Where do immigrants move in Germany?

The role of international migration for regional disparities in population development (2007-2017)

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Abstract

This paper examines the impact of foreign migration on regional disparities in population development in Germany by analysing recent spatial patterns and determinants at the county level. A counterfactual analysis shows that international migration has significantly contributed to counteract population shrinkage in German regions. However, immigration was mainly directed towards large cities and highly urbanized areas and has therefore reinforced the existing spatial disparities in population development. Our spatial regression models nonetheless reveal that international migrants are not per se attracted to large agglomerations. Controlling for a broad set of further variables, including the existence of ethnic peer groups, labour market characteristics, amenities and accessibility, we estimate that indicators of urbanization are not significantly or even negatively correlated to the net migration rates of international migrants. Moreover, the results strongly differ between the external and internal spatial migration patterns of foreigners as well between certain subgroups of migrants.

Keywords: international migration, domestic migration, population development, counterfactual analysis, spatial autoregressive model

1 Introduction

Since the beginning of the 21st century Germany has become one of the major destination countries for international migrants from European countries as well from more distant regions of origin (OECD, 2014). The reasons for increasing immigration rates range from increased

labour mobility following the enlargement of the European Union, through the severe economic decline after the global financial crisis in 2008 in many southern European countries, to political crises and civil wars, particularly in some Middle Eastern countries.

Most recently, since the massive influx of refugees from Syria and Iraq in 2015, immigration has been one of the most controversially debated topics in Germany and many other European countries. Next to aspects of internal security and the (macro-) economic costs and benefits of immigration, the national and regional distribution patterns of migrants have been one of the core issues of those debates. However, unlike on the former aspects, there has been – at least for Germany – only few empirical research on this topic. Yet the spatial patterns and determinants of international migration have very important implications for regional development and the degree of demographic as well as economic disparities within a host country.

Similar to many other countries of the global north, Germany has for a long time suffered from demographic change and a shrinking domestic population. Hence, net immigration has become one of the major sources of population growth (Champion, 1994) and an indispensable factor to ensure future demographic and economic stability (Livi Bacci, 2018). However, the spatial patterns of demographic change and population shrinkage as well as of foreign migration to Germany are far from being clear-cut and stable (see Figure 1). Especially in recent years Germany has experienced a period of increasing re-urbanization, involving the movement of particularly highly educated young adults to the large cities (Siedentop, Zakrzewski, & Stroms, 2018) and a drastically declining and ageing population in many small cities and rural areas, especially in eastern Germany (Gans & Schlömer, 2014a; Sander, 2014). Given the fact that foreign migrants have been strongly concentrated in large West German cities in the past (Gans & Schlömer, 2014b) and that international immigration has significantly contributed to the population growth of the largest cities (Gans, 2000, 2018), one could assume that the increasing

net immigration rates since the mid of the 2000s have reinforced the above-mentioned patterns of spatial divergence (Bucher, Kocks, & Schlömer, 2002).

Otherwise, there is a growing evidence from other European countries of increasing proportions of foreign migration to non-metropolitan areas (Collantes, Pinilla, Sáez, & Silvestre, 2014; Fonseca, 2008; Hugo & Morén-Alegret, 2008; Janská, Čermák, & Wright, 2014; Kasimis, 2008). This phenomenon, although largely neglected by policymakers and researchers alike, raises the question if foreign migration could actually play a role in counteracting population decline and maintaining demographic and economic sustainability in shrinking small cities and rural regions. Given the fact that Germany, even before the peak of the recent refugee movement in 2015 was the world's second most important international migrant destination (OECD, 2014), the regional implications of foreign migration are largely unresearched. While there have been some very recent efforts to explain the spatial patterns of foreign employment (Lehmann & Nagl, 2018) and the location choices of EU migrants in the aftermath of the 2009 European financial crisis (Tanis, 2018), the consequences of foreign migration for regional development and spatial divergence or convergence processes in Germany still remain a remarkable research gap.

This paper aims to fill this gap, by analysing the spatial patterns of foreign migrants at the county level (NUTS3) between 2007 and 2017. We map the spatial patterns of the most important migratory movements towards Germany and carry out a counter-factual analysis to examine how foreign migration has contributed to reinforce or counteract the spatial polarization of population development in Germany. The results show that while international migration was an important factor for population change in all types of German regions, migrants were mainly attracted by highly urbanized regions. Thus, immigration has rather reinforced the existing spatial polarization in demographic development.

However, spatial regression models with a large set of explanatory variables reveal that international migrants are not per se attracted by agglomeration. Instead of the degree of urbanization, the location choices of international migrants were mainly driven by existing regional ethnic networks and factors that are related to different personal life stages such as educational or family motivated migration. In addition, we find that the estimated regional determinants vary strongly across migrants from different geographical backgrounds as well as between the external and internal migration of foreigners. In strong contrast to the internal migration of German citizens, economic factors such as unemployment rates and the structural transformation towards a service and knowledge economy play only a minor role for the sub-national location choices of most international migrants.

Our results are not only of empirical interest regarding the specific German context, but also contribute to a relatively small but growing literature at the interlinkage between internal and international migration studies (for an overview see Ellis, 2012; King & Skeldon, 2010). Moreover, they have a high policy relevance at different spatial tiers, entailing important implications for the design of national distribution schemes for asylum seekers and appropriate regional strategies for regions to attract and maintain foreign migrants.

2 Literature Review

The primary goal of this paper is to assess the role of immigration for regional differences in population development. Thus, it must necessarily relate to the literature on (1.) the general patterns and determinants of internal (interregional) migration, (2.) the subnational spatial distribution/location choices of international migrants, and (3.) approaches analysing the interlinkages between international and internal migration flows.

The former strand of literature is – at least regarding the developed countries of the global north – strongly focused on the question whether economic opportunities or natural and man-made (cultural) amenities are the primary pull factors of interregional migration (Graves, 1979;

Greenwood & Hunt, 1989). While the scientific debate around this question is ongoing, there exists abundant evidence that both categories are important predictors of interregional migration flows (e.g. for Germany see Buch, Hamann, Niebuhr, & Rossen, 2014). Further, some authors have shown that the preferences for economic or quality of life related factors vary across different personal life cycle stages (Chen & Rosenthal, 2008; Ferguson, Ali, Olfert, & Partridge, 2007) as well as different socio-economic backgrounds (Niedomysl & Hansen, 2010) of migrants.

In contrast to the literature on the determinants of internal migration, the literature on the spatial distribution and the location choices of international migrants is less focused on amenities vs. economic opportunities. Most studies on the spatial distribution of international migrants in host countries found that migrants are strongly concentrated in large and dense metropolitan areas (Bartel, 1989; Chiswick & Miller, 2004;). While this phenomenon can partially be attributed to the fact that large agglomerations are better equipped with economic opportunities, more inclusive housing markets and certain urban amenities, the concentration of immigrants in particular cities can in general be described as a self-reinforcing process. Pioneer immigrants settle in certain cities which are geographically or relationally close to their origin country (e.g. in border cities) or which are important hubs within a globalizing economy (Benton-Short, Price, & Friedman, 2005; Friedmann, 1986). This leads to the rise of so-called gateway cities (Price, 2008) with large ethnic networks reducing the migration and integration barriers (e.g. language barriers, access to the housing and labour market) for newcomers. A growing number of micro-econometric studies found evidence that existent ethnic networks are a major factor especially for the initial location choices of international migrants (e.g. Bartel, 1989; Jayet, Ukrayinchuk, & Arcangelis, 2010; Nowotny & Pennerstorfer, 2018; Tanis, 2018). The spatial distribution of foreign migration within host countries should therefore be strongly path dependent.

However, in many countries of the developed world, there is also a growing evidence of immigration to areas outside these traditional arrival cities. This development involves the rise of new immigrant gateways in second tier cities and suburban regions (Janská et al., 2014; Painter & Yu, 2008; Singer, Brettell, & Hardwick, 2008), but also foreign migration to rural areas (Collantes et al., 2014; Fonseca, 2008; Hugo & Morén-Alegret, 2008; Kasimis, 2008). While this relatively recent trend can be partially explained by studies in the realm of spatial assimilation theory which posit that with increasing assimilation immigrants are likely to move away from ethnic neighbourhoods (Massey, 1985; Massey & Denton, 1985) and that the impact of ethnic networks decreases for subsequent (internal) movements of international migrants (Bartel, 1989; Funkhouser, 2000), there is also evidence that those new immigrant destinations attract migrants directly from abroad (Painter & Yu, 2008, p. 1163). Thus, the claim of international migration as a more or less entirely urban phenomenon does not longer hold.

Last but not least, the empirical research conducted in this paper also relates to a strand of literature examining the interlinkages between immigration and internal migration flows. Most studies in this realm are based on the hypothesis that native citizens who are most vulnerable to immigrant competition for jobs would leave regions of strong immigration. This flight of the native-born from immigration would in the long run result in a "demographic balkanisation" of host countries (Frey, 1995). The evidence on this redistribution mechanism is ambiguous. Some studies on the U.S. found that particularly low skilled natives, presumably the most exposed group to immigrant labour market competition, indeed left areas of high immigration (Frey, 1995; Frey & Liaw, 1998). Other researchers have countered these findings by showing that immigration has little or no effect on internal migration (Card & DiNardo, 2000; White & Imai, 1994) and that the measurement of this linkage is extremely sensitive to model specification and the scale and sample of the observed units (Wright, Ellis, & Reibel, 1997). In addition, for some European countries, there is evidence that international migration has played a

fundamental role for the revival of rural regions which went through long phases of demographic shrinkage due to low fertility rates and the outmigration of especially young and skilled native citizens (Collantes et al., 2014; Kasimis, 2008). In this context, immigrants were especially important in feeding the labour demand of a thriving agricultural sector. Thus, the causal linkage between external and internal migration flows might be the other way around, and immigration could in the future play a crucial role in counteracting regional population shrinkage.

3 Data

Research on the sub-national patterns and determinants of international migration in destination countries has often been limited due to severe data restrictions. Many studies are therefore based on more or less representative survey data (Bartel, 1989; Chiswick & Miller, 2004; Tanis, 2018) and/or take a strictly cross-sectional perspective (Lymperopoulou, 2013). In this regard, the relatively strict German registration law and the related administrative statistics, which provide the most important base for this paper, represent an interesting exception. The figures published by the Federal statistical office (DESTATIS) report annual migration flows of foreign citizens for each German county and distinguish between internal and external migration. Moreover, they distinguish between migrants from different origin regions (e.g. pre-2004 EU member states, new EU member states, different continental subregions). Hence, our empirical analysis is not only able to distinguish between initial and subsequent migratory movements of non-natives to and within Germany, but also between migrants from different regional backgrounds with different initial purposes of migration (e.g. European labor migration, refugees, etc.).

[Insert Figure 1 around here]

Within the restrictions of these predefined groups of origin countries, we choose to focus on six country groups, which are more or less representative for the most important migratory movements towards Germany during the observed period: Foreigners in total, EU15 countries

("Western" EU member states as of before May 2004), EU13 countries ("Eastern" new members after May 2004), the Rest of Europe (all European states without EU-membership), Middle East (17 states in Southwest Asia) and the Rest of the world. According to Frey (1995), international migration might have an influence on native-born domestic migration. Therefore, we also integrated the migration of the German population as a reference group into some of our analyses. Figure 8 and Figure 9 (Appendix III) present the composition of the six different migrant groups in detail, while the development of the external migration balances and the internal migration volumes of each subgroup are shown in Figure 1. The immigration of Western Europeans plays an important role since 2009 when the economic crisis hit the Southern European States and triggered an increasing amount of work-related and educational migration to Germany (Gans 2018, p. 333-334). In addition, the enlargement of the European Union in 2004 and 2007 resulted in the freedom of movement of workers for the new Eastern member states. As a consequence, there was also a continuous increase of economically motivated migration from those countries. Another important origin region of immigrants in recent years are the countries of the Middle East. This group mainly involves war refugees from Syria and Iraq[1]. Hence, the migration balances drastically increased in 2015 and 2016. The two further subgroups Rest of Europe and Rest of the world are rather heterogenous. Both involve refugees (e.g. from the Ukraine or Afghanistan) as well as migrants with work-related or educational motives (e.g. from China or India).

For the regression analysis in section 5, we combine the above described migration figures with a comprehensive set of contextual variables. Those indicators were provided in the INKAR database of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR).

[1]Due to the predefined scheme of origin regions by the German statistical office, it was not possible to summarize all origin countries of refugees within one particular group; e.g. Afghanistan as another very important origin country is represented in the group 'Rest of the world'.

4 Patterns of foreign migration across German counties

4.1 Demographic development of German counties

In this chapter we will present the main characteristics of foreign migration patterns in Germany. First, we will introduce four different types of counties in Germany and give an overview on main demographic development trends (4.1). Afterwards, we will focus on the distribution of foreign migration among these county subtypes (4.2). In order to address the role of foreign migration for regional population development, we apply a counterfactual analysis which compares the real population development of the different county types to a couple of scenarios, where population change is solely caused by the migration of the above defined migrant groups (4.3). For most of the following analyses the net migration rate (*NMR*) was used. It indicates the difference between the migration inflow I, and the outflow E of a specific subgroup of migrants g within a defined time period $t_1 - t_0$ per 1,000 inhabitants of the initial total population P.

$$NMR_{i,g,t_1-t_0} = \frac{I_{i,g,t_1-t_0} - E_{i,g,t_1-t_0}}{P_{i,t_o}} * 1000 \quad (1)$$

Our typology of German counties (see Figure 10) is closely related to the official typology ('Siedlungsstrukturelle Kreistypen') of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR 2019) which is based on the share of the urban population and the population density (with and without the consideration of large and medium sized towns). On this basis, a distinction is made between 'district-free cities' (over 100.000 inhabitants), 'urban counties', 'rural counties with concentration tendencies', and 'sparsely populated rural counties'. Due to the relevance of large cities in the context of foreign migration, we subdivided the category 'district-free cities' into 'large cities' (cities over 500,000 inhabitants) as well as 'medium sized cities' (cities between 100,000 and 500,000 inhabitants). The category 'urban counties' mainly maps the suburban areas of the large and

medium sized cities as well as some smaller cities. Thus, this category is called 'suburban counties' hereinafter. Finally, the two last BBSR categories were merged to one category 'rural counties' due to rather minor differences regarding their relevance for international migration.[2]

[Insert Table 1 around here]

Table 1 gives an overview on (foreign) population development across the above defined county types from 2007 to 2017. It can be noticed that the denser an area type, the higher was the population growth rate, the total and foreign net immigration rate, and the share of the foreign population. Looking at the values in detail it becomes clear that foreign migration has at least partially absorbed the population decline in rural and suburban counties, but it has also significantly reinforced the population increase in urban areas. Rural counties were on average experiencing population decline. However, a positive net migration rate (24.9) of foreigners and a significantly increasing share of foreign population (+96.7%) can be noticed. The suburban counties had a nearly neutral population development (+0.2%) but gained foreign migrants (46.3) and experienced an increasing share of foreigners (+50.2%). Medium sized cities registered positive population development (+2.8%) due to a notable positive net migration rate of foreigners (74.5). Finally, the large cities had a very positive demographic development (+6.7%), which can also be explained by strong rates of foreign migration. But unlike for the other subtypes the total NMR (115.28) for large cities was higher than the foreign NMR (104.76). Thus, the internal migration of German citizens also exerted a positive demographic impact on large cities.

[2] In sum there are 401 counties in Germany but only 395 counties provide suitable and complete statistics of foreigners. According to this the county of Spree-Neiße in Brandenburg and the county of Kassel in Hessen are absent. The state of Saarland only provides one statistic for the whole area, so the six counties have been merged to one single unit 'suburban counties'. The city of Duisburg was classified as a 'large cities' due to minimum deviation from the fixed value of 500,000 inhabitants (498.110 inhabitants in 2017).

4.2 Development and distribution of migration across German counties

We could show that total and foreign migration was in general unevenly distributed across space. But since we assume that the spatial patterns of domestic and external migration as well as the migration patterns of different subgroups of foreigners differ fundamentally, a distinction between external migration and domestic migration patterns and a comparison of the above defined subgroups should reveal interesting insights. In the following we will first focus on the development and spatial distribution of external migration (net migration from abroad).

For the entire period from 2007 to 2017 Germany has gained 4,966,756 immigrants. After an initial decline (116,652 in 2007 to 78,529 in 2009) the net immigration to Germany has dynamically developed since 2009. While the period from 2009 to 2012 can be characterized by a moderate but increasing migration gain (from 78,529 to 394,917), the period from 2013 till 2017 was outstanding with a surplus over half a million migrants per year. Particularly, extreme values with a surplus of approx. 1,000,000 migrants were registered for the years 2015 and 2016 (see Figure 1).

The immigration throughout the observed period, but especially since 2009, has been significantly influenced by Eastern Europeans. From 2009 till 2014 this group registered a strong increase, while the immigration of the other subgroups rose only moderately. Since then, the migration balance of Eastern Europeans remained at a very high level. In addition, since 2013, a rapidly increasing immigration from the Middle East and the rest of the world, mainly due to war refugees, can be observed. These subgroups became the main immigrant groups in 2015 and 2016. However, this was only a brief episode. Since then the stronger regulation of immigration into the EU and Germany has led to a rapid decline in immigration from these countries. However, the migration surplus from these countries is certainly still high in 2017 compared to the end of the 2000s.

[Insert Figure 2 around here]

The strong surplus of external migration throughout the observed period had a positive impact on the population development of all county types. The external net migration rate of foreigners shows similarly increasing development trends for all county types from 2009 to 2015, but at different intensities. Accordingly, the NMR rises with increasing population density of the county types. On average, large cities (+ 97.4) had more than twice as much migration gain as rural counties (+44.0) for the entire period. After 2015 only the large cities could further increase their NMRs, while in the other types the rate significantly decreased (see Figure 2).

Regarding the different subgroups, the NMRs also increased across all county types. In general, the subgroups had an orientation towards urbanized areas, especially large cities, but there are nuances. The subgroups 'Eastern Europe' and 'Middle East' also registered high NMRs in rural and suburban counties. With regard to the subgroups 'Middle East' and 'Rest of the World', it must be stated that the strong immigration of refugees in combination with certain regulations of allocation enabled the suburban counties and rural counties to catch up with the urban areas in 2015 and 2016. The distribution of refugees is strongly linked to the 'Königsteiner Schlüssel', a distribution ratio between the federal states. The place of residence for refugees is regulated and assigned by each federal state authority. Persons undergoing asylum proceedings usually have to comply with a three-year residence requirement. Thus they have no free choice over their place of residence (for further information see BBSR 2017). Since 2015, an exceptionally high immigration rate of refugees can be observed for counties with 'reception centers'. Therefore, the migration flows during those years were strongly determined by immigration laws.

[Insert Figure 3 around here]

Figure 3 maps the distribution of the external NMRs of the different migrant groups. For total foreign external migration, an orientation towards West German cities and rural counties near the Western border is discernible. Only a few counties and cities in East Germany (the GDR)

have registered above-average NMRs (Berlin, Chemnitz, Cottbus and Oder-Spree). In West Germany, the cities and counties of the regions Rhine-Ruhr, Frankfurt, Stuttgart and Munich were the main immigrant destinations. For Western Europeans, a focal area can be identified in the western border regions. The external migration of Eastern Europeans is focused on the suburban counties in southern Germany and the rural areas of Western Germany with a strong agricultural sector. Surprisingly, no concentrations in the eastern border regions can be observed. The spatial distribution of the subgroup 'Rest of Europe' is reflective of the heterogeneity within this group. The external migration of this group is particularly directed towards the Southern parts of Germany, near the Swiss border, and towards large cities. The subgroups 'Middle East' and 'Rest of the world' are conspicuously even distributed over all parts of Germany due to the legal allocation of refugees. However, a focus on cities can also be noticed.

[Insert Figure 4 around here]

Compared to the external migration, the internal migration shows the expected different spatial patterns (see Figure 4). Rural counties lost foreign inhabitants during the entire period. This negative internal migration balance has increased significantly since 2016. For suburban counties, a slight but increasing surplus can be identified. While medium sized cities had a balanced NMR over the entire period (exception surplus in 2016), the large cities gained significantly from domestic foreign migration. Thus, the spatial patterns of domestic migration indicate a concentration in favor of large cities and their suburban areas.

[Insert Figure 5 around here]

Internal migration has obviously resulted in a redistribution from rural counties to suburban and urban areas. In Figure 5 it becomes visible that the strongest outmigration has occurred in those rural counties that have benefited strongly from external migration. In East Germany only a few

cities could gain from internal foreign migration. Large parts registered negative NMRs. In West Germany the suburban counties and medium sized cities benefitted the most from internal foreign migration. But large cities also registered significant surpluses.

There are some remarkable differences regarding the different subgroups (Figure 4 and Figure 5). Eastern Europeans have left the urban areas and moved to rural and suburban counties. Except for the year 2017 the Western Europeans showed a similar domestic migration pattern of sub- and counter-urbanisation. This trend could be mostly observed in the Southern and Western part of Germany. In the East an opposite trend became apparent. Here a tendency towards a concentration in only a few cities seems to be persistent. The internal migration of the group 'Rest of Europe' was mostly focused on suburban and urban counties until 2012. Since then, the trend for this group started to concentrate on suburban areas, while the negative NMRs of rural areas have decreased to a more or less stagnating development. It is difficult to identify a spatial focus, but there have been concentrations around large cities and in the Swiss border region. Furthermore, the group 'Rest of the world' showed a highly negative internal NMR for rural counties and a stagnating development in suburban counties. The internal migration of the group 'Middle East' was focused on medium sized and large cities, while there have been negative NMRs in rural areas and a stagnating development in suburban counties. Figure 5 reveals that especially the cities of the Rhine-Ruhr region have benefitted from this process. Last but not least, the group 'rest of the world' showed a tendency for large cities and their surrounding suburban counties, especially in the region around Frankfurt (Main).

[Insert Figure 6 around here]

Last but not least, we compare the external and internal net NMRs to the internal migration of the native population (see Figure 6). Until 2013, the migration of Germans was directed towards medium sized and large cities and a high outflow from rural counties was characteristic. A strong process of (re-)urbanisiation can be identified for this period. Since then, parallel to the

sharply increasing foreign migration towards urban areas, a reversed trend of sub- and counter-urbanisation of native citizens with an increasing outmigration out of large and medium sized cities and increasingly positive NMRs for rural counties can be observed. This pattern seems to support the hypothesis by Frey and Liaw (1998) that strong immigration into cities reinforces the sub- and counter-urbanisation of the native-born population. However, we cannot draw any conclusions on the causal linkages.

4.3 Impact of foreign migration on regional population development

In order to examine if the above described migratory patterns contributed to a reinforcing or counteracting trend of spatial divergence in population development along the urban-rural gradient, we apply a relatively simple counter-factual analysis (see also Collantes et al., 2014) comparing the real observed population growth rates across different subtypes of regions to a couple of alternative scenarios without foreign or domestic migration.

Due to the extremely high rates of immigration in 2015 and 2016, we subdivide the observed decade into two periods (2007 till 2014 and 2015 till 2017). The counterfactual scenarios simulate the population development as if there was no external and internal migration[3] of the above described migrant groups. To answer the question of whether population shrinkage in the German counties can be reduced or even compensated by foreign migration, we do not only distinguish between the above defined four different subtypes of counties, but also between growing and shrinking counties. Additionally, as a reference, we also include the migration of Germans into our analysis.

Table 2 depicts the results of our counterfactual analysis for the period 2007 till 2014. The first line reports the real average annual population development for both periods in parts per

[3] Since the internal migration of the subgroups of foreigners has only a minor impact on total regional population growth, we decided to abandon the distinction between external and internal migration for this part of our analysis.

thousands[4]. The values for the simulated scenarios indicate the population growth as if there was no migration of the particular subgroup in question. For example, the average annual development of growing rural counties from 2007 till 2014 would have been –1.7‰ per year instead of +1.4‰ without the migration of foreigners. In addition, the values in parentheses indicate the differences between the real population growth rate and the growth rate of the respective no migration scenario. Thus, they refer to the net contribution of migration to annual population growth.

[Insert Table 2 around here]

From 2007 to 2014, the roles of German and foreign migration for population growth in the different county types were quite contrary. The migration of Germans has had a significant negative impact on the shrinking counties, but foreign migration could almost completely compensate for these losses in all types except shrinking rural counties. Hence, population decline in most German counties was not caused by migration but by natural population development. Without foreign migration the population change rates of all county types except for the largest cities would have been negative. Besides this compensating effect, the above-average population development of the urban counties was also reinforced by foreign migration. The contribution to overall population growth was higher in highly urbanized counties compared to rural ones. Eastern Europeans were by far the most influential subgroups with regard to regional population development, particularly in less urbanized counties, accounting for more than 50% of total foreign migration. The influence of the other subgroups on the demographic development in rural and suburban counties was little to none while the influence on cities was distinctly higher.

[4] In 2011 the annually updated population figures have been corrected due to the first population census in Germany since 1987. Hence, population change rates for 2011 could not be calculated. Consequently, we excluded all changes between 2011 and 2012 from our analysis.

Looking at the period from 2015 to 2017, it becomes clear that the trend of native migration towards urban areas has been turned around. German migration had a relatively strong negative impact on the population development of large and medium sized cities as well as of sub- and exurban counties during those years. However, this development has been counteracted by a drastically increased amount of immigration resulting in positive population growth rates across all types of counties. Unlike the migration of Germans, the reinforcement of foreign migration has resulted in an intensification of the disparities in population growth across the different county types. Although the absolute amount of immigration into and its relative contribution to the population growth of rural and suburban counties has also drastically increased, immigration to cities was still distinctly stronger. Medium sized cities can be seen as the major beneficiaries of this trend as their average annual growth rate has almost tripled compared to the previous period. Not surprisingly, the migrant groups 'Middle East' and 'Rest of the world' have played a major role for this development, Eastern Europe has been however still the most important immigrant group for regional demographic development.

[Insert Figure 7 around here]

Mapping the real population development (2007-2017), the respective scenario without foreign migration and the contribution of foreign migration to population development at the county level (see Figure 7) points out that while the spatial patterns of population development and foreign migration in general significantly correlate (Pearson correlation .685; significance < .01), immigration has also reversed tendencies of population shrinkage particularly in large cities (Berlin) or polycentric metropolitan regions (Rhine-Ruhr, Rhine-Main, Rhine-Neckar). In addition, international migration has also contributed to stabilize population development in some of the otherwise shrinking western border regions. On the other hand, there were only a few mostly East German cities (e.g. Leipzig, Potsdam, Dresden) which registered strong population growth without the contribution of foreign migration. With regard to the impact of

international migration, as expected, significant disparities between urban and rural counties as well as between East and West Germany can be observed. Especially the rural counties in East Germany (except for the counties surrounding Berlin) are therefore characterized by a strongly negative population development.

In conclusion, foreign migration could be identified as the major factor of demographic development in German counties. Foreign migration reduces or sometimes even reverses population decline, especially in parts of Germany that face a strong outmigration of native citizens. But it also reinforces spatial divergence in population development along the urban-rural gradient due to a focus on large and medium sized cities amongst most subgroups of migrants. However, external and internal migration patterns have played different roles in this development. External migration is focused on urban areas but some rural counties (with a strong agricultural sector, and along the western and southern border) could also gain from immigration from abroad. The domestic migration patterns are on the other hand characterized by the redistribution from rural counties to suburban and urban areas, particularly in large metropolitan regions. Furthermore, the patterns deviate strongly across different subgroups. The results hint at different motivations and opportunities with regard to different types of migration. The underlying regional determinants will be analyzed in the following.

5 Regional determinants of foreign migration

5.1 Estimation strategy

The second part of our empirical analysis aims at the identification of the underlying regional factors which are able to explain the above described spatial patterns of the external and internal migration of the different subgroups of foreigners. Moreover, we compare these determinants to those explaining the internal migration of German citizens in order to validate how the locational preferences of nationals and non-nationals deviate.

For this purpose, we estimate the following cross-sectional regression model:

$$NMR_{i,g,t_1-t_0} = \alpha + \sum_k \beta_k x_{k,i,t_0} + \varepsilon_i, \quad (2)$$

where NMR_{i,t_1-t_0} represents the above described migration rate for the period 2007-2014[5], $\sum_k \beta_k x_{k,i,t_0}$ represents a comprehensive set of county characteristics in the baseline year 2007, and ε_i is a random error term. This approach is similar to previous studies estimating the general appeal of regions for migrants (Buch et al., 2014) or the regional distribution of foreign employment (Lehmann & Nagl, 2018) in Germany but unlike the former we are particularly interested in the diverging locational preferences between the above described subgroups of migrants, and between the external and internal migration of foreigners, and unlike the latter we are interested in flows and their contribution to population development instead of the static distribution of foreigners.

Our set of explanatory variables mainly refers to the push and pull factors mentioned in the literature review above. These variables can roughly be grouped into four categories: Socio-demographic factors, economic factors, amenities, and geographic accessibility. The first category of socio-demographic factors consists of four variables, population potential and the share of the immigrant subgroup of total regional population, the population share of children under 6 years, and the population share of young adults between 18 and 30 years. Population potential (for an overview see e.g. Pooler, 1987) refers to the increased opportunity of social interaction in and around densified urban areas. It is calculated as the sum of the inverse-distance weighted population from all locations *j* within a certain threshold radius from location *j*: $pp_i = \sum_{ij} \frac{pop_j}{d_{ij}}$.[6] Therefore, it does not only reflect the agglomeration effects within large cities but also the spillover effects of all nearby areas. The latter might be particularly relevant for suburban regions. The expected sign of the estimator for population potential is not clear-

[5] As described above, foreign migration to Germany between 2015 and 2017 has been strongly dominated by the massive influx of refugees. The spatial patterns during this period were relatively random and can barely be estimated by an econometric model. Hence, we decided to restrict the observed period from 2007 to 2014.

[6] The version used in this paper refers to the definition of the BBSR (Spangenberg 2003), which employs a negative exponential distance decay function $\sum_{j=1}^{j} pop_j * e^{\beta d_{ij}}$ with $\beta = 0.0693$ and a threshold radius of 100km.

cut as there might be positive and negative effects of urbanity on the appeal of a region for migrants. The population share of the immigrant subgroup in the dependent variable reflects the so-called network effect in international migration. Immigrants are expected to be highly attracted by existing communities from their origin countries, but the magnitude of the coefficient should vary across certain subgroups as well as between external and internal migration. In addition, the initial population shares of children under 6 years and young adults between 18 and 30 years are used as proxy variables reflecting a region's attractivity for family and education/job entry motivated migration. Again, the estimated parameters are expected to deviate between the different types of foreign migration.

Regional labor market conditions have proven to be a very robust predictor of regional migration. For our model we use four different indicators to characterize these labor markets. The first two variables unemployment rates and average wages (in 1000 €) are very obvious push and pull factors, while the latter two, employment share of the service sector, and the share of employees with an academic degree, particularly reflect the structural transition towards a service and a knowledge economy, which has proven to be an important driver of interregional/interurban migration in most industrialized countries (Buch et al., 2014; Rodríguez-Pose & Ketterer, 2012).

Our third category of explanatory variables involves a relatively diverse set of amenities and quality of life related factors. While the number of annual overnight stays in hotels and other accommodations per capita and recreational area per capita reflect the general appeal of a region in terms of leisure and tourism, we also operationalize amenities by the average available flat size per capita and population weighted average travel distances towards certain facilities of daily need (supermarkets, public transport, physicians and hospitals) which were provided in the INKAR database. Since these distances are highly correlated, we decided to aggregate them by using a principal component analysis (PCA) in order to avoid any issues of multicollinearity.

The first principal component has an eigenvalue of 3 and accounts for 74.9 percent of the total variance, while the second component has an eigenvalue of 0.63 and represents only 16.2 percent of total variance. Thus, we choose only the first component for our regression model. The expected signs of the amenity variables are again not clear-cut. The distance measures aggregated by the PCA should be particularly low in urbanized areas, while other amenity variables such as recreation area should be higher in rural areas. Hence, the direction of the expected effect on regional migration rates is highly dependent on the dominant preferences for urban or rural amenities among the immigrant subgroup in question.

Further, travel costs between origin and destination regions have proven to be important predictors of international and interregional migration flows (Bartel, 1989; Jayet et al., 2010). This might be particularly relevant for the location choice of migrants from Germany's neighbor countries and is operationalized in our model by including dummy variables for counties located at the western (including northern and southern) and eastern German border. In addition, we introduce some more general measures of accessibility by including area weighted travel distances (in minutes of car travel time) towards the nearest airport and highway access.

To test for the validity of our model we first estimate naive OLS regressions and run a couple of standard econometric tests (see Appendix III). The computed variance inflation factors (VIF) of all independent variables are distinctly below 10, which is commonly perceived as critical threshold value with regard to multicollinearity issues. Further, the Breusch-Pagan test rejects the null-hypothesis of homoscedasticity and therefore recommends the use of heteroscedasticity adjusted standard errors. Last but not least, we perform Moran tests based on a queen contiguity matrix. The results hint at significant spatial autocorrelation among the dependent variables and the residuals, which may cause our OLS estimation to be biased (Anselin, 1988). To account for this potential bias the baseline model in equation (2) is extended to a spatial error model:

$$NMR_{i,g,t_1-t_0} = \alpha + \sum_k \beta_k x_{k,i,t_0} + \lambda \sum_j W_{i,j}\tau_j + \varepsilon_i, \quad (3)$$

where $\sum_j W_{i,j}\tau_j$ is a spatial autoregressive error term and $W_{i,j}$ represents the above mentioned spatial weights matrix. Following Kelejian & Prucha (2010) as well as Drukker, Prucha, & Raciborski (2013) we estimate the above described model parameters using a generalized spatial two-stage least-squares (GS2SLS) procedure which additionally allows for heteroscedasticity of unknown form in ε_i.

5.2 Regression results

Table 3 and 4 depict the results for estimating equation (3) for the external and internal migration of each of the above-mentioned migrant subgroups (including the internal migration of German citizens). The explanatory power of our model expressed by the Nagelkerke Pseudo R^2 varies greatly across the different types of migration. While the model performs relatively well, in explaining spatial patterns of the external migration of foreigners, the Pseudo R^2 for internal migration patterns is rather low (particularly for citizens from EU15 countries)[7]. Moreover, the Pseudo R^2 is rather poor for external and internal migration patterns of non-EU Europeans and for migrants from the Middle East.

[Insert Table 3 around here]

[Insert Table 4 around here]

With regard to the explanatory variables in our model, there is no factor which is consistently significant across all subtypes of migration. However, we find the estimator for the initial population share of the respective subgroup of migrants to be highly significant for all cases of external migration. This implies that the location choices of foreign migrants have been strongly driven by network effects and were therefore highly path dependent. The strongly decreased

[7] These remarkable differences in model fit can mostly be attributed to the fact that a large share of total variance regarding to external migration rates can be explained by the initial population share of the migrant group in question. As this effect is distinctly lower for internal migration, the Pseudo R^2 also diminishes.

magnitude of this effect for internal migration patterns indicates that ethnic enclaves were mostly relevant for the initial location choices of foreign migrants and mattered less for subsequent movements. This is basically in line with spatial assimilation theory (Massey, 1985; Massey & Denton, 1985) and was confirmed by most previous empirical studies on regional location choices of immigrants (Bartel, 1989; Funkhouser, 2000). However, it contrasts the results of Tanis (2018) on the initial and subsequent location choices of EU immigrants in Germany in the aftermath of the great economic recession in 2008.

For external foreign migration in total, the significant estimates for population potential (negative), available flat size per capita (positive), distance towards amenities (positive) indicate that, holding everything else constant, foreign migrants were rather attracted to less densely populated places. A significant positive effect of the initial share of young adults between 18 and 30 years further implies that motives related to education and/or job entry were relevant to the initial location choices of foreign migrants in Germany. Moreover, we find significant effects of airport and highway accessibility as well as the Western border dummy. The estimates for internal migration balances of foreigners stand in strong contrast to the above described drivers of external migration. Instead of educational motives (approximated by the initial population share of young adults which have now a significant negative coefficient), family related motives approximated by the share of children under six years[8] and economic factors (wages, employment share of the service sector) are significant explanatory variables. In addition, we also do not find any significant signs for a specific preference for urban or rural places.

Regarding the different subgroups of migrants, our estimates partially reflect the specific background and socio-demographic composition of the different migratory movements. For

[8] This pattern is consistent throughout most immigrant subgroups except for citizens from EU13 countries. While educational or job entry are dominant motives for external migration flows, internal flows can be mostly explained by family related motives of migration.

example, migrants from EU15 countries and the rest of the world (external migration) were significantly attracted to regions with high initial shares of young adults and high shares of employees with an academic degree. Hence, one could conclude that this group is dominated by international students and highly qualified young professionals. Some of the results seem at first sight rather counter-intuitive. A significant positive coefficient of unemployment and a significant negative estimate for the share of employees with an academic degree regarding the migration rates of EU13 citizens and migrants from the Middle East can be found. This could partially be explained by the circumstance that migrants from these regions are more often economically and/or socially deprived (Algan, Dustmann, Glitz, & Manning, 2010). Therefore, they were forced to move to structurally rather weak places with labor intensive industries and more relaxed housing markets (see also Lymperopoulou, 2013). This pattern is complemented by the fact that the effects of regional ethnic communities were particularly strong for those two subgroups of migrants[9]. In addition, we find that EU13 migrants were particularly attracted to rural regions[10] and that family migration seems to be a rather strong motive for this subgroup. Surprisingly, we also estimate a significant positive effect of the Western border dummy and a significant negative effect of the eastern border dummy on the external migration rates of Eastern Europeans. This might be attributed to the fact that many of Germany's eastern border regions are amongst the structurally weakest in the whole country and partially suffer from drastic population decline (Heider, 2018). Some of the western border regions on the other hand have achieved high levels of economic development due to long-lasting cross-border economic interaction (Topaloglou, Kallioras, Manetos, & Petrakos, 2005).

Although, the above presented counter-factual analysis has shown that highly urbanized regions have benefitted above average from the international migration surplus during the observed

[9] See also Bartel (1989), who found that the location choices of lower educated migrants are more affected by the existence of ethnic networks.
[10] This preference of Eastern European migrants for less urbanized regions resembles Lymperopoulou's (2013) findings for the UK.

period, the estimates mostly do not hint at specific preferences of international migrants for highly urbanized regions and dense places. Holding all further factors constant, significant positive effects of population potential could only be found for the migration balances of Europeans from non-EU countries (external and internal) as well as the internal balances of migrants from the Middle East and the rest of the world.

Last but not least, the estimates for foreign migrants are compared to the internal migration of German citizens. It can mainly be concluded that in contrast to the sub-national distribution of foreign migration, the internal migration of Germans was more strongly driven by economic factors such as unemployment and the structural change of the German economy. In addition, we estimate a significantly positive elasticity regarding the initial population share of children under six years, indicating that family migration has played a dominant role for the internal migration of native citizens. A significantly negative sensitivity for ethnic concentration further implies that Germans were also attracted to regions with high population shares of foreigners, rejecting the hypothesis that immigration is a cause of the outmigration of the native-born[11]. While the estimate for population potential is significantly negative, the coefficients for recreation area per capita and distance towards amenities indicate a preference for urban amenities.

In conclusion, our regression results show that the strong concentration of recent foreign migration in highly urbanized counties was more related to the initial patterns of ethnic concentration than to the more general effects of density and agglomeration. Holding all other factors constant, we could not find a significant positive effect of agglomeration on regional net migration rates. In contrast to the internal migration of the German population, we also find that economic motives and amenities played a rather minor role for the initial location choices

[11] Note that the regression analysis only involves the period from 2007 till 2014. From then on the patterns of foreign and domestic migration might have changed (see Figure 6).

of foreign migrants. However, a general conclusion on the regional preferences of foreign migrations is difficult to draw, since there have been strong differences even between our rather broadly defined migrant subgroups as well as between the external and internal migration patterns of those groups.

6 Conclusion

Our empirical findings clearly demonstrate that both the international immigration and the domestic migration of foreigners have become key factors of the recent population change in Germany. We have shown that international migrants are mainly attracted by large cities and highly urbanized areas. Rural areas still play a very minor role for the spatial distribution of foreign migrants. Hence, international migration has rather reinforced the spatial disparities in population development. However, our spatial regression models also reveal that international migrants are not per se attracted by agglomeration. Instead of the degree of urbanization, the location choices of international migrants were mainly driven by existing regional ethnic networks and factors that are related to different personal life stages such as educational or family motivated migration. In other words, it is not density in itself that makes certain places attractive to migrants, it is rather certain qualities of places that are partly related to agglomeration and density.

Moreover, our results also reveal that the regional patterns of foreign migration strongly diverge across different subgroups of migrants as well as between migration from abroad and interregional movements of non-Germans. Especially for the latter form of migration we find a loss of significance for large cities and increased importance for intermediately urbanized areas. These findings generally suggest that future research on migrant's location choice should be carried out on the basis of different origins. We were able to show that the groups of countries differentiated here show significant differences in their preferences for certain types of regions.

With regard to the political relevance of our findings, the question of whether international immigration can reduce the shrinkage of rural areas is of particular importance. In general, the residential attractiveness of cities and regions depend on their capabilities of providing favorable socio-economic environments for international migrants. An immigration-friendly social climate and existing ethnic networks can be seen as critical determinants in this regard. However, since these factors are very unequally distributed over space and highly path-dependent, it is relatively unlikely that international migration will contribute to a reduction of interregional disparities in population development in the near future. In this regard it might be particularly interesting to examine how the massive influx of refugees in 2015 has created new spatial patterns that will in the longer run affect future locational decisions of international migrants.

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Appendix I: Tables

Table 1. Population development in different types of German counties (2007-2017)

COUNTY TYPE	Rural counties	Suburban counties	Medium sized cities	Large cities	Total
N (total)	200	128	52	14	394
N (growing)	79	74	39	12	204
N (shrinking)	121	54	13	2	190
Area (km²)	241,743	97,933	7,098	4,897	351,672
Total population (2007)	26,906,449	32,021,097	10,255,617	12,996,726	82,179,889
Population density (2007)	111	327	1,446	2,655	234
Foreign Population (2007)	957,321	2,645,805	1,179,970	1,966,296	6,749,392
Total population (2017)	26,174,758	32,093,900	10,546,462	13,861,775	82,676,895
Population density (2017)	108	328	1,486	2,831	235
Foreign Population (2017)	1,883,340	3,973,240	1,734,100	3,024,780	10,615,460
Total population development	-2.72%	+0.23%	+2.84	+6.66%	+0.60%
Foreign population development	+96.73%	+50.17%	+46.96%	+53.83%	+57.28%
Total net migration rate (2007-2017)	24.88	46.31	74.00	115.28	53.66
Foreign net migration rate (2007-2017)	38.83	54.43	74.46	104.76	59.78
Foreign population share (2007)	3.56%	8.26%	11.5%	15.13%	8.21%
Foreign population share (2017)	7.20%	12.38%	16.44%	21.82%	12.84%

Source: Authors' calculations

Table 2. No Migration Scenarios 2007–2014 (average annual growth rate in ‰)

County type		Rural counties			Suburban counties			Medium sized cities			Large cities
Development		growing	shrinking	total	growing	shrinking	total	growing	shrinking	total	total /growing
Real Population development 2007-2014		1.4	-7.6	-3.2	2.3	-4.6	0.2	4.0	-4.6	2.7	7.4
No Migration (2007-2014)	Foreigners (total)	-1.7	-9.0	-5.4	-1.5	-6.7	-3.1	-0.7	-8.2	-1.8	1.7
		(3.1)	(1.4)	(2.2)	(3.8)	(2.1)	(3.3)	(4.7)	(3.6)	(4.5)	(5.7)
	EU15 (West)	1.0	-7.6	-3.4	1.9	-4.8	-0.2	3.4	-4.9	2.3	6.6
		(0.4)	(0.1)	(0.3)	(0.5)	(0.2)	(0.4)	(0.5)	(0.3)	(0.5)	(0.8)
	EU13 (East)	-0.3	-8.3	-4.4	0.4	-5.6	-1.4	2.0	-6.3	0.9	5.7
		(1.7)	(0.7)	(1.2)	(1.9)	(1.0)	(1.6)	(2.0)	(1.8)	(1.8)	(1.7)
	Rest of Europe	1.1	-7.7	-3.4	1.8	-4.9	-0.2	3.3	-5.3	2.1	6.6
		(0.3)	(0.1)	(0.2)	(0.5)	(0.3)	(0.4)	(0.6)	(0.7)	(0.6)	(0.8)
	Middle East	1.2	-7.7	-3.4	2.1	-4.9	-0.1	3.4	-5.1	2.2	6.8
		(0.2)	(0.1)	(0.2)	(0.3)	(0.2)	(0.3)	(0.6)	(0.4)	(0.5)	(0.6)
	Rest of World	1.0	-7.5	-3.2	1.7	-5.0	-0.2	2.9	-5.2	1.8	5.7
		(0.4)	(0.3)	(0.3)	(0.7)	(0.4)	(0.6)	(1.0)	(0.6)	(1.0)	(1.7)
	Germans	0.9	-3.6	-1.4	2.2	-2.3	0.9	2.9	-1.6	2.2	5.3
		(0.5)	(-4.0)	(-1.8)	(0.1)	(-2.3)	(-0.7)	(1.1)	(-3.0)	(0.5)	(2.1)
N		94	106	200	91	37	128	45	7	52	14

Notes: Values in parentheses represent differences between real and simulated population growth. Source: Authors' Calculations

Table 3. No Migration Scenarios 2015–2017 (average annual growth rate in ‰)

County type		Rural counties			Suburban counties			Medium sized cities			Large cities
Development		growing	shrinking	total	growing	shrinking	total	growing	shrinking	total	total /growing
Real Population development 2015-2017		8.3	-0.7	3.8	8.2	1.8	6.3	9.2	3.4	8.4	10.9
No Migration (2015-2017)	Foreigners (total)	-1.2	-6.9	-4.1	-2.2	-6.5	-3.5	-3.6	-8.7	-4.3	-7.6
		(9.4)	(6.2)	(7.8)	(10.5)	(8.4)	(9.8)	(12.7)	(12.1)	(12.7)	(18.6)
	EU15 (West)	7.8	-0.8	3.5	7.5	1.4	5.7	8.4	2.8	7.6	6.8
		(0.4)	(0.2)	(0.3)	(0.7)	(0.4)	(0.6)	(0.8)	(0.6)	(0.8)	(4.2)
	EU13 (East)	4.8	-2.4	1.2	5.0	-0.1	3.4	6.2	0.6	5.5	5.6
		(3.5)	(1.8)	(2.7)	(3.2)	(2.0)	(2.9)	(3.0)	(2.8)	(2.9)	(5.4)
	Rest of Europe	7.6	-1.0	3.3	7.2	1.3	5.5	8.0	2.6	7.3	9.9
		(0.7)	(0.3)	(0.5)	(1.0)	(0.5)	(0.9)	(1.1)	(0.8)	(1.1)	(1.0)
	Middle East	5.4	-3.1	1.2	5.3	-1.8	3.1	4.5	-2.5	3.6	6.9
		(2.8)	(2.4)	(2.6)	(3.0)	(3.7)	(3.2)	(4.6)	(5.9)	(4.8)	(4.1)
	Rest of World	6.6	-1.7	2.6	6.0	0.2	4.3	6.0	1.5	5.4	7.0
		(1.7)	(1.3)	(1.5)	(2.3)	(1.6)	(2.1)	(3.1)	(1.9)	(3.0)	(4.0)
	Germans	7.0	0.2	3.6	8.8	3.4	7.2	11.1	7.4	10.6	13.2
		(1.3)	(-0.9)	(0.2)	(-0.6)	(-1.5)	(-0.9)	(-2.0)	(-4.0)	(-2.2)	(-2.3)
N		94	106	200	91	37	128	45	7	52	14

Notes: Values in parentheses represent differences between real and simulated population growth. Source: Authors' Calculations

Table 4. SEM Estimates: Regional determinants of external migration rates (I).

MIGRANT GROUP	Foreigners total	EU15 (West)	EU13 (East)	Rest of Europe	Middle East	Rest of World
VARIABLES						
Pop. potential	-6.400***	-0.0893	-3.74***	0.811**	-0.391	0.0946
	(2.210)	(0.517)	(1.30)	(0.371)	(0.000326)	(0.000535)
Ethnic Concentration	2.561***	1.670***	9.830***	0.154**	4.452***	1.954***
	(0.339)	(0.156)	(1.611)	(0.0779)	(1.450)	(0.480)
Share <6years	1.506	0.155	4.496***	-0.435	-0.716**	-0.920**
	(1.928)	(0.427)	(1.247)	(0.281)	(0.292)	(0.396)
Share 18-30years	1.840***	0.500***	0.0796	0.461***	0.260***	0.510***
	(0.377)	(0.105)	(0.199)	(0.101)	(0.0769)	(0.118)
Unemployment	0.0735	0.0207	0.447***	-0.0514	-0.0496	-0.113*
	(0.249)	(0.0613)	(0.172)	(0.0395)	(0.0338)	(0.0649)
Wage	2.350	-0.664	2.940	0.613	-0.280	1.100
	(3.530)	(0.632)	(2.450)	(0.449)	(0.443)	(0.986)
Service share	0.0898	0.00330	0.00188	0.0331***	0.00792	0.0172
	(0.0653)	(0.0166)	(0.0392)	(0.0108)	(0.0139)	(0.0204)
Academic share	-0.0727	0.112***	-0.608***	-0.0298	-0.0741*	0.166***
	(0.210)	(0.0394)	(0.117)	(0.0459)	(0.0439)	(0.0605)
Flat size	0.389**	0.144***	0.0307	0.0348	0.0381	0.0260
	(0.177)	(0.0521)	(0.126)	(0.0334)	(0.0277)	(0.0452)
Recreation area	0.134	0.482	-0.469	-0.111	-0.0792	-0.0867
	(0.925)	(0.406)	(0.603)	(0.143)	(0.130)	(0.278)
Tourists	0.0991	0.00515	0.0446	-0.00179	0.000245	0.0166
	(0.0710)	(0.0233)	(0.0534)	(0.0121)	(0.0136)	(0.0166)
Dist. amenities	1.090**	0.250*	0.172	-0.0389	-0.123*	0.0428
	(0.547)	(0.141)	(0.337)	(0.0876)	(0.0726)	(0.104)
Dist. highway	-0.149***	-0.0281**	-0.0733**	-0.00296	-0.0112	-0.00968
	(0.0466)	(0.0137)	(0.0333)	(0.00829)	(0.00687)	(0.0117)
Dist. airport	-0.0686**	0.000771	-0.0476**	-0.0104**	-0.00722	0.00455
	(0.0272)	(0.00642)	(0.0192)	(0.00511)	(0.00462)	(0.00721)
Border east	-2.319	-0.512*	-2.073*	-0.386	-0.105	-0.442
	(1.466)	(0.290)	(1.223)	(0.313)	(0.253)	(0.449)
Border west	2.498*	0.994	2.377**	0.328	0.140	0.607**
	(1.500)	(0.678)	(1.180)	(0.235)	(0.296)	(0.302)
Spatial error	0.619***	0.652***	0.657***	0.162	0.198	0.129
	(0.0683)	(0.154)	(0.0653)	(0.135)	(0.125)	(0.103)
Pseudo R^2	0.707	0.628	0.627	0.394	0.400	0.653
Observations	393	392	392	393	392	387

Notes: Dependent variable: Migration balance per 1000 inhabitants; heteroscedasticity adjusted standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations.

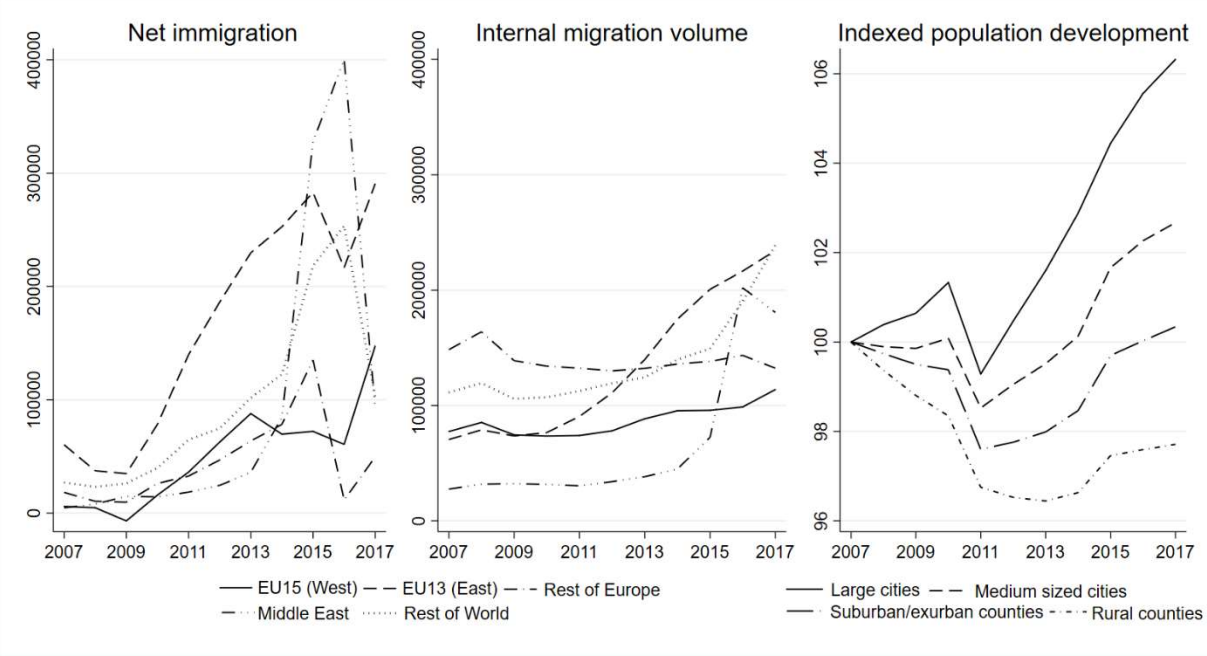
Table 5. SEM Estimates: Regional determinants of internal migration rates (II).

MIGRANT GROUP	Foreigners total	EU15 (West)	EU13 (East)	Rest of Europe	Middle East	Rest of World	Germans
VARIABLES							
Pop. potential	0.385	-0.106	-0.772***	0.465*	0.539***	0.000584**	-0.0120***
	(0.784)	(0.144)	(0.205)	(0.000273)	(0.000208)	(0.000281)	(0.00326)
Ethnic concentration	0.206**	0.0297	0.603***	0.0105	0.479	0.265	-0.144***
	(0.100)	(0.0388)	(0.146)	(0.0764)	(0.418)	(0.207)	(0.0205)
Share <6years	2.390***	-0.0595	0.765***	0.441**	0.382***	1.024***	5.280*
	(0.563)	(0.0900)	(0.148)	(0.182)	(0.128)	(0.227)	(3.069)
Share 18-30years	-0.637***	-0.0744***	-0.192***	-0.140***	-0.0509	-0.178***	0.272
	(0.151)	(0.0269)	(0.0394)	(0.0402)	(0.0462)	(0.0629)	(0.737)
Unemployment	0.0377	-0.0399***	0.0361	-0.0111	0.0395**	0.0232	-1.665***
	(0.0790)	(0.0118)	(0.0233)	(0.0262)	(0.0191)	(0.0351)	(0.394)
Wage	2.950**	-0.360*	0.471*	1.090**	0.639***	1.57***	-1.500
	(1.180)	(0.192)	(0.258)	(0.424)	(0.216)	(0.479)	(5.000)
Service share	0.0571**	0.0127***	0.00729	0.0145*	0.00825	0.0171*	0.636***
	(0.0239)	(0.00486)	(0.00659)	(0.00818)	(0.00595)	(0.00932)	(0.119)
Academic share	-0.128	-0.0102	-0.0869***	-0.0229	-0.0103	-0.0358	0.743*
	(0.0787)	(0.0156)	(0.0194)	(0.0314)	(0.0227)	(0.0264)	(0.398)
Flat size	-0.0820	-0.00847	-0.0246	-0.0465*	0.00966	-0.00469	0.547
	(0.0733)	(0.0137)	(0.0220)	(0.0271)	(0.0163)	(0.0313)	(0.511)
Recreation area	-0.0470	-0.0313	0.0786	0.0616	-0.00172	-0.117	-6.1***
	(0.360)	(0.0515)	(0.0970)	(0.108)	(0.0687)	(0.240)	(1.92)
Tourists	0.00342	0.00107	-0.00380	-0.00681	-0.00346	0.0210*	0.0469
	(0.0291)	(0.00608)	(0.00993)	(0.00975)	(0.00566)	(0.0112)	(0.132)
Dist. amenities	-0.170	0.0442	-0.172***	-0.0592	0.0148	-0.0715	-1.600**
	(0.180)	(0.0287)	(0.0520)	(0.0595)	(0.0445)	(0.0675)	(0.785)
Dist. highway	-0.00401	-1.38e-05	-0.00425	-0.00483	0.00249	0.00506	-0.0101
	(0.0173)	(0.00324)	(0.00562)	(0.00697)	(0.00380)	(0.00725)	(0.110)
Dist. airport	-0.00850	-0.00310	-0.00683*	-0.00494	0.00134	0.00129	-0.0530
	(0.0117)	(0.00189)	(0.00349)	(0.00391)	(0.00260)	(0.00434)	(0.0597)
Border east	0.692	0.132	0.142	0.0796	0.340	0.213	-1.267
	(0.643)	(0.0981)	(0.242)	(0.270)	(0.332)	(0.300)	(5.709)
Border west	0.706	0.442***	0.279	0.307*	0.0751	-0.0768	1.963
	(0.465)	(0.114)	(0.170)	(0.177)	(0.0894)	(0.173)	(2.062)
Spatial error	0.396***	0.206*	0.652***	0.172	0.123	0.233*	0.679***
	(0.0893)	(0.115)	(0.0643)	(0.108)	(0.129)	(0.133)	(0.0668)
Pseudo R^2	0.457	0.230	0.389	0.330	0.254	0.408	0.490
Observations	393	392	392	393	393	383	394

Notes: Dependent variable: Migration balance per 1000 inhabitants; heteroscedasticity adjusted standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations.

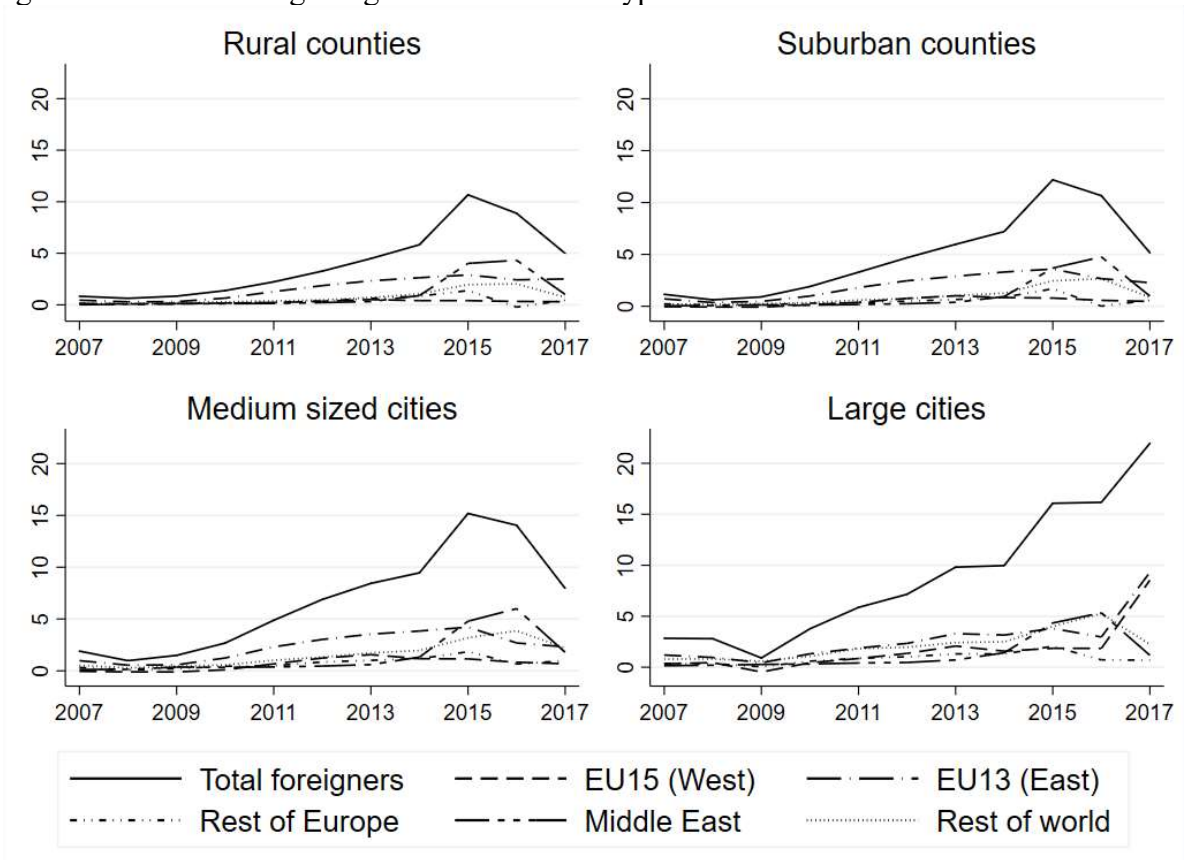
Appendix II: Figures

Figure 1. Foreign migration and spatial disparities in population development (Germany 2007-2017)



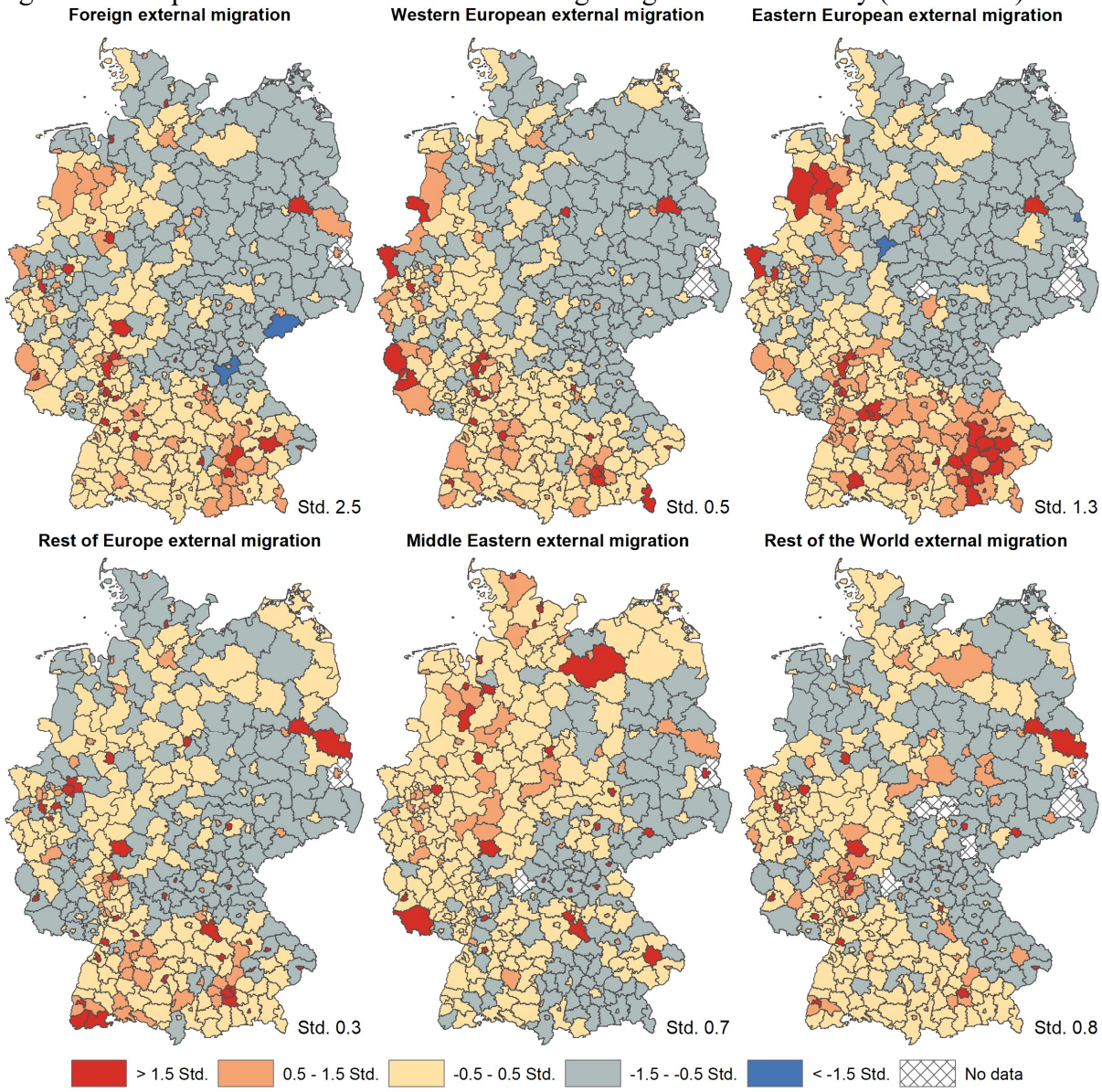
Source: Author's illustration

Figure 2. External foreign migration in different types of German counties



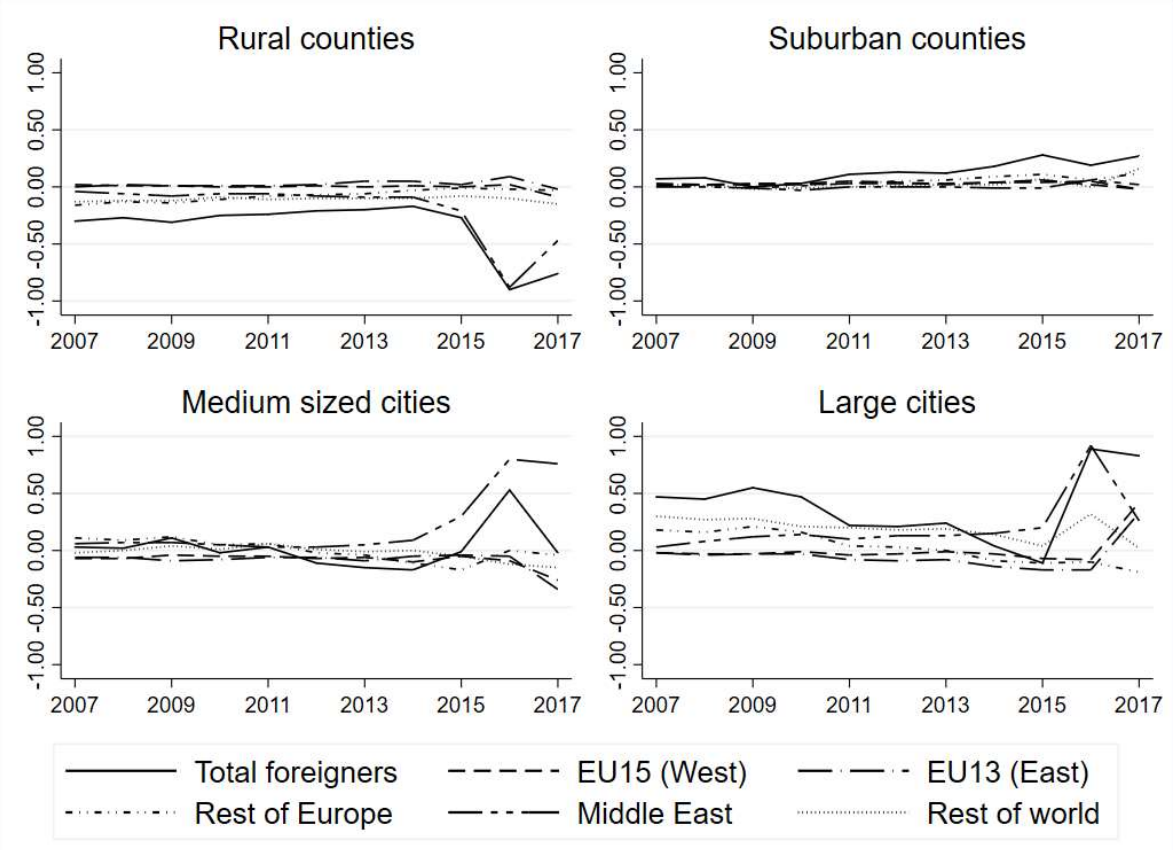
Notes: Net migration rate per 1000 total inhabitants. Source: Authors' calculations.

Figure 3. The spatial distribution of external foreign migration in Germany (2007-2017)



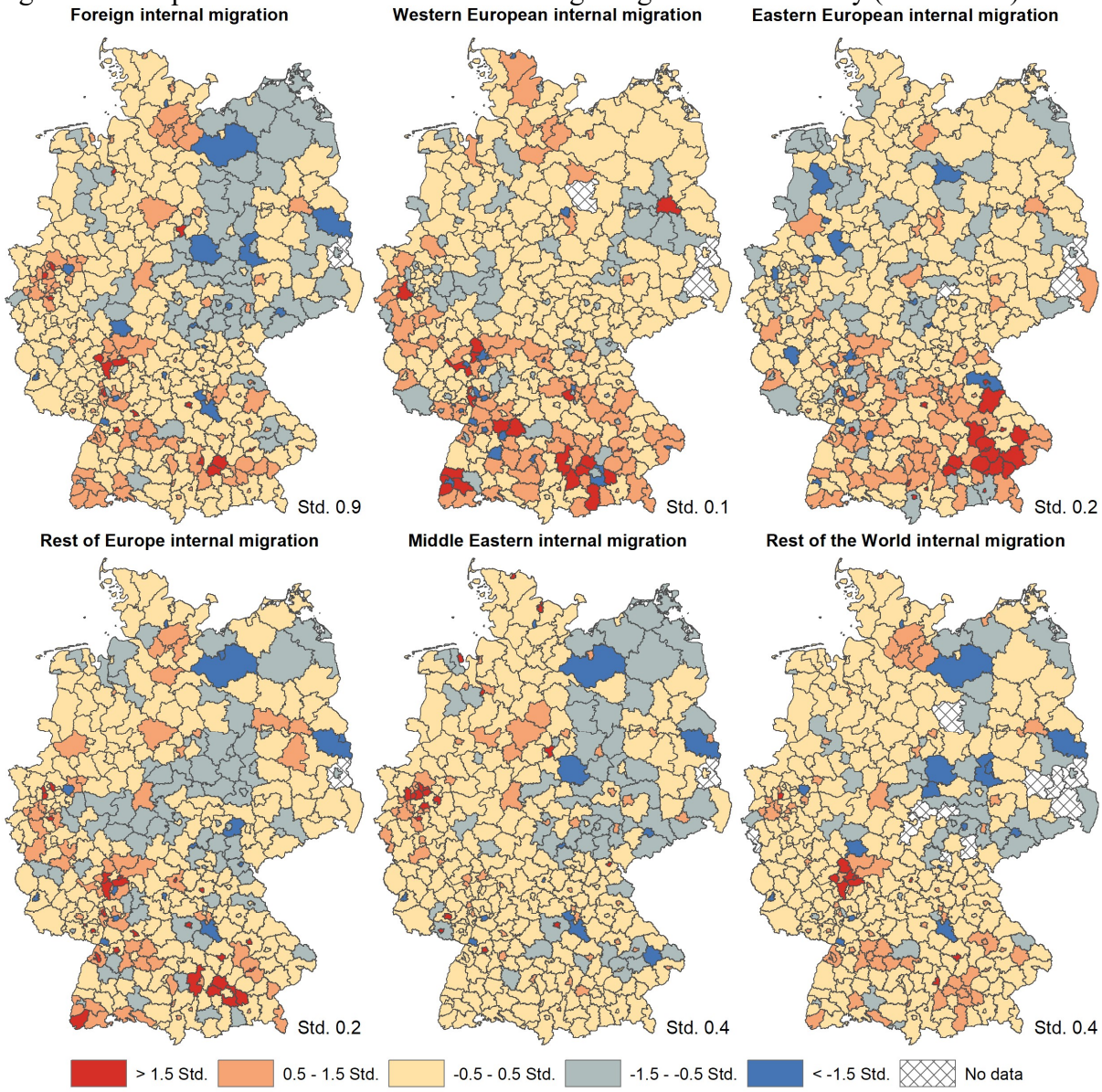
Notes: Migration balances per 1000 inhabitants in 2007. Classes refer to the standard deviation with regard to the respective migrant group. Source: Author's calculations. Cartography: Jannik Koch

Figure 4. Internal migration of foreigners in different types of German counties



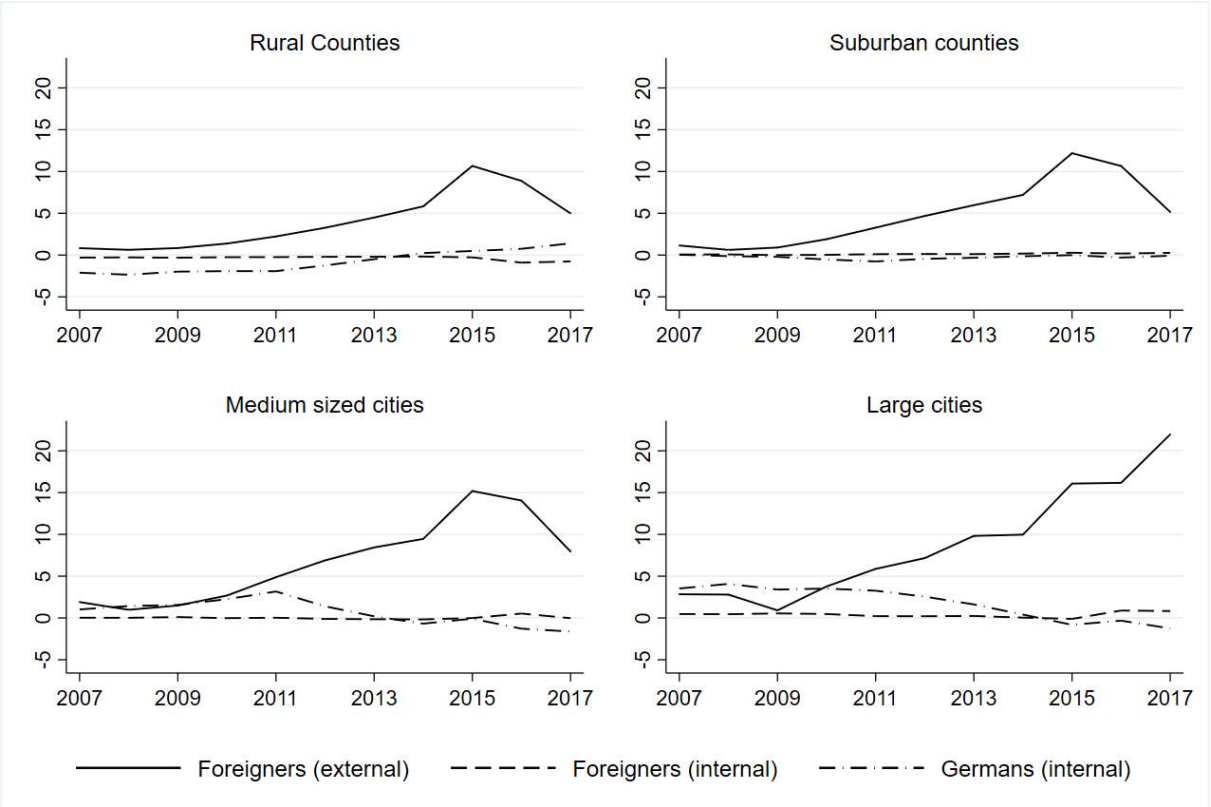
Notes: Net migration rate per 1000 total inhabitants. Source: Authors' calculations.

Figure 5. The spatial distribution of internal foreign migration in Germany (2007-2017)



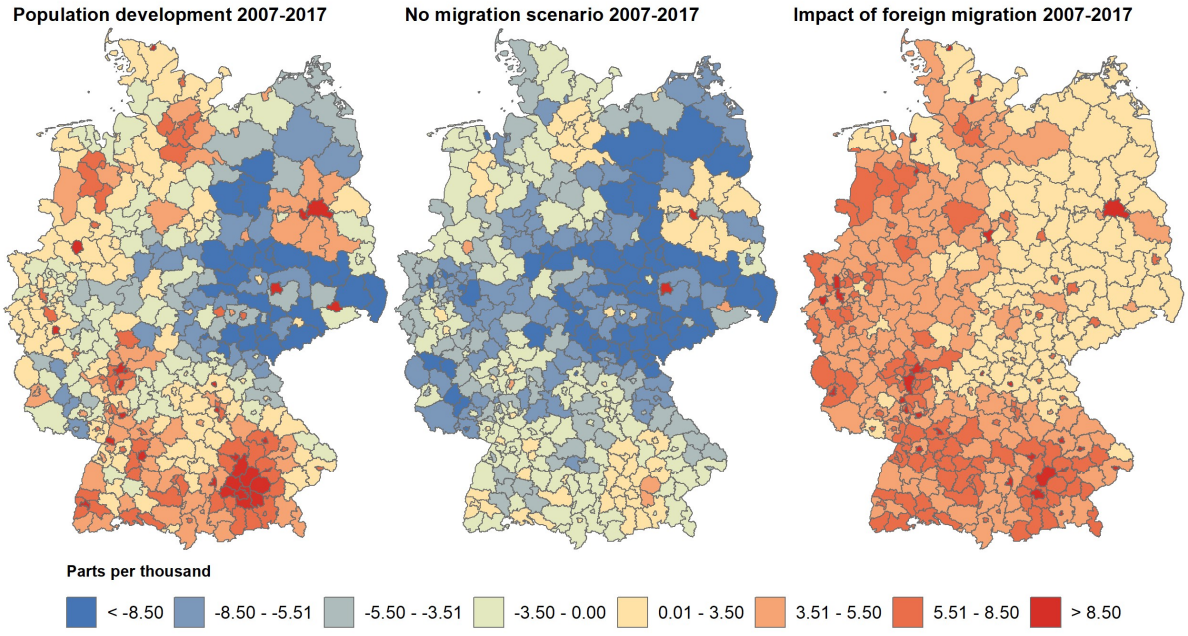
Notes: Migration balances per 1000 inhabitants in 2007. Classes refer to the standard deviation with regard to the respective migrant group. Source: Author's calculations. Cartography: Jannik Koch

Figure 6. Net migration rates of foreigners and Germans for different county types.



Notes: Net migration rate per 1000 total inhabitants. Source: Authors' calculations.

Figure 7. Regional population development and impact of foreign migration



Source: Author's calculations. Cartography: Jannik Koch

Appendix III: Supplemental material

Table 6. Principal Component Analysis

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.99926	2.36732	0.7498	0.7498
Comp2	0.631941	0.344783	0.158	0.9078
Comp3	0.287158	0.205514	0.0718	0.9796
Comp4	0.0816436	.	0.0204	1

Notes:PCA including average travel times to public transport stops, supermarkets, physicians, and hospitals. Source: Author's calculations.

Table 7. Variance inflation factors of the explanatory variables.

Variable	VIF	1/VIF
Dist. Amenities	4.09	0.244725
Wage	3.86	0.258791
Unemployment	3.59	0.278205
Ethnic Concentration	3.41	0.293398
Academic share	3.2	0.312681
Flat size	2.77	0.360378
Service share	2.52	0.396043
Pop. Potential	2.47	0.405528
Share < 6 years	2.21	0.452154
Dist. Airport	2.19	0.455777
Share 18-30 years	2	0.500537
Recreation area	1.97	0.506562
Dist. Highway	1.85	0.541952
Tourists	1.56	0.642183
Border west	1.3	0.769851
Border east	1.24	0.805761
Mean VIF	2.48	

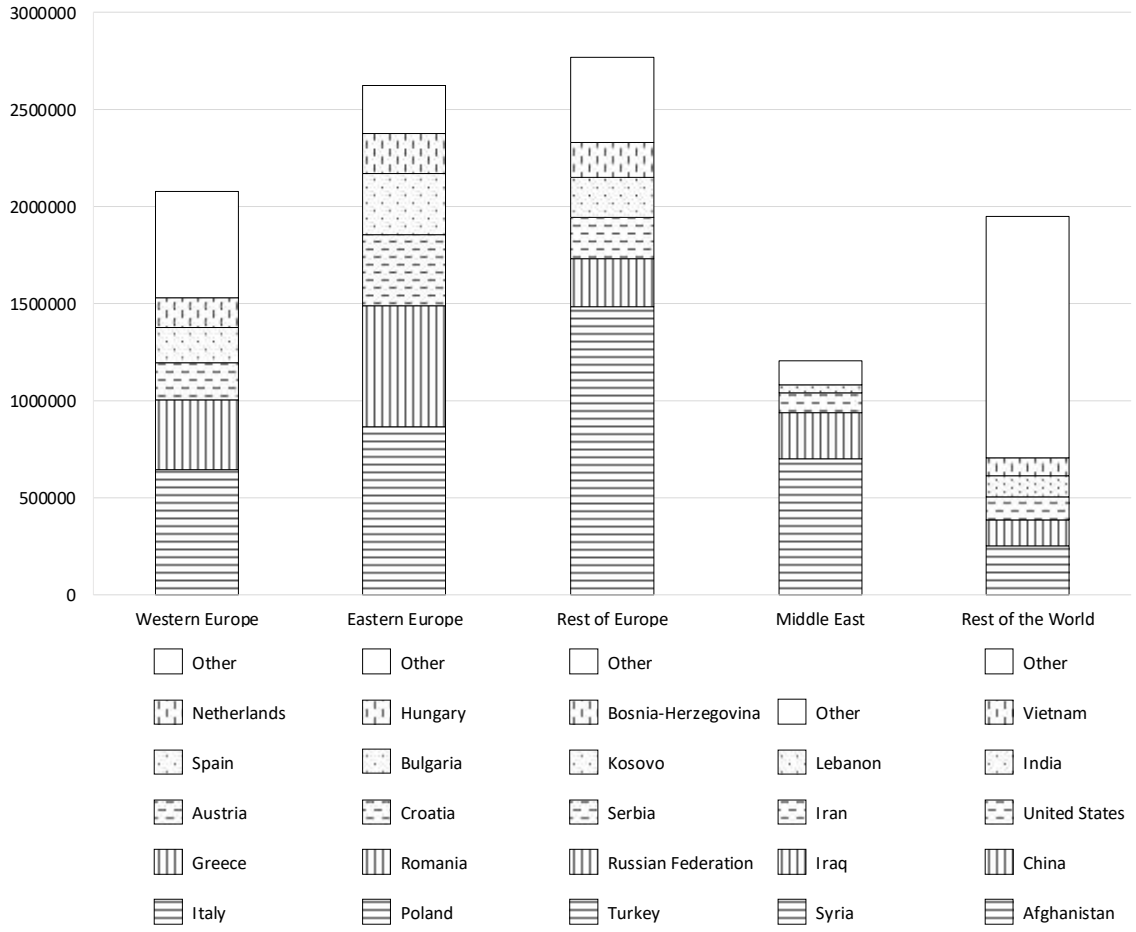
Source: Author's calculations.

Table 8. Test statistics for OLS models.

EXTERNAL MIGRATION							
MIGRANT GROUP	Foreigners total	EU West	EU East	Rest of Europe	Middle East	Rest of World	
Breusch-Pagan	233.16***	344.05***	213.62***	154.1***	498.68***	377.44***	
Moran's I (dep. var)	11.42***	8.93***	12.92***	2.14**	0.57	2.24**	
Moran's I (error)	45.14***	27.67***	54.08***	1.22	2.25	0.74	
INTERNAL MIGRATION							
MIGRANT GROUP	Foreigners total	EU West	EU East	Rest of Europe	Middle East	Rest of World	Germans
Breusch-Pagan	28.54***	0.15	44***	49.01***	41.77***	0.18	12.55***
Moran's I (dep. var)	11.67***	2.46**	11.37***	7.39***	4.03***	8.38***	12.94***
Moran's I (error)	9.56***	2.5	53.66***	1.24	0.56	1.73	61.95***

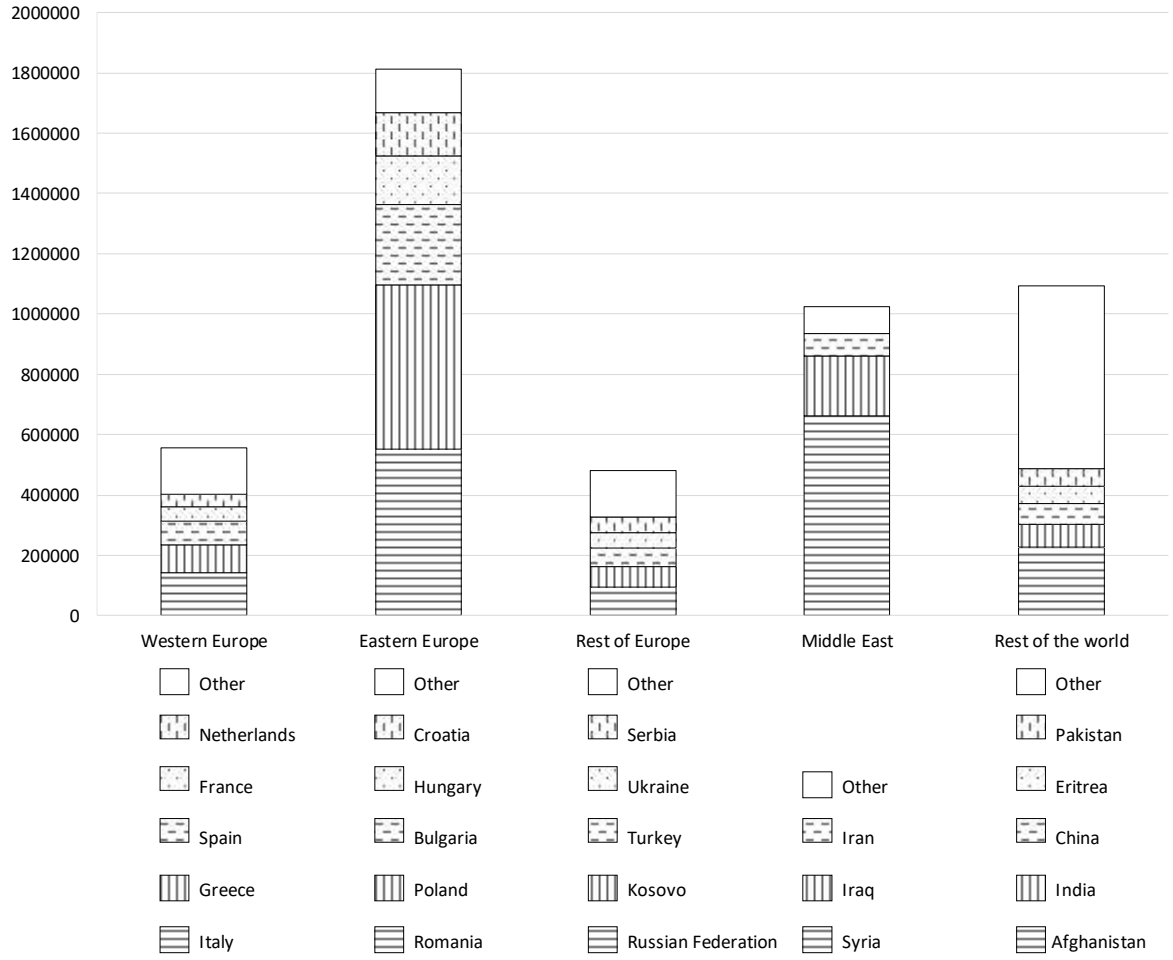
Notes: *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations.

Figure 8. Composition of migrant subgroups (stock 2017).



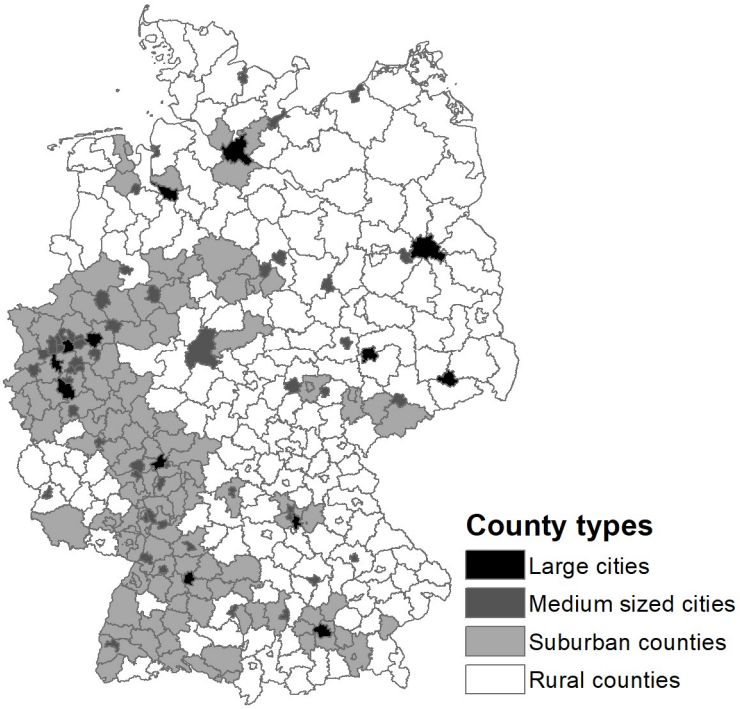
Source: Authors' illustration

Figure 9. Composition of migrant subgroups (net immigration 2007-2017).



Source: Authors' illustration

Figure 10. Typology of German counties



Source: Authors' illustration. Cartography: Jannik Koch.