Local Fiscal Effects of Immigration in Germany

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Abstract

We investigate the impact of immigration on public budgets using administrative data from German districts (Kreise). While previous literature suggests that the fiscal benefits of migration depend on government spending responses to immigration, the local-level effects in Germany remain relatively unexplored. Our study analyzes how immigration influences public spending, the provision of public goods, and public revenues from 2010 to 2019. Employing the post-double selection LASSO method for model identification and instrument generation, our results suggest that an increase in the foreign population proportion at the district level does not significantly affect public investment spending or collected tax revenues. Overall, along with 2011 results at the community level (Gemeinde), this research discusses the importance of distinguishing between different local levels, migration groups, and expenditure categories, when studying the gains and burdens of immigration in Germany.

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1 Introduction

A long-standing debate concerns whether migration induces additional government spending on public goods. The fiscal impact of migration has been a prominent topic over the years, especially since estimating the impact of immigration is notoriously one of the most challenging exercises in empirical economics (Jaeger et al., 2018). For policymakers, restoring fiscal sustainability in the welfare state amidst migration waves, including refugees, is crucial to ensure sustainable public policy and maintain the country's budget. This task becomes particularly challenging during unexpected migration influxes. Germany's population dynamics have significantly changed over the past decade, notably by the end of 2015, when the country received an unprecedented influx of refugees, stimulating extensive public discourse (*see* e.g., OECD, 2013). This influx has raised critical questions about whether immigrants contribute more to the welfare system than they consume and whether migration overall benefits or burdens the German economy, becoming central topics in public debates (Hinte and Zimmermann, 2014; Vargas-Silva, 2015).

The effect of immigration on public coffers in Germany is highly debatable and, to a large extent, still ambiguous. More specifically, policymakers and the public are concerned not only with the net fiscal effects of immigration for the nation as a whole but also with the effects on revenues and expenditures for state and local governments (National Academies of Sciences and Medicine, 2017). The fiscal impact may differ between different levels of government. Several fiscal studies stress the importance of distinguishing between federal, state, and local levels when estimating the fiscal impact of immigration (*see* e.g., Card, 2009; Lee and Miller, 2000; OECD, 2013). For example, OECD (2013) highlights that contributions are mostly directed to the central government level, while expenditures tend to occur at the local level (e.g., social assistance and housing support payments). Similarly, Collado et al. (2004) found that the net effect is strongly positive at the federal level but negative at the state and local levels. While the local level has been explored for other European countries (e.g., the UK, Finland, Denmark), the regional effects in Germany remain relatively unexplored (Jaschke et al., 2021). Our study aims to fill this gap by examining the direct local fiscal impact of migration on public coffers in Germany. *Local* corresponds to the district level in the following. Our robust local-level results are confronted to the community level, i.e., municipalities, at the end of our study. Next to these different regional levels, our approach acknowledges the importance of inspecting the fiscal effects of migration across various levels of the

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public budget and migrant groups.

Our empirical analysis utilizes data from the publicly available INKAR database for local-level inspection, alongside data from the German statistics office (DESTATIS) for the community level.[1] The main analysis is derived based on the rich local-level data. We cover the period from 2010 to 2019, which includes the peak of the refugee influx in Germany. Managing the panel dimension of the data with over 200 potential covariates poses a challenge. We select control variables using a combination of economic reasoning and a machine learning (ML) based approach, namely lasso regression (Belloni et al., 2013; Chan-Lau, 2017). By fully exploiting the available data, we gain new empirical evidence on the role of confounders in analyzing public budgets and immigration at the district level. Model identification of migration effects is often tackled using shift-share instruments (*see*, e.g., Alesina et al., 2021). However, this is not feasible here due to the lack of data on migrants' origins. We instead use the lasso-identified confounders to generate an instrument (Belloni et al., 2012). Additionally, we confront this with ML-based post-double selection which allows us to analyse more detailed effects of migration groups. Our estimation primarily captures the contemporaneous effect of migration on regional public finances.[2]

This paper contributes to the literature in three ways. First, we disentangle the local fiscal effects of migration on the district level by examining both the public expenditure side, focusing on public investment spending[3], and the revenue side, analyzing collected aggregate tax revenues.[4] Our results, derived from instrumental variable (IV) regressions, indicate the insignificance of an increase in the district foreigners' share on public spending and revenues. Additionally, our findings highlight the diverse effects of migration on German public budgets, contingent upon the type of migration under consideration. Second, we complement this analysis by studying additional dynamics on public coffers through public employment, childcare, and healthcare spending. Our investigation encompasses a range of impacts associated with different migrant categories, including

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[1]The INKAR database, provided by the Federal Institute for Research on Building, Urban Affairs, and Spatial Development, includes around 600 indicators.

[2]The "effect" of migration on public finances can be conceptualized in various ways, with both short-term and long-term channels. Indirect fiscal impacts, such as those on the labor market, fall outside the scope of this paper.

[3]Similar to Bremer et al. (2022), we focus on physical capital, such as public investment in infrastructure and other physical assets.

[4]Specifically, it employs tax revenues of a municipality per inhabitant, also known as fiscal capacity. These per capita tax revenues cover property tax A and B, trade tax, municipality's share of income tax, municipality's share of sales tax, and tax-like charges.

shelter-seeking populations and foreign vocational students, on various outcome variables such as public investment spending, tax revenues, and the percentage of spending allocated to childcare and healthcare respectively. Third, we explore the fiscal effects at the community or municipality level based on data from 2011 which provides us with the background for discussing the importance of the choice of the regional level.

This paper proceeds as follows: Section 2 reviews related literature. Our data, data limitations, and our econometric model specification are discussed in Section 3. Section 4 presents and discusses our empirical findings where we also discuss our robustness checks. Finally, Section 5 concludes this paper.

2   Related literature

Our study builds on the growing literature that has assessed the impact of migration on public finances. Empirical research has mostly shown that migration's net fiscal effects are either small in terms of GDP or almost zero. Some studies additionally stress the importance of addressing related methodological issues first before reaching conclusions, and several issues are discussed in this respect. For example, Preston (2014) reviews the literature and comprehensively clarifies the range of issues involved in assessing the effect of immigration on public finances, with a particular emphasis on the UK.

A number of studies have focused on investigating migration's impact at a local level. Overall, while some studies have inspected the impact of migration on the government's expenditures side (e.g. for England: Broberg and Ludolph 2021, for Finland: Viren 2022; Mäkelä and Viren 2018), others have focused instead on the government's revenue side. To maintain a balance, similar to our scope, some scholars have covered both sides of the public budget (Chevalier et al., 2023; Clune, 1998; d'Albis et al., 2019; Gerdes, 2011; Müller, 2006).

Public spending and tax revenues are two key parameters in a typical fiscal effects of migration study. On the tax revenue side, some analyses analyzed the determinants of tax revenues in a cross-country framework (Andrejovska and Pulikova, 2018; Ángeles Castro and Ramírez Camarillo, 2014). Moreover, Smith (2018) identified the relative size of the immigrant population as the most obviously important factor in determining the magnitude of the immigrant taxpayer effect. Another study by Card (2009) examined the relationship between the fraction of immigrants in a city and

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various indicators of local fiscal conditions, including average earnings per capita (a simple measure of the "tax base") and school enrollment rates. One part of this paper specifically relates to the literature on the provisions of public goods or public capital.[5]

Public goods are one main item on the public budget expense side whose provision might strain public coffers. Studies often rely on assumptions related to public goods, especially in the context of dynamic fiscal analyses. To what extent migration affects public goods has been under study in the literature. For instance, Gerdes (2011) investigated this topic for Denmark, although this study has not focused on the *direct* financial impact of immigration on public coffers. Similarly, for Germany in a more general context, Bremer et al. (2022) studied what drives a variation in the provision of local public goods under cooperative federalism. Similarly, Bianchi et al. (2023) studied how fiscal decentralization affects the provisions of public services and local labour markets. Still related to the public spending strand of research but rather with an investment nature, scholars explored this topic extensively covering different dimensions which we summarize below. Part of their motivation was that public investment has several characteristics that makes it attractive for both spending cuts and boosts in support of economic recovery (Tandberg and Allen, 2020). One research dimension covered in some research works analyzed the macros related to the relationship between public investment and growth (e.g., Felice, 2016). Another study by Müller (2006) covered both sides of the public budget, the revenue and the expenditure sides similar to Gerdes (2011), and discussed how social and infrastructure spending is of paramount importance.

Our discussion on the fiscal impacts of migration extends further. In the following, in analyzing the effect of migration on government coffers, the below-listed factors are taken into consideration in our empirical approach. And they, to a large extent, explain the rationale of our econometric model's specification described in Section 3.

2.1 The distinction between federal, state, and local government levels

The fiscal impact may differ between levels of government (OECD, 2013). Such differentiation between the different levels of government is addressed partially in the fiscal literature that estimates the fiscal impact of immigration (Lee and Miller, 2000; OECD, 2013). Interestingly, some studies reported how results could change based on this assumption (for the US: Clune, 1998). While

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[5]Jong et al. (2018) discuss how the economic and accounting concepts of what constitutes public capital are not always aligned in the National Accounts (NA).

contributions are mostly directed to the central government level, expenditures tend to occur at the local level (e.g., social assistance and housing support payments) (*see* ibid.).[6] Likewise, Collado et al. (2004) arrived at similar results. On average, they find the net effect is strongly positive at the federal level but negative at the state and local levels.

2.2 Variations in government's spending alongside immigrant population size changes

Several studies have examined the relationship between immigration and local government spending or finances (e.g., Chevalier et al., 2023; Gerdes, 2011; Jofre-Monseny et al., 2016; Mäkelä and Viren, 2018; Tabellini, 2020). One aspect of these investigations is exploring the relationship between changes in government purchases and the size of the immigrant population. Some government expenditure items, deemed public in nature, might remain constant irrespective of the immigrant population size (for instance, defense considered as a public good, as seen in Auerbach and Oreopoulos (1999). Consequently, these studies investigate whether there is any gain at all from migration, is contingent upon the degree to which government purchases increase alongside the immigrant population. Bonin et al. (2000), in a similar vein, assert that the impact of immigrants on the sustainability gap is not solely contingent upon their net tax payments (after benefits) in the host country; it also involves changes in government purchases due to immigration.[7]

A few scholars exploited migration waves to analyze the public spending side (e.g., Jofre-Monseny et al., 2016; Tabellini, 2020). For example, in a study about the effect of migration on local government finances in the US, Tabellini (2020) exploited the First Great Migration episode to study how an increase in racial heterogeneity affects the provision of public goods and city finances. The author's findings suggest that black migration inflows had a strong, negative impact on both public spending and tax revenues in northern cities. Likewise, Jofre-Monseny et al. (2016) exploited the recent, massive arrival of immigrants in Spain to analyze the relationship between immigration and redistributive public spending. Their results support the hypothesis that immigration reduces income redistribution.[8] Likewise, the recent study by Chevalier et al. (2023) used regional variation

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[6] A useful depiction of items relating to both sides of the public budget was laid out by Müller (2006), *see* Table 2 of the previous study.

[7] In their study, they assume that aggregate government consumption grows at the same rate as labor productivity and anticipate that migration induces additional government purchases.

[8] More precisely, their results imply that an immigrant density increase of 6.9% points (the 1998–2006 change in

in the population share of forced migrants across West German cities to estimate the effect of this inflow on cities' taxation and spending decisions. Their findings show that cities with high inflows of forced migrants increased spending on welfare and education, decreased spending on infrastructure, raised local taxes, and incurred more debt. Interestingly, Alesina et al. (1999) identified ethnic conflict as an important determinant of local public finances, and their empirical work controlled for income distribution measures. Furthermore, studying education as one type of public goods, Speciale (2012) observed an increase in foreign population to have a small negative effect on public education expenditures.

2.3   Public budget constraint

In this study, we are interested in the component of the GDP that entails public spending (G).[9] To restore fiscal sustainability in response to immigration, the welfare state has to adjust the redistribution system, depending on whether immigrants represent a net fiscal cost or a net fiscal gain for public finances (*see* Murard 2017). In this context, Facchini and Mayda (2009) discussed two types of adjustments that are possible; (a) either social benefits are held constant and the *tax rate* adjusts (tax adjustment model), or (b) the tax rate remains the same and *benefits* adjust reflecting the so-called (benefit adjustment model).

The equilibrium condition rests on a *balanced public budget* assuming no inter-regional transfers. Furthermore, it relies on the assumption that every local government spends its available budget entirely on local public goods (Henkel et al., 2021). With the effective budget that is available for local public goods provision in a region denoted by $G(i)$, the following equality results,

$$[t(i) + \theta(i)]w(i)L(i) = G(i) \tag{1}$$

where the *net receipts* are denoted as $\theta(i)w(i)L(i)$, income is taxed at *tax rate* $t(i)$ which generates an *overall tax revenue to regions* equal to $t(i)w(i)L(i)$.

The reality implies that this assumption does not hold, at least not initially. The financial viability or solvency of the government can be restored through the following different scenarios: either through higher taxes, higher immigration, or other alternative scenarios such as high employment

the proportion of non-EU15 immigrants in Spain) reduces municipal spending on social services by 32.5 € per capita.

[9]Some studies applied the definition of government purchases as the sum of general government final consumption expenditure and general government fixed capital formation (see d'Albis et al., 2019).

(HE) or high fertility (HF), or a combination of these. Likewise, more detailed, Kotlikoff and Raffelhüschen (1999) establish that the array of alternatives to achieve generational balance includes four exclusive ways: The first alternative is through cutting government purchases while the second one implies cutting government (transfer) payments. Alternatively, the government could resort to increasing all taxes (tax rates at all levels of government; regional, state, local, and federal) and of all types. Finally, to restore the balance, one alternative fiscal policy option is to increase income taxes (i.e., corporate and personal). Each case shows the tax rate required to satisfy the "intertemporal budget constraint" (Rowthorn, 2008).

2.4 The fiscal impact by immigration category

One crucial research dimension is accounting for the different effects of the several demographic groups. Not all immigrants should be placed in the same basket because their legal status affects the fiscal impact of immigrants' estimations (Vargas-Silva, 2015; Smith, 2018). This necessitates a distinction between immigrants based on their immigration type. However, in practice, few empirical studies distinguish between different immigration types (Hagen-Zanker and Hennessey, 2020). Immigrants are expected to have a much more favorable fiscal position in host countries where humanitarian migrants do not account for a significant part of the population (Bansak et al., 2015; OECD, 2013). To give an example, for Australia where the fiscal impact has been broken down by category of visa entry, Access Economics (2008) found that the fiscal impact model projected migrants to generate a net benefit for the federal government.[10] Likewise, Hinte and Zimmermann (2014) expect the fiscal impact of immigration to be *positive* if labor migrants make up the bulk of the immigrant population. Notably, OECD (2013) observes that there has been little research on the impact of specific migrant categories (e.g., labor, family, humanitarian), a gap also evident in simulation studies assessing the effects of admitting additional immigrants. Differentiating between refugees in analyses is beneficial but often unfeasible due to data limitations, leading to refugees not being accounted for as a distinct group (Raffelhüschen and Manthei, 2018). Consequently, many studies on the fiscal effects of immigrants focus primarily on immigrants without considering refugees. The necessity to distinguish between different migrant categories also applies to tax rev-

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[10]Gál (2019) justified such result was due to the domination of labor migration, taking the share of over 60% while refugee or humanitarian migration only accounts for 7%. This would however judge the fiscal contribution at a point in time (status-quo) rather than assessing it over time (dynamic).

enues. Smith (2018) emphasized that taxpayer effects should be calculated separately by immigrant type to better inform immigration policy decisions.

2.5 Economic dynamics and business cycles

The anticipated outcomes and consequences of distinct migrant groups on public finances are poised to diverge according to the prevailing economic circumstances. Particularly crucial is understanding the impact of financial crises on overall public finances, which includes the spending patterns of local administrations and their investment allocations (*see*, for instance, Gamper, 2012). In a similar vein, the perspective put forth by Gál (2019) contends that the outcomes derived from static analyses conducted during recessions, periods characterized by elevated unemployment rates, and substantial fiscal deficits, markedly differ from those arising from identical analyses conducted during economic prosperity periods and robust public fiscal health. Likewise, Rowthorn (2014) expects the expenditure on everyone, including migrants, to be squeezed and revenue to increase if the government's deficit reduction strategy remains on track. Therefore, depending on the assumptions made and the business cycle dynamics, the expected fiscal impact of immigration varies (*see* OECD, 2013; Rowthorn, 2008). Overall, it was found that immigrants tend to be net contributors in upturns but net beneficiaries during downturns (*see* Gott and Johnston, 2002; OECD, 2013).

3 Econometric framework

For identifying and quantifying the local fiscal effects of immigration, we mainly analyze data on the level of German districts ('*Kreise*'). In the following, we describe the data and develop and reason the econometric framework in more detail. We analyze the data in R and the R code of our analysis is available upon request.

3.1 Data

The main data source is the INKAR database maintained by the Federal Office for Building and Regional Planning (BBSR, 2018). We collect data for the sample period 2010-2019, which contains the years 2015 onwards when Germany experienced a period of unprecedented refugee influx. This specific selected period results from data availability of the main variables representing the district's
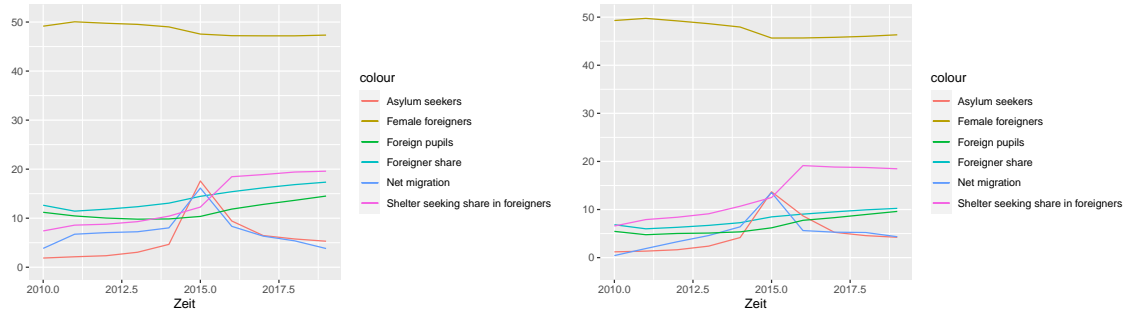
Figure 1: A selection of INKAR variables relating to migration over the years 2010-2019 split into the city ('Kreisfreie Stadt') on the left-hand side and countryside ('Landkreis') on the right-hand side. The graph displays the mean over the districts in each year.

investment in addition to accumulated tax revenues and asylum-seekers. The INKAR database collects around 400 indices covering, e.g., education, demography, labor market, economy, housing, traffic, and environment. There are 401 districts in Germany which add up to a balanced panel data of roughly 4000 observations in total. Similar to Bremer et al. (2022), our dataset includes information on districts from all federal states except the three city-states (Berlin, Hamburg, and Bremen) that have no districts.

For analyzing the fiscal effects, we study five output variables: four on the spending or expenditure side, i.e., per-capita (pc) public investment spending, municipal personnel, childcare rate, and health care represented by hospital beds, and one on the revenue side, i.e., aggregate tax revenues at the local or district level.[11] Our main outcome variables are public investment spending and tax revenues which are additionally divided by the incumbent population for a per capita measurement. The public district investment spending covers tangible investments made in assets such as bridges, administration buildings, and fire services, including construction and other items.[12] This per-capita regional investment spending subtracts payments the German districts received from the same level (*see* Appendix A.1).

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[11]We use the terms local governments and districts (Kreise) interchangeably.

[12]These items could resemble the category of 'other publicly provided goods and services' described by Dustmann et al. (2010), e.g., community development.

3.1.1 Variables representing different types of immigration

As discussed in Section 2.4, we address the necessity to disentangle the effects of the different foreign populations instead of bundling them altogether in one basket (cf. Vargas-Silva, 2015). Conveniently, the INKAR database contains various indicators of the migrant and foreign populations such as numbers of asylum-seekers, foreign unemployed/working, students, or migration rates (female/male). Figure 1 displays the development of some of these series over the period 2010-2019. We can identify the peak of asylum-seekers in 2015 which slightly shifts the overall share of foreigners upwards and the share of female foreigners downwards. We can also see that asylum seekers peak higher in cities (Kreisfreie Stadt) but the share of shelter-seeking persons among all foreigners is higher in the countryside (Landkreis). Overall, the above graph underlines the importance of considering different types of immigration which gains additional importance when generating an instrument. In our Results Section 4.2, we briefly discuss which role the different categories play.

Additionally, a map of German districts in Figure 2 displays the share of foreigners in 2015 on the left-hand side and the asylum-seekers (per 1000 inhabitants) on the right-hand side. We can identify significant differences in the distribution of foreigners which are potentially attributable to the difference between rural/urban areas and the presence of work possibilities. For model identification, it becomes crucial to discuss whether the distribution of foreigners is dependent on the amount of public spending. As highlighted by Gerdes (2011), endogeneity problems are not related to the relocation of immigrants per se, but they would become a concern if the change of residence varies systematically with the provision of publicly provided goods or locally determined tax rates. We address potential endogeneity by applying post-double selection and instrumental variable estimation.

3.1.2 Data limitations

Publicly available data have some limitations which implicitly define our empirical operation space. Overall, homogeneous data on the regional level is not easy to obtain for Germany. The INKAR website offers regionally disaggregated data, which is however mostly limited to groups of municipalities bundled together (*Gemeindeverbände*, GVB) instead of separate municipalities. Additionally, aggregate fiscal expenditures for the government across German regions (municipalities or districts based on INKAR) exists only for tangible investment spending as an expenditure item and not as

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Figure 2: Map of German districts in 2015 with the share of foreigners on the left-hand side and asylum seekers per 1.000 inhabitants (50 means 50 or more) on the right-hand side. Based on data from the INKAR.

an aggregate spending component related to all types of public spending. The German regional statistics offer data on aggregate municipality expenditures for 2008-2014; however, such data is not available as an open source for the years thereafter. The share of foreigners on municipality level is only available in the census year 2011. Due to such data restrictions, we base our main analysis on district-level data and briefly explore the municipality level when discussing policy implications in Section 4.4.

3.2 The model

Our empirical analysis applies a panel data model to study the district data over time. We follow the approach of Gerdes (2011) and use two main output variables capturing the spending and the revenue side of government public budget discussed in Section 2.3 in relation to financial sustainability: (i) *per capita* public spending (Sachinvestitionen) (exp)[13], particularly *per capita* local tangible investment spending and (ii) *per capita* local aggregate tax revenues (Steuereinnahmen)

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[13] INKAR defines it as follows (in German): "Sachinvestitionen sind Investitionen, die in Sachanlagen (z.B. Brücke, Verwaltungsgebäude, Feuerwehrfahrzeug) getätigt werden. In der Finanzstatistik werden die Sachinvestitionen als die Summe der folgenden Positionen definiert: Baumaßnahmen, Erwerb von beweglichen Sachen, Erwerb von unbeweglichen Sachen. Bei der Bevölkerung ist zu beachten, dass sich die Zahlen vor 2011 auf die Fortschreibung auf Basis der Volkszählung 1987 (BRD) und 1981 (DDR) und ab 2011 auf die Fortschreibung auf Basis des Zensus 2011 beziehen."

(rev). For district $i = 1, \ldots, 401$ in year $t = 2010, \ldots, 2019$, this results in the following models

$$exp_{it} = \nu_i + \eta_t + \beta_1 foreign_{it} + \beta_2 \mathbf{x}_{it} + \varepsilon_{it}, \tag{2}$$

$$rev_{it} = \nu_i + \eta_t + \beta_1 foreign_{it} + \beta_2 \mathbf{x}_{it} + \varepsilon_{it}, \tag{3}$$

where ν_i and η_t are district and time-fixed effects, respectively. The error terms $\varepsilon_{it} \sim (0, \sigma_{it})$ are assumed to be independent across districts and time. The variable $foreign$ describes the percentage share of the foreign to total population and $\mathbf{x}_{it}$ is a vector of control variables. Following prior studies as Mäkelä and Viren (2018), we use the log of total operating costs as output variable. Our income proxy for districts is captured by districts' aggregate tax revenues per capita (Steuereinnahmen).[14]

3.2.1 Model selection

For selecting our model's covariates we proceed in four steps. Our baseline model for (2) and (3) contains the share of foreigners (Ausländeranteil), time effects for 2011 to 2019, and a constant (M.basic). Second, we extend this model following the literature and include additional control variables to form the model (M.lit).[15] We rely on prior regional fiscal analyses, such as those conducted by Viren (2022), Mäkelä and Viren (2018), and Gerdes (2011) for other European countries and additionally include the *lagged* outcome variable, *lagged* share of foreigners and (*lagged* tax revenues for model (2)) into the model (see Bremer et al., 2022). In addition to time-fixed effects, the resulting model (M.lit) contains the below covariates:[16]

Population density	GDP (pc)	Net migration (pc)
Unemployment rate	Inhabitants aged 65 and older	Inhabitants aged 18-25
Lagged share of foreigners	*Lagged* public spending	*Lagged* tax revenues

We find that the literature-based variables in (M.lit) model improve the model performance

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[14]This monetary item covers property tax A and B, trade tax, the municipal share of income tax, municipal share of sales tax, parafiscal taxes, per capita.

[15]For instance, the analysis in Mäkelä and Viren (2018) employs the share of the foreign-background population and control for variables such as total population, population density, the population share of the elderly proxied by the share of the population aged 65 and over, the population share of the young, the unemployment rate, and a proxy for income (*see* Table B.7).

[16]We have translated the variable definitions from INKAR to the best of our knowledge. The German definitions are used in the output tables in the Appendix, detailed descriptions can be found on `www.inkar.de`.

compared to (M.basic) in terms of adjusted R^2, BIC, and prediction power (*see* Table A.2). Further, schematically working through the unused 231 INKAR variables reveals further interesting factors for explaining the two main output variables and addressing the endogeneity of the share of foreigners registered in a district. We proceed by creating a list of potential further covariates as, e.g., municipal personnel, districts' spending on social assistance (SGBII), and net migration, make a pre-selection of 'can and must include' variables, and subsequently run a Lasso regression (cf. James et al., 2021) to select the most important remaining variables.

Lasso (Least absolute shrinkage and selection operator) is a method for variable selection mainly applied when facing the decision between many potential covariates for prediction (*see*, e.g., James et al., 2021, for an introduction). This method has been increasingly used for model selection in econometrics, especially when a large variety of covariates exist. For instance, it has been applied in recent fiscal investigations as an identification strategy (Berset et al., 2023). Still one has to keep in mind that the applied technique provides a model which minimizes the prediction error and not necessarily a model which suits best for causal statements. For this reason and due to the presence of many multicollinear regressors, we base a first selection of variables on economic reasoning. The results of the lasso procedure and more details on the lasso technique are provided in Appendix A.2. After the model selection, we obtain three models for equations (2) and (3): a basic model containing only the target variable and time-fixed effects (M.basic), a literature-based model (M.lit) and a lasso-*plus*-theory-based model (M.lasso). In the final step, for capturing important confounders and to identify the model, we apply instrumental variable (IV) estimation and derive additional models via post-double selection (Belloni et al., 2013).

3.2.2 Model estimation and identification

After variable selection, models M.basic, M.lit, and M.lasso are estimated by fixed effects estimation similar to Hepp and von Hagen (2012) to pick up any relevant effects at the aggregate levels such as the country-wide business cycle or political events like federal elections (*refer to* our discussion in Sec 2.5). We apply within estimation to estimate the regression coefficients. Furthermore, we use robust standard errors since the variance of several variables, especially public spending, increases over time (cf. Figure 4).

We are primarily interested in estimating the causal effect of the share of foreigners on the district's public expenditures/revenues. As observed in the literature on immigration effects, the

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Model	Covariates	Identification
M.basic	Share of foreigners, time FE	–
M.lit	M.basic + literature-based and lagged effects	–
M.litIV	M.lit	20 most important confounders (Tab2)
M.lasso	M.lit + lasso-selected covariates	–
M.lassoIV	M.lasso	20 most important confounders (Tab2)
M.double	M.lasso + 2nd step selected confounders	Post-double selection (A.2.1)

Table 1: Summary of regression models and components. Details on variable selection are provided in corresponding sections/tables.

shift-share instrument is widely applied for model identification. While this is an established tool to some extent (see, e.g., Alesina et al., 2021), critics argue that this approach is unlikely to identify a well-defined causal effect of interest when there is only limited change in the country-of-origin composition of immigrant inflows at the national level (Jaeger et al., 2018).

In our model setting, on the one hand, we do not have data given on the origin of immigrants in the public administrative data. On the other hand, many variables in the INKAR database might explain the district-specific immigrant inflows in another way. To make use of these variables, we combine two strategies: post-double selection and instrumental variable estimation (IV). Post-double selection technique (Belloni et al., 2013) joint with economic reasoning can be used to identify the actual effect of immigration on public investment spending and tax revenues. The procedure consists of two lasso regressions: 1) We regress the dependent variable on potential economically meaningful variables excluding the variable of interest that is the share of foreigners (Ausländeranteil). 2) In a second lasso regression, we regress the share of foreigners on all available variables and choose a certain number of variables related to the share of foreigners in the final model choice.

Step (1) additionally enables us to generate a valid instrument for measuring the causal effect of the share of foreigners (Belloni et al., 2012). We combine the 20 most influential confounders identified in Step (1) to be related to the share of foreigners into a valid and exogenous instrument. Confronting the results with straightforward instrumentation by the lagged share of foreigners, we find the latter to be endogenous. Based on the combined instrument, we derive the models

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(M.litIV) and (M.lassoIV) that apply instrumental variable estimation to the literature- and lasso-based models. In a second step, the post-double selection procedure allows us to manage the omitted variable bias and the identification issue (Belloni et al., 2013). In this way, we can directly study the variables associated with the share of foreigners. We end up with an additional model (M.double), based on post-double selection. Details on the Lasso procedure and the validity of the instrument are provided in the Appendix A.2 and A.3, respectively. An overview of the applied models is provided in Table 1.

3.2.3 Confounders related to the share of foreigners

To provide deeper insight into the factors linked with the share of foreigners, we present the top 20 variables associated with the share of foreigners in Table 2.

Female share $(-)$	Foreign pupils $(+)$	Foreign female unemployed $(+)$
Regional population potential $(+)$	Shelter seeking in population $(+)$	factor(time)2013 $(-)$
Shelter seeking in foreigners $(-)$	Inhabitants aged under 3 $(+)$	Private debt ratio $(+)$
factor(time)2011 $(-)$	Value-added tax $(+)$	factor(time)2012 $(-)$
SGBII-benefits $(+)$	Influx rate $(+)$	Out-commuters $(+)$
Teacher-to-child ratio preschool $(-)$	Micro-businesses $(-)$	Foreign vocational students $(+)$
Population density $(+)$	Single parent, share of employable eligible for benefits $(-)$	

Table 2: The top 20 variables exhibiting the highest coefficients obtained through the lasso regression of the foreigner share. The sign of the association is added in brackets.

In our case, out-commuters, for example, are individuals who commute from suburban areas to urban centers or between regions due to workplaces and residences being located in different districts. This phenomenon is associated with the share of foreigners, potentially because foreigners are more likely to be involved in commuting. This could arise from their limited work opportunities in their residential areas or challenges in affording rent. Accordingly, out-commuters serve as a proxy for the share of foreigners. Similarly, the regional population potential is positively related, and the teacher-to-child ratio is negatively related, indicating that foreigners tend to live in structurally weak areas. Additionally, the number of micro-businesses is negatively associated as they may not be the major workplace for foreigners.[17] The year effects 2011-2013 are negatively associated with

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[17]An exception might be startups that attract foreigners in the cities, but note that, e.g., major places such as

the share of foreigners which speaks for the higher shares in the later stages of the sample after 2013. In the literature, the analysis by Albarosa and Elsner (2023), for example, contributes to understanding the association of migration rates with such local factors. These factors associated with the share of foreigners were previously discussed by some scholars (Gerdes, 2011; Mäkelä and Viren, 2018).

In addition to the socio-economic factors, we can uncover the relationship between the share of foreigners and the distinct subgroups within the foreign population. For example, we observe that shelter-seeking is negatively associated when presented as the share of foreigners, whereas it exhibits a positive association when expressed as a share of the overall population. Other variables show an association with the foreigners share such as foreign pupils, female foreign unemployed, and foreign vocational students. Consequently, this differentiation considered in our context allows us to interpret the different effects of these population groups on public spending, in contrast to the less complex models.

4 Local fiscal effects of immigration

In this section, we discuss the regression results of the fiscal effects of migration at the district level in Germany and, in the final part, address the results at the municipality level. We begin by presenting descriptive statistics of the underlying data, followed by a detailed interpretation of our regression results.

4.1 Descriptive results

Figure 3 displays three of the studied outcome variables: (a) public spending on tangible investments, (b) municipal personnel expenditures, and (c) district tax revenues. The differences between these maps highlight the need for separate studies on the expenditure and revenue sides. A comparative map of public investment in all German districts for the years 1996, 2006, and 2018 can be found in Bremer et al. (2022). They analyzed changes in investment spending and observed that in 2018, per capita public investment spending was particularly high in Southern German districts, while it remained low in the Western and Northern districts. Similarly, we observed increased per capita local spending on public investment in Southern German districts in 2019, with an opposite

Berlin, and Hamburg are not included in the sample.
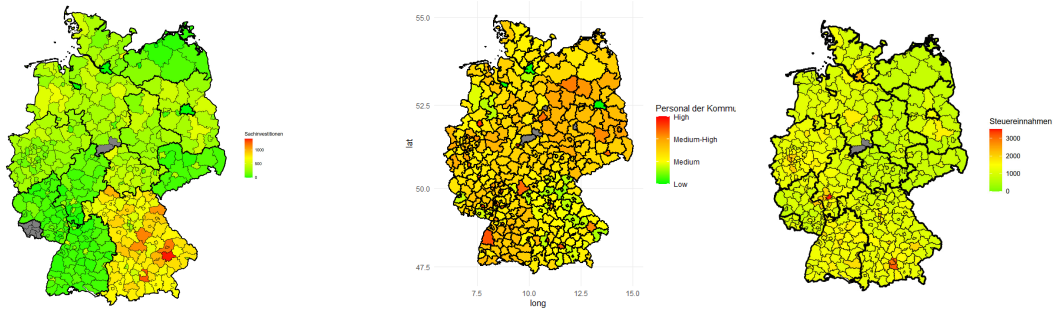
Figure 3: Map of German districts in 2019 with (a) public investment spending (Sachinvestitionen) on the left, (b) municipal personnel (Personal der Kommune) in the middle, and (c) the tax revenue (Steuereinnahmen) on the right.

trend for municipal personnel spending. On the tax revenue side, while Müller (2006) expected considerable regional disparities, our analysis does not show particularly high tax revenues in some districts relative to others.
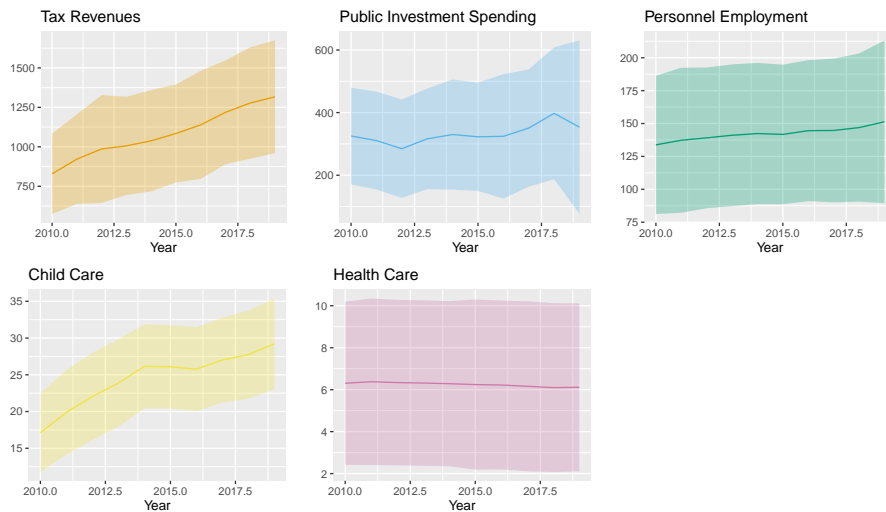
Figure 4: Mean and variance of public spending and tax revenue series, 2010-2019.

Figure 4 displays the development of the main of variance of the outcome variables over the observation horizon. The mean of tax revenues increases over time while the mean of public investment spending stays roughly equivalent. This is connected with the remark that public investment

spending declined steadily in advanced economies during the last three decades, thus the investment growth has been weak until very recently (Bremer et al., 2022; IMF, 2019). Supporting the findings of Figure 3, it is important to consider the variation over the different regions at the end of our observation period. The variance of tax revenues stays constant while an increase in the variation in public investment spending is notable. This could be understood in light of the included measures in the 2019 budget to increase family support and public investment, as well as the income tax relief (IMF, 2019). To capture this variation, the use of a panel data model that controls for the different regions by fixed effects is therefore useful, also applied in similar studies (Mäkelä and Viren, 2018). As we observe here, the increase in revenues does not necessarily imply simultaneous higher expenditures. This supports that the states (Länder) do not raise investment expenditures in the face of higher revenue, essentially treating higher revenue as temporary (IMF, 2019). Furthermore, an increase in the childcare rate and a slight increase in the municipality's personnel is noticeable over our observation period.

4.2   Regression results

Figure 5 and 6 show the migration effects of the expenditure model (2) and the revenue model (3), respectively. Detailed regression results are displayed in the Appendix in Table C.8 and Table C.9, respectively. These tables include the regression outputs using the original German terms as applied from the regional data source to avoid confusion. From the reasoning in Section 3.2.1 we consider the estimation results from six different models M.basic, M.lit, M.litIV, M.lasso, M.lassoIV and M.double for each of our selected outcome variables. As a general note, the models for tax revenues explain a larger part of the variation in the outcome variable than the models for public spending ($adjR^2$ of 0.97 compared to around 0.7). The main reasons for this are the increase of revenues over the years and the related explanatory power of the year effects, and the stronger relation of the revenues to other macro-level variables as identified by their correlations.

4.2.1   Local effects of immigration: The spending side

In the first model (M.basic), we only regress public investment spending on the share of foreigners and years. We find a negative association with all years which shows a decline in public spending in the mean, also noted by Bremer et al. (2022). In this and the alternative models, not all years are significant. These insignificant effects might be reasoned by the fact that the stimulus package
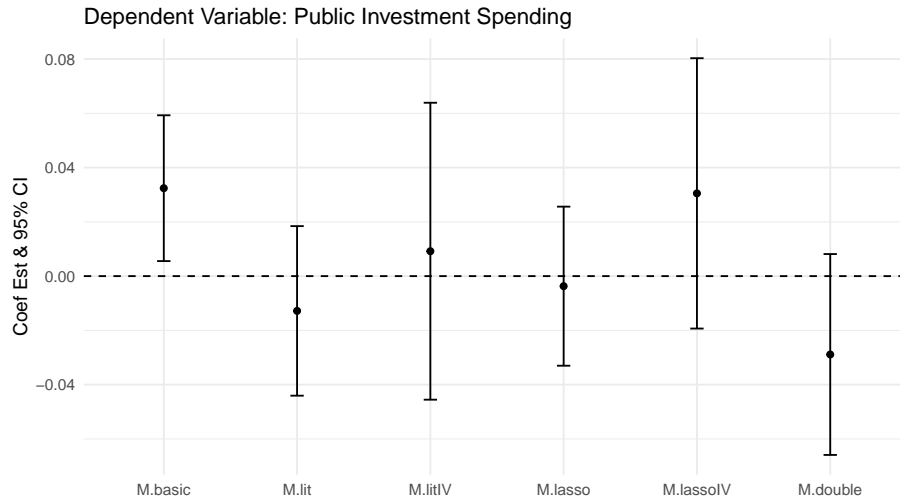
Figure 5: Regression results for dependent variable 'public investment spending'. The graphic shows the estimated regression coefficient for the share of foreigners (or the fitted value of a two step IV regression) joint with 95% confidence intervals.

following the global financial crisis was released over the analysis period 2009-2010 and part of it was directed towards new spending on infrastructure. Indeed, increases in public investment are common elements in fiscal stimulus programs (Tandberg and Allen, 2020). In this basic model (M.basic), we also observe a slightly significant positive effect of the local foreigners' share. However, an omitted variable bias appears to be present when comparing this to the more complex models.

Comparing the effects across the alternative models, we find that the effect of the share of foreigners in the literature-based model (M.lit) and the model chosen by Lasso (M.Lasso) is slightly negative but statistically insignificant. The sign here aligns with Jofre-Monseny et al. (2016), who found that increases in immigrant density lead to a reduction in municipal spending. Population density might strain needs, consequently affecting fiscal sustainability and public investment spending.[18] We further discuss the regression coefficients based on the model (M.lassoIV) displayed in Table C.8 as it addresses the endogeneity concerns as explained above. The results point to the share of foreigners being not significant on the per capita public investment spending.

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[18]A negative correlation was observed by Chevalier et al. (2023), explaining that cities with high shares of forced migration significantly reduced their infrastructure spending.

Moreover, we observe that Lasso model selection provides further important variables, mostly in line with Bremer et al. (2022) (e.g., short-term liquidity loans (pc) denoted by 'Kassenkredite', net migration (per 1000 capita), unemployment, social security expenditures, GDP).[19] The coefficient of public debt or the per capita short-term loans in Table C.8 is negative, which aligns with the theoretical expectation and with Bremer et al. (2022)'s results since this public debt may constrain voluntary or investment spending, however, we find the effect not significant. In our setting, we capture the income effect as a covariate through tax revenues (Steuereinnahmen) at a district level instead of employing the business tax revenue. We observe a significant effect of unconditional financial grants from states to local authorities, the so-called ('Schlüsselzuweisungen').[20], and significant effect of the allocation for investment funding (Zuweisungen für Investitionsfördermaßnahmen) aligning with our discussion in Section B regarding the financing sources of public investment, and indicates a largely exogenously determined public spending behavior which is to the most extent not determined by population dynamics.

Moreover, In the (M.lassoIV) model, the debt rate is highly significant (-0.09^{***}). Albeit insignificant in all models except M.double, the negative sign of population density aligns with that in Mäkelä and Viren (2018). An escalation in local population density could burden districts leading to additional expenditure types beyond tangible investment outlays. This might also relate to the quality of public services and expenditures following fiscal stress labels (Thompson, 2017). Based on our findings, the coefficient for internal migration volume shows a slight negative trend, while the new dwellings per capita coefficient displays a positive trend. Moreover, the coefficient for net migration (per 1000 capita) does not exhibit statistical significance. These results could suggest that overall inter-district population shifts have a negative effect on public investment spending.

Exploring the effects of other spending types

Besides public investment spending, we also explore the potential impact of the foreign population share on additional outcomes, including municipal staff or public municipal employment, health, and education expenditures. The detailed results are shown in Appendix D. We begin with Figure D.1 that examines municipal staff per 10,000 inhabitants (Personal der Kommune) from 2010 to

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[19]For more information on short-term liquidity loans, *see* for example, Junkernheinrich and Wagschal (2014).

[20]This is a vertical fiscal equalization element, also denoted by unconditional formula-based grants. They are granted if fiscal needs exceed fiscal capacities and represent general revenues to be spent for any purpose that local governments pursue (*see* Otter 2008).

2019. The results indicate a negative impact of the district's foreign population share on public employment of civil servants across the non-IV models, although these effects are statistically insignificant. Notably, in the (M.basic) model where only year-fixed effects are considered, the impact becomes statistically significant. A similar variable has been explored in previous studies, such as in Bremer et al. (2022), where it was regarded as an indicator of administrative capacity, particularly technical personnel. The lack of statistical significance of this variable suggests that local governments may encounter limitations in enhancing their administrative capacity simultaneously when aiming to expand local public investment. This discrepancy between anticipated and actual public employment aligns with previous research findings. Moreover, we observe that an increase in the lagged employed personnel staff leads to an increase in public-sector employment in the following year.

Next, Figure D.2 presents results of the enrollment rate of children under 3 years old in public childcare facilities or daycare centers, relative to the total count of children under 3 years old at that same time point (Betreuungsquote Kleinkinder). Public nursery schools are a municipal service that can have important consequences on female labour supply (Bianchi et al., 2023) and its link with the parents' labour supply has been asserted.[21] Our findings indicate a notable trend: an increase in the district's proportion of foreigners corresponds with a statistically significant reduction in the percentage of children under 3 years old enrolled in childcare facilities. In other words, as the share of foreigners in the district rises, the enrollment rate for this age group tends to decline, while holding other variables constant. This effect reflects the extent of utilization of publicly provided social services. Former studies have highlighted the potential impact of migrants' awareness of their childcare rights as a critical factor influencing their childcare utilization (Seibel, 2021).

Finally, Figure D.3 shows the results for healthcare utilization which is one of the communal SDG indicators. Our focus centers on the variable 'Acute Hospital Beds per 1000 Population', that is (Krankenhausversorgung). Through this investigation, we investigate how the growing share of foreigners within districts impacts the healthcare sector. Notably, within Germany, health expenditure displays an ascending trend in correlation with economic performance. Germany stands among the European countries allocating a considerable GDP percentage to health, registering at 11% of gross domestic product (compared to the EU average of approximately 9%), as reported by

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[21]*See* INKAR's description for this variable.
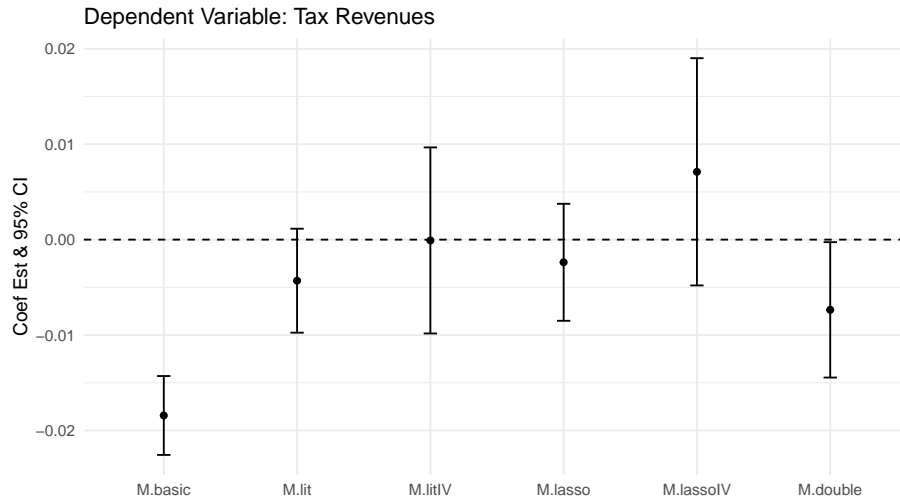
Figure 6: Regression results for dependent variable 'tax revenues' in logarithmized form. The graphic shows the estimated regression coefficient for the share of foreigners (or the fitted value of a two-step IV regression) joint with 95% confidence intervals.

the RKI.[22] Our analysis, centered on this healthcare provision indicator, reveals that the presence of foreigners does not seem to significantly impact the availability of emergency hospital beds, measured as beds per 1000 capita. In contrast to other output variables, the sub-population groups showing significance for other spending types are not crucial in this model.

4.2.2 Local effects of immigration on district level: The revenue side

Figure 6 shows the regression results for the revenue side, particularly per capita tax revenues. As discussed by Gerdes (2011), this outcome variable provides a clear-cut measure of the actual tax policies stipulated by local governments. In their research, Hepp and von Hagen (2012) underscore that empirical evidence on both income and tax revenue smoothing remains somewhat scant. Likewise, Smith (2018) argues that the best current estimates of taxpayer effects are becoming seriously outdated. Drawing on these former discussions, we notice a high significance of the year effects in Table C.9 which are throughout positive. As discussed in Figure 4, this displays the exogenous

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[22]*See:*https://www.rki.de/EN/Content/Health_Monitoring/Health_Reporting/HealthInGermany/ Health-in-Germany_Summary.pdf?__blob=publicationFile

increase of tax revenues over time.

When focusing on the association between per capita tax revenues and the share of foreigners, we observe a pattern similar to that in the spending model. The effects are slightly negative but insignificant in the models (M.lasso) and (M.double). However, the coefficient in the (M.lassoIV) model is positive and also insignificant. From all the different models, we deduce that the share of foreigners has an insignificant impact on tax revenues at the district level.

In the model M.lassoIV, in contrast to the district's foreigners share, the county's GDP (+), unemployment rate (-), and average monthly gross earnings (-)[23] show throughout a significant relation to tax revenues. These results align with the findings of Andrejovska and Pulikova (2018) that the decisive factors were employment rate, gross domestic product, and foreign direct investment. The gross domestic product per capita, in our case, positively impacts the dependent variable, similar to Ángeles Castro and Ramírez Camarillo (2014). The coefficient of the unemployment rate gains in significance and size the more complex the model becomes. By contrast, population density and net migration are not found significant.

4.2.3 A short note on distinguishing between migration groups

In addition to the general categories of migrants and non-migrants, we are interested in a more detailed demographic breakdown, distinguishing migration types as discussed in Section 2.4. Based on our results from model M.double, we find that disaggregating migration groups is essential for accurately understanding their various effects on the public budget. For example, we observe that the share of foreigners negatively affects public investment spending but does not significantly influence tax revenues or public employees. Shelter-seeking populations show a significant negative effect on tax revenues and a positive effect on public employees. Foreign vocational students positively impact public investment and tax revenues but negatively affect childcare and health care. Asylum-seekers have minimal significant impact across the variables. This highlights the diverse fiscal implications of different migrant groups at the local level.

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[23]It reflects gross earnings per employee per month since this gross effect is divided by the employees' number at each time point.The negative association of gross earnings (Bruttoverdienst) appears counter-intuitive. The significance of this relation between increasing gross earnings and tax revenues results from the definition of gross earnings in a straightforward way. The main positive development is captured in the positive time effects which are even larger in size compared to the model M.basic. Similar to the relation to value-added tax.

4.3 Robustness checks

We check the robustness of our results through several approaches. While our initial models incorporated various spending variables, we also examined the logarithmized SGBII benefits ('SGBII-Leistungen') as an outcome variable to represent other expenditures, given that Social Security expenditures are mandatory. The model M.double explains a large portion of the variation in SGBII benefits with an adjusted $\text{adjR}^2 = 0.89$. We observe a slight negative association with the share of foreigners in M.double (-0.01^*) and an insignificant effect in M.lasso, consistent with other studies such as Bremer et al. (2022).

To focus on the high refugee influx period (2015-2019), we refine our analysis, reducing the sample to 1713 observations. During this period, lasso regressions show a shift towards immigration-related variables, indicating that immigration played a larger role in public investment spending. Specifically, model M.lasso includes additional variables such as shelter-seeking population, asylum-seekers, debt ratio, region's allocations, allocations for investment funding, and gross earnings. In model M.double, the effect of the share of foreigners is small, positive, and significant (0.00^{**}), aligning with Viren (2022). Conversely, the share of shelter-seeking persons shows a significant negative effect (-0.00^{***}), emphasizing the importance of distinguishing between different types of immigration, especially during peak periods of shelter-seeking individuals.

4.4 Policy implications and further disaggregated results

There is an increasing appreciation of work on regional fiscal differences (IMF, 2019). Our results highlight the political economy of local public finances and indicate that immigration at the local level in Germany seems to be cost-neutral, an aspect that has been long debated. Especially since expenditures might incur with the arrival of or the existence of migrants, it should be ascribed to them in the respective fiscal analyses (Rowthorn, 2014). However, the association we find between the share of foreigners and public spending and revenue, respectively, is not statistically significant during the observed period. In that sense, concerns about the impact of a larger share of foreigners cannot be supported on district level which is in contrast to Mäkelä and Viren (2018)'s work that suggests that cost-neutrality might not be given in their context.

Through this study, we additionally gain insights into the factors associated with a higher share of foreigners. Most variables either relate to different types of immigration, displaying a logical

relation to the share of foreigners, or the socio-economic conditions of the districts. This further helps to identify causes and effects of population dynamics based, for instance, on the population structure or the predominant types of businesses present in the area. Having these factors in mind, governments can more easily determine districts with adjustment needs in times of higher influxes. This can additionally guide public spending behavior.

The resulting cost neutrality could be further rooted in the level of aggregation, meaning that regional effects might differ when studied on a finer grid. In Germany, the next finer aggregation level corresponds to municipalities. While data availability on this level hinders a comprehensive analysis, we discuss tentative results in the following. Data from the German Federal Statistical Office (Statistisches Bundesamt) contains the share of foreigners only for the census year 2011. We, thus, limit our empirical analysis to this period and take the results as a starting point for further discussions. As known, most municipalities in each federal state must supplement their income with additional funds from the federal-state level which is done via municipal financial equalisations (Länderfinanzausgleich).[24]

At the level of German municipalities, we inspect the public purse dimensions similar to those explored at the district level. Results from a schematic regression model are presented in Table E.10. We control for key covariates similar to the model (M.lit) above, including gross revenues, population density, unemployment share, and migration saldo. On the revenue side, we observe that an increase in the foreigner's share on a community level is correlated with an increase in the total public tax revenues in the same year (2011). On the expense side, an increasing foreigner share is associated with a reduction in public municipal spending on tangible investments in the same year and one year later. When studying the aggregated level of gross public spending, we find insignificance of the effect of the 2011 share of foreigners on gross public spending in 2012. The lagged effect might be more informative in terms of budget planning and point to the fact that investment spending is reduced, but other spending categories potentially increased. Thus, we find an indication of cost neutrality on the gross spending level. It might be noteworthy that the effect of the share of unemployed dominates the foreigner effect in all regressions, affecting investment spending in the same direction but influencing the gross spending positively. Overall, the initial integration of foreigners might not immediately demand significant municipal spending. Over time, as foreigners become more settled, the need for public investments (e.g., in housing, education, and

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[24]The regional statistics data does not include the reserves variable in their database.

infrastructure) might increase.

All in all, these results underscore the importance of examining the varied effects across different national levels (*see* Section 2.1 above). In this regard, the findings contribute significantly to discussions regarding the allocation of state support during migration waves: while remaining neutral at the district level, our municipality-level results suggest potential effects at the municipal level. Resolving data shortages, further investigation at this level could ascertain the presence of cost neutrality and determine the precise magnitude and direction of migration effects on various spending categories.

5   Conclusions

We examine the local fiscal effects of immigration in Germany on different local levels and investigate how the share of the local foreign population affects public finances mainly at the district level. Our analysis utilizes regional administrative data for Germany at the district level, inspecting the period from 2010 to 2019, during which Germany witnessed a significant influx of immigrants. To our knowledge, this analysis is one of the early analyses to examine the local fiscal effects of migration in Germany covering several dimensions and a recent study period.

Our paper employs a comprehensive methodology, offering a balanced evaluation encompassing both government budget facets: expenditures and revenues. Consistent with earlier literature, we anticipate that individual contributions primarily flow to the central government (as tax revenues), while expenditures tend to localize. Rather than only relying on aggregate spending, we decompose public expenditures, including those classified as public goods together with other spending components.

There are several key findings from our study. From a policy standpoint, our findings based on a well-selected IV regression suggest that the foreigners' share insignificantly impacts collected tax revenues and public investment spending at the district level. Our findings in this respect corroborate the finding of Card (2009) that the local fiscal effects of increased immigration appear to be relatively small. Given the lack of significance for both models, we do not find supporting evidence that migration shrank the size of the government in Germany, reducing both spending and revenues (*see* Bianchi et al. 2023). We additionally find disaggregated effects that oppose each other when incorporating detailed immigration types. Also, when differentiating various spending

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categories, we find that the share of foreigners negatively influences the enrollment rate for children under three in childcare facilities while holding other variables constant. By contrast, the share of foreigners in a district does not seem to significantly impact emergency public health spending and public staffing.

Overall, our analysis provides better insights into the constitution of public budgets and the channels between the state's budget and migration in a data-driven way. This contributes by laying further avenues for more detailed studies and detecting key regional characteristics to consider in times of increased immigration influxes. Furthermore, as our results suggest, the welfare state might react differently depending on immigration type, where some subgroups might even show a favorable effect. Therefore, our analysis speaks to the importance of decomposing the migrant groups. By examining various outcomes, we illustrate that cost-neutrality may hold for certain aspects of public finances (*see* e.g., Mäkelä and Viren, 2018). Lastly, we differentiate between the district and municipality levels which indicates that potential effects might rather be politically addressed on a community level.

Future studies on the local fiscal impacts of immigration can take different paths. One avenue is analyzing budget data, exemplified by Bremer et al. (2022), while another approach involves utilizing surveys, similar to Gerdes (2011). Employing German SOEP data could provide comprehensive insights into government budget aspects, including household transfers and contributions, enabling the assessment of distinct effects based on population skill levels (*see* Smith, 2018). Additionally, integrating fiscal sustainability into broader Sustainable Development Goals (SDG) analyses offers valuable insights. Furthermore, future research could delve into overall population shocks in greater detail, such as asymmetric revenue shocks or impacts on the German fiscal equalization scheme. Studies should also differentiate between various population dynamics, distinguishing between foreigners and locals requiring support (community of need) versus the working population.

Data availability & declarations of interest

Data will be made available upon request.

Declarations of interest: none.

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A   Appendix

A.1   Definitions

Foreigners share (Ausländeranteil %) : Zur ausländischen Bevölkerung zählen alle Personen, die nicht Deutsche im Sinne des Art. 116 Abs. 1 GG sind, d. h. nicht die deutsche Staatsangehörigkeit besitzen. "Zu Ausländern zählen auch Staatenlose und Personen mit ungeklärter Staatsangehörigkeit. Personen, die sowohl die deutsche als auch eine andere Staatsangehörigkeit haben, gelten als deutsche Staatsangehörige. Mitglieder der Stationierungsstreitkräfte und der diplomatischen/konsularischen Vertretungen und ihre Familienangehörigen werden statistisch nicht erfasst. Seit dem 1.1.2000 erwerben Kinder ausländischer Eltern die deutsche Staatsangehörigkeit, wenn ein Elternteil seit acht Jahren seinen gewöhnlichen Aufenthalt in Deutschland hat und eine Aufenthaltsberechtigung oder seit drei Jahren eine unbefristete Aufenthaltserlaubnis besitzt. Bei der Bevölkerung ist zu beachten, dass sich die Zahlen vor 2011 auf die Fortschreibung auf Basis der Volkszählung 1987 (BRD) und 1981 (DDR) und ab 2011 auf die Fortschreibung auf Basis des Zensus 2011 beziehen. Stichtag 31.12. " (BBSR, 2018).

Public investment spending (Sachinvestitionen): Items that fall under this definition:[25] Construction work, loan repayments from administrations, other expenses, *minus*: Payments from the same level.

County GDP (measured as pc): Sum of the added value of all economic sectors plus the balance of taxes on goods minus subsidies on goods.

A.2   Lasso regression and post-double selection

Lasso regression is often applied for improving the predictability of a model by using a penalty on the regression coefficients (James et al., 2021). This shrinks certain 'unimportant' coefficients to zero depending on a tuning parameter $\lambda \geq 0$ when minimizing

$$RSS + \lambda \sum_{j=1}^{p} |\beta_j|.$$

Lasso can be useful for model selection by taking advantage of the property of shrinking coefficients to zero and running a post-lasso model including the remaining variables. In the context of causal identification of effects, the post-double selection is a widely used tool (Belloni et al., 2013; Chan-Lau, 2017). In the following, we describe this technique in more detail and explain the strategy and detailed results in our case. The related R code is available on request.

A.2.1   Post-double selection

We run two different lasso regressions in the spirit of post-double lasso selection. The strategy proceeds in the following way (cf., e.g., Chernozhukov et al., 2016):

1. Select controls x_{it}'s that predict y_i by Lasso (excluding the variable $foreign_i$).

2. Select controls x_{it}'s that predict $foreign_i$ by Lasso.

3. Run OLS of y_i on $foreign_i$ and the union of controls selected in Steps 1 and 2.

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[25]   In German as listed: Sachinvestitionen sind Investitionen, die in Sachanlagen (z.B. Brücke, Verwaltungsgebäude, Feuerwehrfahrzeug) getätigt werden. see: https://www.statistischebibliothek.de/mir/servlets/MCRFileNodeServlet/SNHeft_derivate_00002207/L_II_2_vj4_06_SN.pdf;jsessionid=38EE4E9302045D59F738958CDFC1A6DD

In our case of a panel model, we take the within-transformation first and demean the variables over the different years before running the lasso algorithm. In difference to Chernozhukov et al. (2016) we select the tuning parameter λ by cross-validation. In Step 2, we restrict the parameter space of the tuning parameter in order to avoid the selection of too many controls and an associated overfitting similar to a guided subset selection procedure where a predetermined number of coefficients is selected.

A.2.2 Detailed results for lasso using INKAR

In order to determine the model M.lasso in Step 1, we preselect the following covariates based on economic reasoning additional to the ones of model M.lit:

'Schutzsuchende an ausländischer Bevölkerung'	'Schuldnerquote'	'Asylbewerber'
'Schutzsuchende an Bevölkerung'	'Personal der Kommunen'	'Schlüsselzuweisungen'
'Neubauwohnungen je Einwohner'	'Beschäftigtenquote'	'Erwerbsquote'
'Zuweisungen für Investitionsfördermaßnahmen'	'Binnenwanderungsvolumen'	'Bruttoverdienst'
'Kommunale Schulden je Einwohner'	'Gesamtwanderungssaldo (pc*1,000)'	'Großunternehmen'
'Kassenkredite'	'ALG II-Leistungen (Höhe)'	'SGB II - Quote'
'Gästeübernachtungen in Beherbergungsbetrieben'	'Verhältnis junge zu alte Erwerbsfähige'	
'Offene Stellen mit Anforderungsniveau Helfer'	'Offene Stellen mit Anforderungsniveau Experte'	

We avoid running the lasso model on the full set of variables as it contains many variables with similar content and thus, this might lead to overfitting or simply choosing economically unimportant variables. As it is less clear what influences the share of foreigners, we leave the lasso of Step 2 without restricting the variable set. In difference, we rather restrict the tuning parameter space and with this restrict to choose the most influential variables only. The cross-validation for the tuning parameter choice is done with $k = 20$ folds. We have run alternative choices of k and found the robustness of the algorithm.

Table A.1: Results of the three lasso regressions, the first two relate to Step 1 for the two alternative regression models. The last column relates to Step 2 and is the same for the two models.

Output variable		Public spending	Tax revenue	Share of foreigners
Tuning parameter	Param space	[0,0.25], steps0.0001	[0,0.1], steps0.001	[0.02,0.1], steps0.001
	Chosen param	0.005	0.013	0.02
Potential covariates		55	55	251
Covariates non-zero		23	7	55

Table A.2: Results for different model estimations of (3) using fixed effects. Model M.basic corresponds includes the share of foreigners and time dummies as regressors, M.lit includes additional covariates based on prior works, model M.all contains all available variables from the INKAR database, M.lasso is the lasso-plus-theory-based model and M.double is the model after post-double selection described in 3.2.2.

Model	Coefficients	adjRsquared	BIC	$RMSE_{train}$	$RMSE_{test}$
M.basic	10	0.964	-6216	0.0582	0.203
M.lit	16	0.966	-6359	0.0566	0.136
M.all	244	0.993	-10099	0.0241	0.0465
M.lasso	19	0.967	-6405.4	0.057	0.127
M.double	65	0.968	-6231.4	0.054	0.136

A.3 Validity of the generated instruments

Table A.3: Test results for the IV regression in model M.litIV for the output variable public spending. The results show relevance but endogeneity of the instrument.

F-test (1st stage),	Ausländeranteil:	stat = 82.8 ,	p < 2.2e-16 ,	on 20 and 2,862 DoF.
	Wu-Hausman:	stat = 1.09798,	p = 0.294798,	on 1 and 2,880 DoF.
	Sargan:	stat = 121.1 ,	p < 2.2e-16 ,	on 19 DoF.

Table A.4: Test results for the IV regression in model M.lassoIV for the output variable public spending. The results show relevance and exogeneity of the instrument.

F-test (1st stage),	Ausländeranteil:	stat = 90.0 ,	p < 2.2e-16 ,	on 20 and 2,844 DoF.
	Wu-Hausman:	stat = 3.33209,	p = 0.068045 ,	on 1 and 2,862 DoF.
	Sargan:	stat = 114.5 ,	p = 1.156e-15,	on 19 DoF.

Table A.5: Test results for the IV regression in model M.litIV for the output variable tax revenues. The results show relevance but endogeneity of the instrument.

F-test (1st stage),	Ausländeranteil:	stat = 86.3 ,	p < 2.2e-16 ,	on 17 and 2,866 DoF.
	Wu-Hausman:	stat = 1.77066,	p = 0.183405,	on 1 and 2,881 DoF.
	Sargan:	stat = 128.8 ,	p < 2.2e-16 ,	on 16 DoF.

Table A.6: Test results for the IV regression in model M.lassoIV for the output variable tax revenues. The results show relevance and exogeneity of the instrument.

F-test (1st stage),	Ausländeranteil:	stat = 67.3 ,	p < 2.2e-16 ,	on 17 and 2,845 DoF.
	Wu-Hausman:	stat = 5.36288,	p = 0.02064 ,	on 1 and 2,860 DoF.
	Sargan:	stat = 82.6 ,	p = 5.614e-11,	on 16 DoF.

B   Background on the German administrative system

Germany has three levels of government or the so-called three-tier system of subnational governments (*SNG*); states ('*Länder*'), districts ('*Kreise*'), and municipalities ('*Gemeinde*'). Districts are responsible for cross-municipal tasks, i.e. tasks for which collaboration across municipalities is necessary, and the central level has a decisive role in determining public investment priorities for the Land (Gamper, 2012).

Financial equalization ('*Länderfinanzausgleich*'), in a cooperative federal system like Germany, is one important tool of fiscal policy to minimize fiscal disparities between the regional levels. Germany is a country that boasts a cooperative federal system and fiscal equalization schemes aimed at reducing subnational governments' differences in fiscal capacity (Bremer et al., 2022). In practice,

to balance regions' needs and income, there are two types of fiscal transfers, horizontal and vertical. The equalization fund is subdivided into conditional grants and unconditional transfers (Otter, 2008). Overall, the extent of fiscal transfers within Germany has been considerable, especially given the growing inequality in investments across districts (*see* Bremer et al., 2022). Supporting this, the volume of fiscal transfers within Germany is more than twice as large as all EU structural funds combined (Henkel et al., 2021; Seidel et al., 2018).

Governments in every region provide local public services, whose costs are financed by local taxes and spatial transfers on the local level (Henkel et al., 2021).[26] Consequently, there is no direct federal grant to local governments, only state grants, and these grants represent a significant source of revenue and comprise general, compensation, investment, and specific grants (OECD, 2016).

Related to investments, overall, there has been a decline in public investment spending in advanced economies over the past three decades (Bremer et al., 2022) and this spending component has been recently increasing. Remarkably, Germany has a lower share of public investment than the OECD average. Particularly, the share of subnational government (SNG) investment in GDP is significantly below the OECD average of 1.8% (OECD, 2016).[27]

Regarding tax revenues, the tax contribution aims to quantify the impact of selected macroeconomic indicators (gross domestic product, level of employment, public debt, foreign direct investments, effective tax rate, statutory tax rate) on the total amount of tax revenues (Andrejovska and Pulikova, 2018). The institutional setting is one factor that leads to differences in the collected tax revenues across countries. For example, in the Finnish system, corporate and capital income tax revenues are collected by the central government. In the German system, local governments have indeed little autonomy over tax rates as discussed by Henkel et al. (2021) who account it as less than 9%. Likewise, Büttner (1999) highlights that the taxation autonomy of communities ('*Gemeinden*') in Germany mainly consists of their choice of the business tax local collection rate of business tax revenues ('*Gewerbesteuer*'). And this item, in particular, constitutes the single largest local tax (Bremer et al., 2022). This is supported by public statistics providing evidence that the tax revenue from this element (i.e., trade or business tax) is rising quite sharply.

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[26]For example, Bianchi et al. (2023) in their study gave an example that a change in the level of public services, such as welfare support, can affect labour supply and demand with far-reaching repercussions on local economies.

[27]*See* Germany's profile: https://www.oecd.org/regional/regional-policy/profile-Germnay.pdf

B.1 Refugees distribution across German regions

The peak in Germany was reached in the second half of 2015 when the unprecedented influx of asylum-seekers and migrants made their way to Europe (*see* Sola, 2018; Gehrsitz and Ungerer, 2022). Refugees are presumably exogenously allocated across German regions between 2013 and 2016. The main tool for the distribution of refugees across States ('*Bundesländer*') is the so-called ('*Königsteiner Schlüssel*'), which allocates refugees according to a state's economic capacity (tax revenues) and population. Precisely, the assignment of asylum seekers across states is governed by this quota system, whereby quotas are set annually based on states' tax revenues (weight 2/3) and population (weight 1/3) two years prior (Albarosa and Elsner, 2023). States themselves could then distribute refugees within their districts, following independent but similar criteria (*see* e.g., Jaschke et al., 2021). The latter study provided evidence of the exogenous distribution of refugees.

In another investigation, Gehrsitz and Ungerer (2022) examined whether economic or political variables measured before 2014 could predict local inflows in the following year. However, their findings revealed only a limited number of significant predictors. These outcomes imply that the resulting influx of refugees exhibited minimal correlation with the economic and social characteristics of the counties. This suggests the presence of exogenous variations in the number of asylum-seekers per county, both within and across states. Similarly, Albarosa and Elsner (2023) explored the relationship between the percentage increase in asylum-seekers between 2014 and 2016 and the local unemployment rate in 2014, as well as the county-level GDP per capita. Their results demonstrated that the relative scale of the inflow exhibited no discernible correlation with the preceding unemployment rate, and displayed a weak positive correlation with the preceding GDP.

B.2 New laws or regulations on state or regional level

Several new laws or regulations emerged in the past few years among which are the ones that emerged over our analysis period. For example, recently, some laws adopted by the German parliament in July 2019 give overall and per capita relief to the German taxpayer (Manthei, 2020). On the district level, some districts have applied some changes to their structures. For example, major district reforms took place in Saxony-Anhalt (2007), Saxony (2008), and Mecklenburg-Vorpommern (2011) as highlighted by Bremer et al. (2022). Moreover, as known, the year 2009 marked the global financial crisis, which was followed by a strong decrease in GDP that was mainly attributed to the

sudden cuts in spending by Germany's trade partners. The German government reacted afterward with a sizable stimulus package in a bid to recover and as part of the economic recovery packages in the EU-member states.

Furthermore, provisions such as the (Balanced Structural Budget), and a "Debt Brake Rule" were introduced in 2011 at the federal and Länder levels following the 2009 Constitutional reform (IMF, 2019; OECD, 2016). However, as declared, it does not take full effect immediately but rather in 2020 and it calls for structurally balanced budgets for the Länder. It underlies that local governments must balance their budgets and have borrowing restrictions, determined by each state. Moreover, the transfers received from the second Solidarity Pact ('Solidarpakt') as part of Germany's reunification process will continue to decrease until phased out in 2019 (Gamper, 2012).

Table B.7: Detailed model based on variable selection from the literature.

	Variable list	Based on INKAR	Year	
Exp.	TC	Ausgaben für Sachinvestitionen	1	2010
Rev.	REV	Steuereinnahmen	2	2011
Foreigners share	FB	Ausländeranteil	3	2012
			4	2013
Controls (among others)			5	2014
	Population density	Siedlungsdichte in km^2	6	2015
	Share of elderly	Einwohner 65 Jahre und älter	7	2016
	Unemployment rate	Arbeitslosenquote	8	2017
	Public income	Steuereinnahmen	9	2018
	Total migration	Gesamtwanderungssaldo	10	2019

C   IV Results for the respective district revenue and expenditure models [28]

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[28]All tables are available in English version upon request. As noted above, the original names of the variables on the INKAR are included to allow for easier variable identification.

Table C.8: Public investment spending

	M.basic	M.lit	M.litIV	M.lasso	M.lassoIV	M.double
Ausländeranteil	0.03*	−0.01		−0.00		−0.03
	(0.01)	(0.02)		(0.01)		(0.02)
factor(Zeit)2011	−0.02	0.01	0.03	−0.11*	−0.09	−0.09
	(0.03)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
factor(Zeit)2012	−0.16***	−0.09*	−0.09*	−0.27***	−0.27***	−0.23**
	(0.03)	(0.04)	(0.04)	(0.06)	(0.06)	(0.08)
factor(Zeit)2013	−0.06**	0.05	0.04	−0.26***	−0.28***	−0.17
	(0.02)	(0.04)	(0.04)	(0.08)	(0.08)	(0.10)
factor(Zeit)2014	−0.03	0.14**	0.12*	−0.27**	−0.31**	−0.14
	(0.03)	(0.05)	(0.05)	(0.09)	(0.10)	(0.12)
factor(Zeit)2015	−0.13***	0.13*	0.08	−0.43***	−0.51***	−0.32*
	(0.03)	(0.06)	(0.08)	(0.12)	(0.13)	(0.15)
factor(Zeit)2016	−0.16***	0.12	0.05	−0.54***	−0.64***	−0.43*
	(0.04)	(0.08)	(0.10)	(0.14)	(0.16)	(0.19)
factor(Zeit)2017	−0.05	0.27**	0.19	−0.52**	−0.65***	−0.43*
	(0.04)	(0.09)	(0.12)	(0.16)	(0.19)	(0.22)
factor(Zeit)2018	−0.01	0.35***	0.25	−0.72***	−0.88***	−0.61*
	(0.06)	(0.10)	(0.14)	(0.19)	(0.22)	(0.25)
factor(Zeit)2019	−0.35***	0.05	−0.06	−1.00***	−1.19***	−0.90**
	(0.07)	(0.12)	(0.17)	(0.22)	(0.26)	(0.30)
Einwohnerdichte		−0.00	−0.00	−0.00	−0.00	−0.00*
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
'Bruttoinlandsprodukt je Einwohner'		0.00	0.00	−0.01	−0.01	−0.00
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Arbeitslosenquote		−0.00	−0.01	−0.04	−0.04	−0.06*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
'Einwohner von 18 bis unter 25 Jahren'		0.12***	0.12***	0.07**	0.08**	0.04
		(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
'Einwohner 65 Jahre und älter'		−0.11**	−0.09*	−0.03	−0.01	−0.02
		(0.03)	(0.04)	(0.03)	(0.03)	(0.04)
Gesamtwanderungssaldo		−0.00	−0.00	0.00	−0.00	−0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
auslaend_lag		−0.00	−0.01	−0.01	−0.01	−0.01
		(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
lasachi_lag		0.00	0.00	0.03	0.03	0.04*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
lsteuerein_lag		0.14*	0.16*	0.30***	0.33***	0.26***
		(0.07)	(0.07)	(0.07)	(0.07)	(0.06)
fit_Ausländeranteil			0.01		0.03	
			(0.03)		(0.03)	
'Schutzsuchende an Bevölkerung'				0.06**	0.05**	0.04
				(0.02)	(0.02)	(0.03)
Asylbewerber				0.00*	0.00*	0.00
				(0.00)	(0.00)	(0.00)
Schuldnerquote				−0.09***	−0.09***	−0.06*
				(0.03)	(0.03)	(0.03)
'Personal der Kommunen'				−0.00	−0.00	−0.00
				(0.00)	(0.00)	(0.00)
steuerein				0.00**	0.00**	0.00
				(0.00)	(0.00)	(0.00)
Schlüsselzuweisungen				0.00***	0.00***	0.00***
				(0.00)	(0.00)	(0.00)
'Neubauwohnungen je Einwohner'				0.02**	0.02*	0.03
				(0.01)	(0.01)	(0.02)
Erwerbsquote				0.01	0.01	−0.01
				(0.01)	(0.01)	(0.01)
'Zuweisungen für Investitionsfördermaßnahmen'				0.00***	0.00***	0.00***

	(0.00)	(0.00)	(0.00)
Binnenwanderungsvolumen	−0.00*	−0.00**	−0.00**
	(0.00)	(0.00)	(0.00)
Bruttoverdienst	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
'Kommunale Schulden'	−0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
'SGB II - Quote'	−0.02	−0.02	−0.02
	(0.02)	(0.02)	(0.02)
Großunternehmen	0.19	0.19	0.17
	(0.22)	(0.22)	(0.23)
Kassenkredite	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)
'Verhältnis junge zu alte Erwerbsfähige'	−0.01***	−0.01***	−0.01**
	(0.00)	(0.00)	(0.00)
'Gästeübernachtungen in Beherbergungsbetrieben'	0.01	0.01	0.00
	(0.01)	(0.01)	(0.01)
'Offene Stellen mit Anforderungsniveau Experte'	0.01*	0.01	0.01
	(0.00)	(0.00)	(0.00)
'Ausländische Schüler'			−0.01
			(0.01)
'Ausländische weibliche Arbeitslose'			0.01
			(0.01)
'Regionales Bevölkerungspotenzial'			−0.00
			(0.00)
'Schutzsuchende an ausländischer Bevölkerung'			0.00
			(0.00)
'Einwohner unter 3 Jahren'			−0.11
			(0.13)
Umsatzsteuer			0.00
			(0.00)
'SGBII-Leistungen'			−0.00
			(0.00)
Zuzugsrate			0.00
			(0.00)
Kleinstbetriebe			0.00
			(0.03)
'Betreuungsquote Vorschulkinder'			−0.00
			(0.00)
Auspendler			−0.06**
			(0.02)
'Leistungen für Unterkunft an SGBII'			−0.04***
			(0.01)
'Alleinerziehende erwerbsfähige Leistungsberechtigte'			−0.01
			(0.01)
'Ausländische Berufsschüler'			0.01**
			(0.00)
'Weibliche Einwohner von 65 bis unter 75 Jahren'			0.05*
			(0.02)
'Bruttowertschöpfung je Erwerbstätigen Tertiärer Sektor'			−0.00
			(0.01)
'Auszubildende je 100 Einwohner 15 bis 25 Jahre'			−0.01
			(0.01)
'Erwerbsfähige Leistungsberechtigte (Frauen)'			−0.01
			(0.01)
Berufsschüler			−0.02*
			(0.01)
'Anteil Bruttowertschöpfung Primärer Sektor'			0.05*
			(0.02)
'Zuzugsrate Frauen'			−0.00
			(0.00)

'Männliche Schulabgänger mit allgemeiner Hochschulreife'						0.00
						(0.00)
'Männliche ältere Arbeitslose'						0.00
						(0.02)
'Weibliche Einwohner von 18 bis unter 25 Jahren'						−0.02
						(0.01)
'Beschäftigte in Kreativbranchen'						−0.02
						(0.02)
Verbraucherinsolvenzverfahren						0.08*
						(0.03)
Ausländerinnen						0.00
						(0.01)
'Beschäftigte in unternehmensbezogenen Dienstleistungen'						−0.01
						(0.01)
Pendlersaldo						−0.01**
						(0.01)
'Abhängigenquote Junge'						−0.02
						(0.03)
Erwerbstätige						0.01*
						(0.00)
'Geringfügig Beschäftigte 65 Jahre und älter weiblich'						−0.01
						(0.02)
'Neubauwohnungen in Mehrfamilienhäusern'						−0.00
						(0.02)
'Bruttoinlandsprodukt in 1000 Euro'						−0.00
						(0.00)
'Arbeitslose Frauen'						−0.01
						(0.01)
Haushaltsabfälle						−0.00*
						(0.00)
'Anteil Minijobs (ausschließlich) an geringfügig Beschäftigten'						−2211.89
						(3463.51)
Abfallmenge						−0.00
						(0.00)
'Anteil Minijobs (Nebenverdienst)'						−2211.87
						(3463.51)
Num. obs.	3275	3275	3275	3275	3275	3275
Num. groups: id	375	375	375	375	375	375
R^2 (full model)	0.63	0.63	0.63	0.73	0.73	0.75
R^2 (proj model)	0.05	0.07	0.07	0.32	0.32	0.36
Adj. R^2 (full model)	0.58	0.58	0.58	0.69	0.69	0.70
Adj. R^2 (proj model)	0.05	0.07	0.07	0.31	0.31	0.34

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table C.9: Tax revenues

	M.basic	M.lit	M.litIV	M.lasso	M.lassoIV	M.double
Ausländeranteil	−0.02***	−0.00		−0.00		−0.01*
	(0.00)	(0.00)		(0.00)		(0.00)
factor(Zeit)2011	0.09***	0.09***	0.10***	0.11***	0.12***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
factor(Zeit)2012	0.16***	0.14***	0.14***	0.17***	0.18***	0.18***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
factor(Zeit)2013	0.19***	0.16***	0.16***	0.21***	0.21***	0.24***

	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
factor(Zeit)2014	0.24***	0.18***	0.18***	0.24***	0.24***	0.28***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
factor(Zeit)2015	0.31***	0.23***	0.22***	0.31***	0.29***	0.35***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
factor(Zeit)2016	0.37***	0.27***	0.26***	0.38***	0.36***	0.41***
	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
factor(Zeit)2017	0.46***	0.33***	0.32***	0.44***	0.42***	0.49***
	(0.01)	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)
factor(Zeit)2018	0.51***	0.37***	0.35***	0.50***	0.47***	0.56***
	(0.01)	(0.02)	(0.02)	(0.04)	(0.05)	(0.05)
factor(Zeit)2019	0.55***	0.39***	0.37***	0.54***	0.50***	0.62***
	(0.01)	(0.02)	(0.03)	(0.05)	(0.05)	(0.06)
Einwohnerdichte		−0.00	−0.00	−0.00	−0.00	−0.00*
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
'Bruttoinlandsprodukt je Einwohner'		0.01***	0.01***	0.01***	0.01***	0.01***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Arbeitslosenquote		−0.01**	−0.01**	−0.02***	−0.02***	−0.02***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
'Einwohner von 18 bis unter 25 Jahren'		−0.01*	−0.01*	−0.01	−0.00	−0.01
		(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
'Einwohner 65 Jahre und älter'		0.02***	0.03***	0.02**	0.02***	0.01*
		(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
Gesamtwanderungssaldo		0.00	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
auslaend_lag		−0.00	−0.00	−0.00	−0.00	−0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
lsteuerein_lag		0.03	0.03	0.02	0.03	0.02
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
fit_Ausländeranteil			−0.00		0.01	
			(0.00)		(0.01)	
'Schutzsuchende an ausländischer Bevölkerung'				0.00	0.00*	0.00
				(0.00)	(0.00)	(0.00)
'Schutzsuchende an Bevölkerung'				−0.02***	−0.03***	−0.02*
				(0.01)	(0.01)	(0.01)
Asylbewerber				−0.00	−0.00	−0.00
				(0.00)	(0.00)	(0.00)
Schuldnerquote				−0.00	−0.00	0.00
				(0.00)	(0.00)	(0.00)
'Personal der Kommunen'				−0.00	−0.00	−0.00
				(0.00)	(0.00)	(0.00)
Schlüsselzuweisungen				−0.00	−0.00	−0.00
				(0.00)	(0.00)	(0.00)
'Neubauwohnungen je Einwohner'				0.00	0.00	−0.00
				(0.00)	(0.00)	(0.00)
Beschäftigtenquote				0.00	−0.00	−0.00
				(0.00)	(0.00)	(0.00)
Erwerbsquote				−0.00*	−0.00	−0.00
				(0.00)	(0.00)	(0.00)
'Zuweisungen für Investitionsfördermaßnahmen'				0.00	0.00	0.00
				(0.00)	(0.00)	(0.00)
Binnenwanderungsvolumen				−0.00	−0.00*	−0.00**
				(0.00)	(0.00)	(0.00)
Bruttoverdienst				−0.00***	−0.00***	−0.00***
				(0.00)	(0.00)	(0.00)
'Kommunale Schulden'				−0.00*	−0.00*	−0.00*
				(0.00)	(0.00)	(0.00)
'SGB II - Quote'				0.01*	0.01	0.00
				(0.00)	(0.00)	(0.00)
Großunternehmen				0.01	0.02	0.06
				(0.04)	(0.04)	(0.04)

Kassenkredite	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)
'ALG II-Leistungen (Höhe)'	0.00*	0.00	0.00
	(0.00)	(0.00)	(0.00)
'Verhältnis junge zu alte Erwerbsfähige'	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)
'Gästeübernachtungen in Beherbergungsbetrieben'	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)
'Offene Stellen mit Anforderungsniveau Experte'	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
'Offene Stellen mit Anforderungsniveau Helfer'	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)
'Ausländische Schüler'			0.00
			(0.00)
'Ausländische weibliche Arbeitslose'			−0.00
			(0.00)
'Regionales Bevölkerungspotenzial'			0.00**
			(0.00)
'Einwohner unter 3 Jahren'			−0.03
			(0.02)
Umsatzsteuer			−0.00*
			(0.00)
'SGBII-Leistungen'			0.00
			(0.00)
Zuzugsrate			0.00
			(0.00)
Kleinstbetriebe			0.01*
			(0.00)
'Betreuungsquote Vorschulkinder'			0.00
			(0.00)
Auspendler			−0.00
			(0.00)
'Leistungen für Unterkunft an SGBII'			−0.00
			(0.00)
'Alleinerziehende erwerbsfähige Leistungsberechtigte'			0.00
			(0.00)
'Ausländische Berufsschüler'			0.00*
			(0.00)
'Weibliche Einwohner von 65 bis unter 75 Jahren'			−0.00
			(0.00)
'Bruttowertschöpfung je Erwerbstätigen Tertiärer Sektor'			−0.00
			(0.00)
'Auszubildende je 100 Einwohner 15 bis 25 Jahre'			0.00
			(0.00)
'Erwerbsfähige Leistungsberechtigte (Frauen)'			−0.00
			(0.00)
Berufsschüler			−0.00
			(0.00)
'Anteil Bruttowertschöpfung Primärer Sektor'			−0.00
			(0.00)
'Zuzugsrate Frauen'			−0.00
			(0.00)
'Männliche Schulabgänger mit allgemeiner Hochschulreife'			−0.00
			(0.00)
'Männliche ältere Arbeitslose'			−0.00
			(0.00)
'Weibliche Einwohner von 18 bis unter 25 Jahren'			−0.00
			(0.00)
'Beschäftigte in Kreativbranchen'			0.00
			(0.00)
Verbraucherinsolvenzverfahren			−0.00

						(0.01)
Ausländerinnen						0.00
						(0.00)
'Beschäftigte in unternehmensbezogenen Dienstleistungen'						0.00
						(0.00)
Pendlersaldo						0.00
						(0.00)
'Abhängigenquote Junge'						0.00
						(0.01)
Erwerbstätige						−0.00
						(0.00)
'Geringfügig Beschäftigte 65 Jahre und älter weiblich'						−0.01*
						(0.00)
'Neubauwohnungen in Mehrfamilienhäusern'						0.00
						(0.00)
'Bruttoinlandsprodukt in 1000 Euro'						0.00
						(0.00)
'Arbeitslose Frauen'						−0.00
						(0.00)
Haushaltsabfälle						−0.00
						(0.00)
'Anteil Minijobs (ausschließlich) an geringfügig Beschäftigten'						112.07
						(568.56)
Abfallmenge						−0.00
						(0.00)
'Anteil Minijobs (Nebenverdienst)'						112.07
						(568.56)
Num. obs.	3275	3275	3275	3275	3275	3275
Num. groups: id	375	375	375	375	375	375
R^2 (full model)	0.97	0.97	0.97	0.97	0.97	0.97
R^2 (proj model)	0.85	0.86	0.86	0.87	0.87	0.88
Adj. R^2 (full model)	0.96	0.97	0.97	0.97	0.97	0.97
Adj. R^2 (proj model)	0.85	0.86	0.86	0.87	0.87	0.87

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

D   Results based on additional outcomes of fiscal indicators

Figure D.1: Regression results for dependent variable 'Personal der Kommunen'. The graphic shows the estimated regression coefficient for the share of foreigners (or the fitted value of a two-step IV regression) joint with 95% confidence intervals.
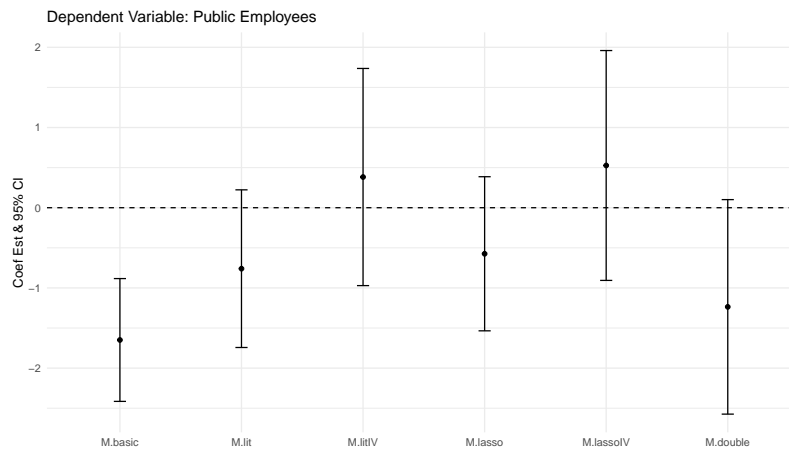
Figure D.2: Regression results for dependent variable 'Child Care'. The graphic shows the estimated regression coefficient for the share of foreigners (or the fitted value of a two-step IV regression) joint with 95% confidence intervals.
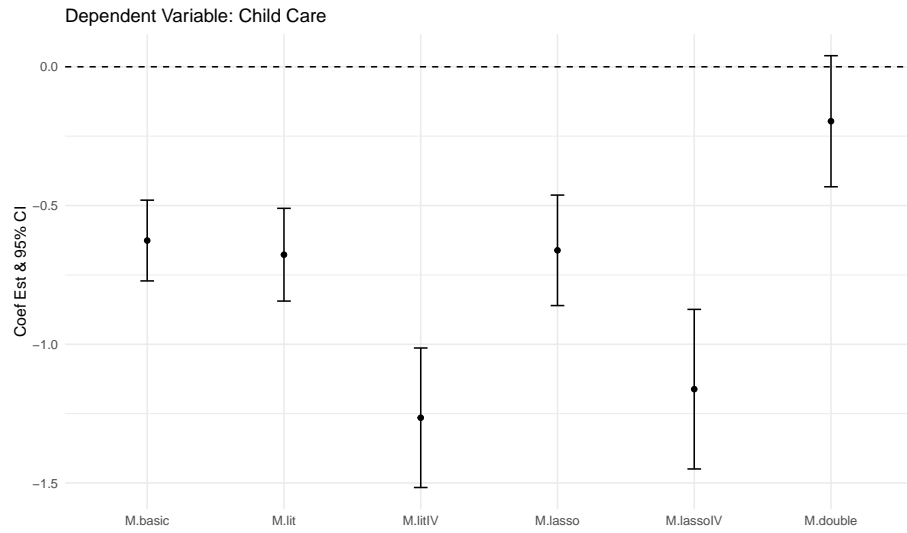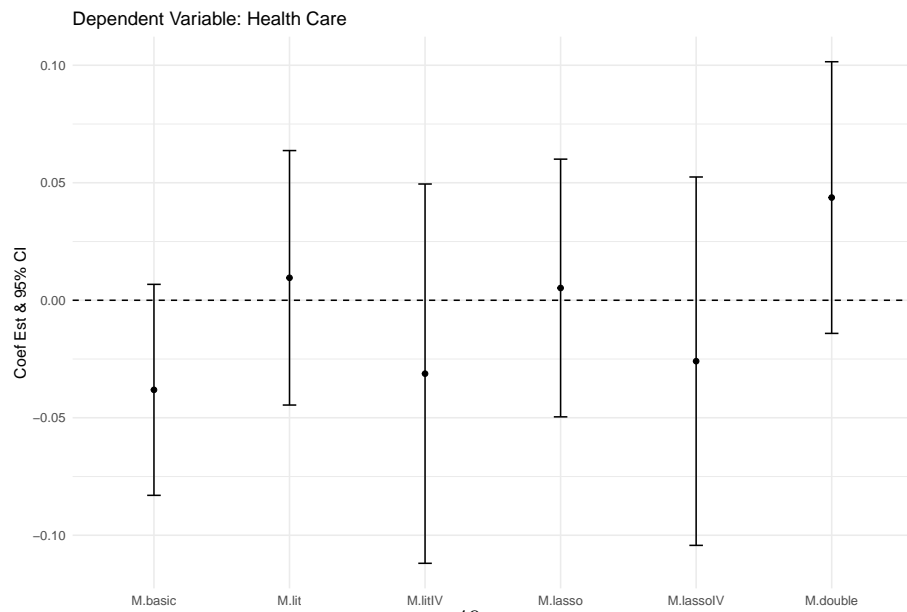

Dependent Variable: Child Care

Figure D.3: Regression results for dependent variable 'Health Care'. The graphic shows the estimated regression coefficient for the share of foreigners (or the fitted value of a two-step IV regression) joint with 95% confidence intervals.

Dependent Variable: Health Care

E   Results on municipality level

	linvest_spend11	lgrossspend11	linvest_spend12	lgrossspend12	ltaxrev11	lgrossrev11
(Intercept)	-5.59^{***}	0.07^{***}	-5.83^{***}	0.17^{***}	12.89^{***}	13.81^{***}
	(0.12)	(0.02)	(0.14)	(0.03)	(0.04)	(0.04)
lgrossrev11	1.25^{***}	0.99^{***}	1.27^{***}	0.99^{***}		
	(0.01)	(0.00)	(0.01)	(0.00)		
popdens11	-0.00^{***}	0.00^{*}	-0.00^{***}	0.00^{**}	0.00^{***}	0.00^{***}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
unemploy_share11	-13.08^{***}	1.12^{***}	-12.55^{***}	0.75^{**}	22.24^{***}	23.26^{***}
	(1.10)	(0.17)	(1.23)	(0.24)	(1.54)	(1.55)
migration_saldo11	-0.00^{***}	0.00	-0.00^{***}	0.00	0.00^{***}	0.00^{***}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
foreign_share11	-3.55^{***}	-0.23^{***}	-2.88^{***}	0.09	10.80^{***}	10.13^{***}
	(0.43)	(0.07)	(0.47)	(0.09)	(0.58)	(0.59)
R^2	0.80	0.99	0.77	0.98	0.30	0.28
Adj. R^2	0.80	0.99	0.77	0.98	0.30	0.27
Num. obs.	7332	7542	6920	7170	7540	7542

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table E.10: Regression results on municipality level for data from 2011 and 2012, the regressors and most output variables are from 2011. The third and fourth columns represent output variables from 2012. The (l) variable refers to the logarithmized variable.