenses between 1980 and 1990 and the horizontal axis shows the change in the predicted share of immigrants, low-skilled immigrants and high-skilled immigrants in the overall population between 1990 and 2010.

Figure 4: Marginal effect of the change in the share of immigrants between 1990 and 2010 (separated between low-skilled and high-skilled immigrants) on per capita revenues from sources



Notes: The continuous impact is calculated using the coefficients in Table 6 panel a i.e. (-2.786 x change in share of low-skilled immigrants between 1990 and 2010 + 3.316 x change in share of high-skilled immigrants between 1990 and 2010. The shape file to draw the map is from the United States Census Bureau (2016).

Figure 5: Marginal effect of the change in the share of immigrants between 1990 and 2010 (separated between low-skilled and high-skilled immigrants) on the per capital general expenditures.



Notes: The continuous impact is calculated using the coefficients in Table 6 panel b, i.e. (-1.850 x change in share of low-skilled immigrants between 1990 and 2010 + 2.992 x change in share of high-skilled immigrants between 1990 and 2010. The shape file to draw the map is from the United States Census Bureau (2016).

12 Appendix Tables

Table A1: Summary statistics in terms of shares

(a) Revenue variables (per-capita)

	1990		2010	
	mean	sd	mean	sd
Share of revenue from own sources in total revenue	58.4	13.8	59.0	13.8
Share of property tax revenue in revenue from own sources	43.4	17.9	43.2	17.4
Sales and income taxes in revenue from own sources	7.7	7.6	10.0	8.7
Share of other taxes in revenue from own sources	2.0	2.6	1.9	2.5
Share of charges and admin. revenue in revenue from own sources	33.4	14.8	31.9	15.3
Share of liquor and insurance trust in own revenue	13.5	13.0	13.1	12.4
Share of intergovernmental revenue in total revenue	41.6	13.8	41.0	13.8
Share of federal transfers in intergov rev	5.6	6.8	8.6	8.3
Share of state transfers in intergov rev	88.5	9.5	85.2	9.9
Share of local transfers in intergov rev	6.0	6.7	6.2	6.1

(b) Expenditure variables (per-capita)

	1990		2010	
	mean	sd	mean	sd
Share of general expenditure in total expenditure	91.3	9.4	91.6	8.9
Share of education in general expenditure	52.6	12.7	49.0	12.9
Share of law and order in general expenditure	7.8	3.7	10.1	4.6
Share of sanitation in general expenditure	3.7	2.9	4.4	3.0
Share of infrastructure in general expenditure	8.9	5.1	8.3	5.5
Share of welfare in general expenditure	15.1	11.1	16.3	13.1
Share of administration in general expenditure	7.6	5.8	6.7	3.7
Share of other general expenditure	4.2	3.2	5.1	4.0
Share of liquor and insurance trust in total expenditure	8.7	9.4	8.4	8.9

Notes: The number of observations is 9237 and weighted by the county population. Total revenue is equal to revenue from own sources plus inter-governmental transfers. Revenue from own sources is the sum of general revenue from own sources and revenue from liquor stores, utilities, and the insurance trust sector. General revenue from own sources is the sum of total taxes and other taxes and charges. Total taxes are equal to property taxes and sales, income, and license. Total intergovern-mental transfers are the sum of transfers from the federal government, the state government and other local governments. Total expenditure is equal to general expenditure plus other expenditures on liquor stores, utilities, and the insurance trust sector. General expenditure consists of expenditure on education law and order, sanitation, infrastructure welfare, administrative, and other general expenditures.

Table A2: Exogeneity test of initial shares by country of origin group a la Goldsmith-Pinkham et al. (2020)
OLS estimates, U.S. Counties, 1980 to 1990

(a) Per-capita revenues from own sources (percentage changes between 1980 and 1990)

Country of origin group	Canada	Other	Mexico	Western Europe	Eastern Europe	China	Japan	Korea	Phillipines	Vietnam	India	Other Asia	Africa	Oceania	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log change revenues from own sources per-capita	-0.002 [0.003]	0.006* [0.004]	0.001 [0.006]	0.001 [0.003]	0.005 [0.005]	0.000 [0.003]	0.000 [0.003]	0.001 [0.005]	0.002 [0.004]	-0.000 [0.003]	0.005 [0.006]	-0.000 [0.004]	0.001 [0.003]	0.000 [0.002]	0.003 [0.003]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044
R^2	0.19	0.24	0.23	0.19	0.13	0.23	0.23	0.22	0.22	0.23	0.13	0.21	0.22	0.24	0.22

(b) Per-capita general expenditures (percentage changes between 1980 and 1990)

Country of origin group	Canada	Other	Mexico	Western Europe	Eastern Europe	China	Japan	Korea	Phillipines	Vietnam	India	Other Asia	Africa	Oceania	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log change general expenditure per-capita	-0.001 [0.003]	0.004 [0.003]	0.010 [0.009]	-0.001 [0.002]	-0.001 [0.003]	0.001 [0.004]	0.004 [0.005]	0.004 [0.006]	0.003 [0.004]	0.003 [0.005]	-0.003 [0.003]	0.002 [0.005]	0.000 [0.003]	0.003 [0.004]	0.001 [0.003]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044
R^2	0.19	0.24	0.23	0.19	0.13	0.23	0.23	0.22	0.22	0.23	0.13	0.21	0.22	0.24	0.22

Notes: The dependent variables are given by the 1980 share of immigrants by country of origin group defined in the specific column. The explanatory variables are the log change in per-capita revenues from own sources and the log change in per-capita general expenditures between 1980 and 1990. Method of estimation is ordinary least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the total population of the county. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table A3: Shock-level representation a la Borusyak, Hull and Jaravel (2018)
2SLS estimates, Immigrants' country-of-origin groups, 1990 to 2010

Dependent variable	Log(Revenue from own sources per-capita)	Log(Total revenue per-capita)	Log(General expenditures per-capita)	Log(Total expenditures per-capita)
	(1)	(2)	(3)	(4)
Low-skilled immigrant share	-0.710**	-2.829***	-1.638***	-1.775***
	[0.359]	[0.589]	[0.342]	[0.451]
High-skilled immigrant share	2.307**	0.941	1.863*	1.960*
	[0.941]	[1.712]	[1.018]	[1.186]
Country-of-origin fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	45	45	45	45
IV F-stat	12.44	12.44	12.44	12.44

Notes: The dependent variables are the log of the per-capita shock-level transformed values given by the specific columns. Method of estimation is two-stage least squares. The shick-level transformed control variables are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average exposure weight of the country of origin. Standard errors in parentheses are clustered by the country of origin group: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

Table A4: County revenue types and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Total revenues	Revenue from own sources	Intergov. transfers	Transfer federal gov.	Transfer state gov.	Transfer local gov.	Tax revenues	Poperty taxes revenues	Sales, inc. and license taxes	Other taxes	Total charges & admin. revenue	Utilities, insurance, liquor stores
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Share of low-skilled immigrants	-10658.613	-8944.005	-1714.611	-609.589	-735.758	-369.263	-8763.472	-3692.129	-4137.300	-934.041*	298.856	-479.391
	[9939.786]	[6824.883]	[3438.746]	[1454.945]	[2000.177]	[763.046]	[6063.348]	[2667.134]	[3423.858]	[558.578]	[3516.557]	[2265.532]
Share of high-skilled immigrants	29890.020	25641.223	4248.802	5078.678	-2293.276	1463.399	18300.544	6883.979	9272.313	2144.248*	11567.880*	-4227.201
	[27063.699]	[18390.601]	[8894.692]	[3972.863]	[4721.201]	[1072.449]	[16922.254]	[6532.056]	[9627.539]	[1283.744]	[6625.651]	[5166.940]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9249	9249	9249	9249	9249	9249	9249	9249	9249	9249	9249	9249
IV F-stat	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38

Notes: The dependent variables are the log of the per-capita values given by the specific columns. Total revenue (1) is equal to revenue from own sources plus intergovernmental transfers. General revenue from own sources (2) is the sum of total taxes (3) and total admin charges (7). Total taxes are equal to property taxes (4) and sales, income, and license (5) and other taxes (6). Method of estimation is two-stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of the average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

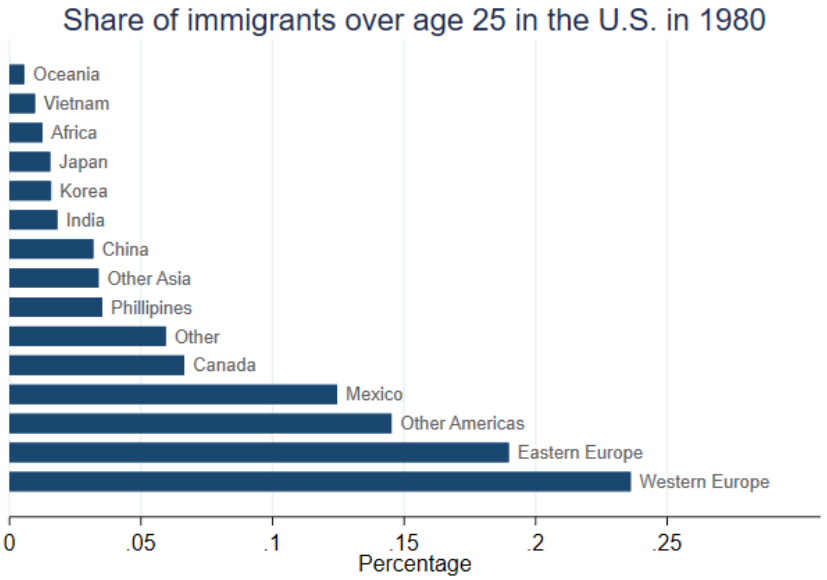
Table A5: County expenditure types and immigrant share
2SLS estimates, U.S. Counties, 1990 to 2010

Dependent variable	Total expendit.	General expendit.	Education expendit.	Law and order	Sanitation expendit.	Infra-structure expendit.	Public Welfare	Admin. expendit.	Other expendit.	Utilies, insurance trust and liquor st.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share of low-skilled immigrants	-9064.558	-8974.564	-246.138	271.282	-1144.167	-1467.093	-3002.986	-89.993	127.431	-3512.890*
	[12280.497]	[11478.397]	[3999.698]	[1106.546]	[886.038]	[1251.449]	[2841.264]	[2072.049]	[995.487]	[1877.940]
Share of high-skilled immigrants	36368.533	34184.908	3348.018	1265.584	2140.132	5138.582	11115.366	2183.622	4119.617*	7057.604
	[33955.584]	[32250.748]	[10642.320]	[3056.279]	[2250.514]	[3205.472]	[7015.303]	[2944.534]	[2281.863]	[5119.870]
Commuting zone controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9249	9249	9249	9249	9249	9249	9249	9249	9249	9249
IV F-stat	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38

Notes: The dependent variables are the log of the per-capita values given by the specific columns. Total expenditure (1) is equal to general expenditure (2) plus other expenditures on liquor stores, utilities, and the insurance trust sector (10). General expenditure consists of expenditure on education, public safety, public welfare, transportation, interest payments and debt, parks and natural resources, sewage and solid waste management, and other general expenditures. Method of estimation is two stage least squares. The controls at the commuting zone level are the 1980 values interacted with linear time trends of: share of men, share of married, share of African-American, share of urban citizens, share of unemployed, the log of average income, the share of people below age 25 and the Bartik employment shifter described in the text. Each regression is weighted by the average population of the county over the sample period. Standard errors in parentheses are clustered by the county level: ***, **, * indicate the statistically significant difference from zero at the 1, 5 and 10 percent levels respectively.

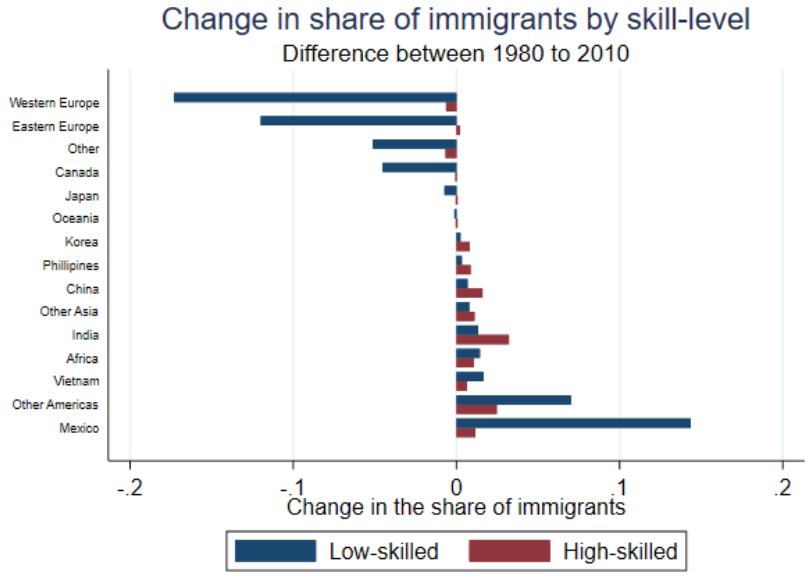
13 Appendix Figures

Figure B1: The share of immigrants by country-of-origin group



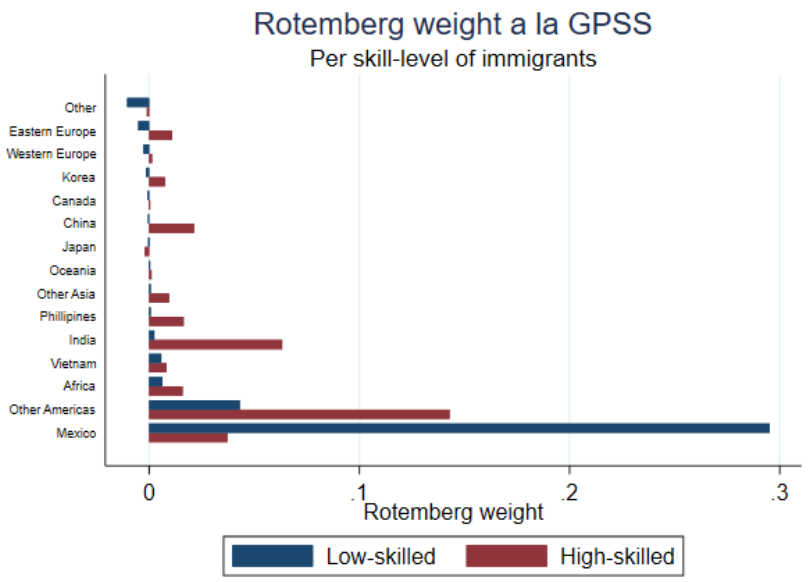
Notes: Each bar represents the number of immigrants of age 25 and above by country-of-origin group as a share of the total number of immigrants of age 25 and above in the U.S. in 1980.

Figure B2: The change in the share of immigrants by skill-level and country of origin
Period 1990 to 2010



Notes: Each bar represents the average change of immigrants by country-of-origin group as a share of the overall population.

Figure B3: Rotemberg weights by skill-level and country of origin group
Period 1990 to 2010



Notes: Each bar represents the Rotemberg weight for low- and hig-skilled immigrants by country of origin as defined by Goldsmith-Pinkham et al. (2020)