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The impact of place-based policies on perceived regional living conditions across German labor market regions. Examining the impacts on migration flows.

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Abstract:

The paper analyzes the impact of the two major German regional development and redistribution policies, the municipal fiscal equalization scheme and the economic funds GRW, on perceived regional living conditions, measured through interregional migration between German labor market regions. Using a spatial vector-autoregressive panel model (SpVar), we find evidence that equalization transfers have a significant positive impact on perceived living conditions and contribute to the aim of regional equity. These effects are especially found for regions with low endogenous fiscal capacities. GRW funding reveals no significant effects on net migration rates in total, but short-term effects in rural regions.

Keywords: amenities, fiscal equalization, impulse-response functions, living conditions, migration, policy, SpVar

JEL Classifications: C33, R23, R58, O38

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1. INTRODUCTION

Equivalent living conditions across all regions are a key target of German regional development policies and part of the German constitution. Nevertheless, although Germany is not as centralized as other countries in Europe, population development is polarized into prosperous cities and peripheral regions falling short of this development. Especially the former socialist GDR areas in the east, but also peripheral regions in the West have to deal with manifold challenges that affect regional living conditions, such as structural change, unemployment, smaller private incomes, demographic change and insufficient public infrastructure. Federal place-based regional development and redistribution policy instruments therefore aim at reducing regional disparities and provide financial funds or fiscal equalization transfers for underperforming or structural disadvantaged regions and firms, analogue to EU cohesion policy instruments.

The economic efficiency of these policies on the German regional level has been frequently examined (Alecke, Mitze & Untiedt, 2013; Dettmann, Brachert & Titze, 2016; Eberle, Brenner & Mitze, 2019 and others). However, the evaluation of regional policies should not only consider economic efficiency, but also social and regional justice (Storper, 2011). This refers to the insight that regional inequalities are not solely an economic problem but also have manifold social and political implications for society. For instance, Rodriguez-Pose (2018) recently pointed out relationships between structurally weak regions getting more and more suspended from economic and social development and rising populist votes. Consequently, the concept of equivalent regional living conditions has drawn more attention in the political debate in Germany in recent years and the Federal Ministry of the Interior, Building and Community established a commission working on this issue since 2018.

This paper can make a substantial contribution to this discussion by investigating the effects of two German place-based policies that aim at reducing regional disparities, the fiscal equalization

scheme on the municipality level and the "Joint Task for the Improvement of the Regional Economic Structures" ("Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur", henceforth GRW). The central aim of this paper is to investigate whether both policies contribute to the development of regional living conditions and foster socioeconomic cohesion between regions. In order to reach this aim, we use a flexible spatial vector-autoregressive (SpVAR) approach that has been recently used in spatial policy evaluation (Eberle et al., 2019; Mitze, Schmidt, Rauhut, & Kangasharju, 2018). We utilize regional migration-balances as an indicator for living conditions, since the literature does not provide a common measurement. This will be explained and discussed in Section 3. To the best of our knowledge our study is the first analysis that explicitly emphasizes the role of living conditions in econometric place-based policy evaluation. In addition, it is the first study enhancing an econometric spatial vector-autoregressive process to investigate the complex interactions of economic and socioeconomic variables in a spatial context. This allows us to gain new knowledge about the mechanisms behind regional policies and the complex dynamics of economic and spatial socioeconomic variables.

Our results suggest, that fiscal equalization on municipality level contributes to the goal of equivalent living conditions in a measurable way by having a positive impact on regional net migration rates especially in regions with low endogenous tax income and economic and social living conditions below average. GRW funding reveals no significant effects to net migration rates in total, but significant short-term effects in rural regions. The remainder of the paper succeeds as follows. We start with a presentation of the examined policies and existing literature on their effects. In Section 3 we discuss the advantages and disadvantages of our measurement approach. In Section 4 hypothetical effects of all policies based on theoretical consideration are developed. Our data and econometric model are presented in Sections 5 and 6. Section 7 provides the empirical results and their discussion. Section 8 concludes.

2. POLICY SETUPS AND LITERATURE EVALUATION

This paper investigates the impact of two German place-based policies aiming at regional development and cohesion. Both provide financial support for structurally lagging regions, but the policies differ strongly in their funding strategy, thematic focus and amount of payments.

2.1. Fiscal Equalization Scheme

Financial equalization schemes redistribute tax revenues from regions and municipalities with high tax incomes to those with low fiscal capacities in order to reduce spatial disparities. We focus on the equalization scheme implemented on the municipality level including vertical fiscal transfers from federal states to local jurisdictions and de facto horizontal transfers across municipalities within federal states. These grants (*In German: "Schlüsselzuweisungen")* are institutionally separated from the horizontal equalization scheme on the federal state level ("*Länderfinanzausgleich*"), although distributed vertical means can result from this superordinate equalization level. Comparable regional equalization schemes are used by many countries (see Blöchlinger & Charbit (2008) for an overview on OECD countries). The amount of support grants from the German equalization scheme is formula-based. The calculation design varies across the federal states, descriptions of the different calculation setups in the federal states are given by Lenk, Hesse & Lück (2013). In general, calculation includes the imputed financial needs and population of a municipality minus its endogenous fiscal capacities. The common basic understanding allows us to assume that appropriated analysis across federal states is possible (Eberle, 2019, Lenk et al., 2013).

The granted funds are unconditional and not earmarked to a specific project. The main purpose is to enhance the public budget of economically weak regions and allow municipalities with low fiscal income to fulfill their municipal tasks and provide public services and public goods at an adequate level. Average annual grants to municipalities amounted to 23.8 billion € in the period

2000-2014[1]. Thus, it is by far the largest regional redistribution policy and the most important income source for regions with comparatively low tax income (Lehmann & Wrede, 2019). The majority of formula-based grants is paid to municipalities in the Eastern German regions, but besides the city states of Berlin, Hamburg and Bremen every municipality received equalization payments in the investigated time period (*see Figure 1 for the spatial distribution of grants*).

The economic consequences of regional fiscal equalization schemes in general have been discussed over a long time period and for several countries (e.g. Buchanan, 1950; Buchanan & Wagner, 1970; Feldstein, 1970; Oakland, 1994; Albouy, 2012). The most common conclusion is that fiscal equalization towards less productive regions appears to be inefficient with respect to total national productivity, but promotes equity by providing necessary financial capabilities to regions with low tax capacities. As high economic productivity is linked to spatial concentration, redistribution of resources to structurally weak region challenges economic efficiency. Martin (1999) and Baldwin et al. (2003) refer to this as the inevitable trade-off between the equity and efficiency goals of public policies.

In contrast to its large volume and its economic and political relevance, scientific evidence on consequences of the German redistribution scheme is small. Henkel, Seidel & Südekum (2018) estimate an equilibrium model for a scenario of abolished total fiscal redistribution (*federal state and municipality level, also including structural funds*) and find evidence for increasing spatial disparities and the relocation of approximately 3.2 million inhabitants mainly from rural former recipient regions to urban areas within Germany. In this scenario national labor productivity would rise by 5.8% and real GDP per Capita by 3.7%, while negative growth effects in overcrowding cities inhibit total welfare gains. Eberle (2019) estimates a Panel VAR approach and finds that enhancing the fiscal equalization payments has significant effects on the regional

[1] Calculation based on Quarterly Cash Statistics of the German Federal Government and the Federal States

employment rate, but not on other economic variables. Lehmann & Wrede (2019) confirm the common conclusions that the equity criterion of the equalization scheme is satisfied, while total efficiency is hampered by the Bavarian redistribution scheme, adapting the approach from Albouy (2012).

2.2. GRW

GRW, the largest German regional economic policy, was implemented in 1969 referring directly to the aim of regional equivalent living conditions (Bundesregierung 1969, Deutscher Bundestag, 2014). Its goals and functionality are closely related to the European Regional Development Fund (ERDF) including means from the European policy. In contrast to the fiscal equalization scheme, the program's main purpose is to explicitly procure primary and secondary effects on economic growth and employment by attracting mobile factors of production and stimulating private sector investments in regions as a kick-off for long-term local economic development.

Subsidies are split into two funding schemes. First, industrial investments of firms, especially labor costs and equipment capital, are subsidized. Second, municipalities are subsidized to improve economic relevant infrastructure, for instance traffic or communication infrastructure. The average annual grants amounted to 1.89 billion euro between 2000 and 2014, whereby 1.32 billion were paid within the industrial scheme[2]. Both industry and infrastructure investments are earmarked to specific investment cases and limited to 35 – 60% of total investments to reduce windfall gains and stimulate further private investments (see Deutscher Bundestag (2014) and Alecke et al. (2013) for more details on GRW functionality). Subsidies are solely payed in regions with high rate of unemployment and low gross salary level. 122 of 258 labor market regions did not receive any GRW funds in the considered period, especially the economic

[2] Calculation based on Funding Data from the Federal Office for Economic Affairs and Export Control (BAFA)

stronger regions in the south. About 77.5% of the money was spent in East German regions, which are inhabited by just 15% of German population[3] (see Figure 1 for spatial distribution of GRW funds).

Eberle et al. (2019) provide a detailed summary on the broad existing literature examining the economic effects of GRW funding. The majority of studies find some evidence that GRW grants support regional productivity, GDP growth and/or employment. However, by now no study focusses explicitly on socioeconomic effects of the GRW funding scheme. Von Ehrlich & Seidel (2015) find positive effects on income and migration balances for historic equivalent funds for West German regions neighboring the Iron Curtain ("Zonenrandgebietförderung"), but also arising negative externalities of higher land rents and negative effects to neighboring regions. For the comparable EU structural funds, a small number of studies estimates effects on migration flows. Egger, Eggert & Larch (2014) find in a theoretical model that structural funds reduce net migration from economic weak to strong countries in the EU-15 over the period 1986-2004. Thomas (2013) finds analogous results for an econometric model of internal migration in Poland in the period 2004-2009.

[3] Own Calculations based on Funding Data by Federal Office for Economic Affairs and Export Control (BAFA) and Population data from Federal Statistic Office, Status 30.12.2017

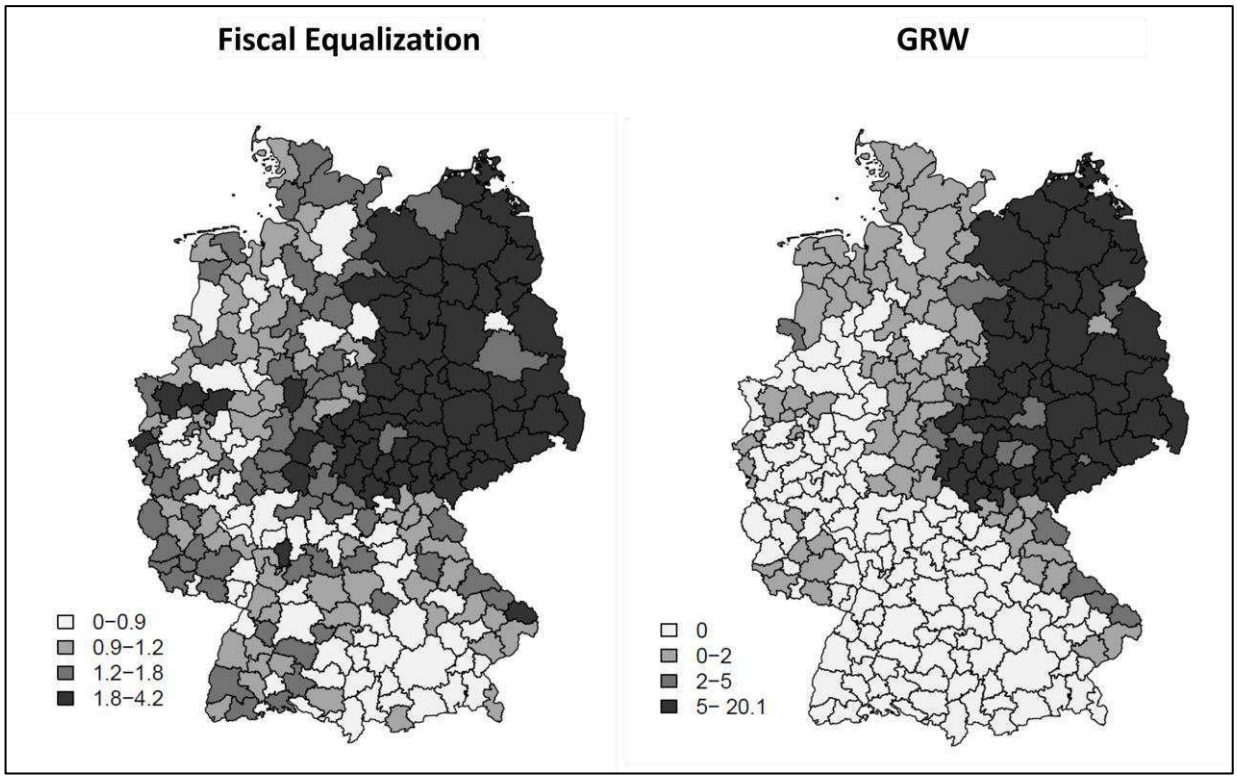

FIGURE 1: Spatial distribution of yearly average support grants from the fiscal equalization scheme and GRW funding intensity from 2000 – 2014 in € per GDP in %

3. A MIGRATION APPROACH TO MEASURE REGIONAL LIVING CONDITIONS

The debate on regional living conditions, regional or national well-being and welfare indices has been intensified by policy makers worldwide in reaction to the economic crisis starting in 2008. Many studies have tried to develop a regional or national well-being indicator, but struggled with the individuality and complexity of well-being (e.g. OECD, 2014, Michalos et al., 2011). In addition, a political and scientific debate on measuring regional living conditions in Germany emerged and resulted in different approaches for alternative welfare indices (Deutscher Bundestag 2013; Diefenbacher, Held, Rodenhäuser & Zieschank, 2016; Federal Institute for Research on Building, Urban Affairs and Spatial Development, 2012; Kawka, 2015). The variety and complexity of existing approaches indicates problems to capture the correct information and represent the multiple dimensions of living conditions on a regional scale. Hence, there is no universal understanding and measurability of regional living conditions. We argue, that none of the yet proposed sets of regional indicators is able to reflect that living conditions are subjective

and perceived on the individual level instead of the regional scale, due to individual preferences and demands. Furthermore, living conditions can vary strongly within administrative regions, causing an additional problem to the region as unit of analysis. In absence of an appropriate indicator, we argue that net migration balances of German regions are the best available proxy indicator on the regional level to measure the development of local socioeconomic living conditions. Therefore, we adapt a behavioral migration framework outlined first by Wolpert (1965), stating that places have individual and subjective utilities for its residents that depend on the fit of the places values and the residents' individual goals and values plus their individual local social integration such as family and social contacts. Residential choices rest upon expectations towards place utilities of alternative residences and perceived likelihoods to achieve individual goals in that places. Individual utility maximization behavior results in higher migration flows, if place utilities are distributed unequal in space and additional expected place values are higher than the total migration frictions and costs (Wolpert 1965). Cebula & Vedder (1973) found first that net benefits of individual migration behavior are not necessarily economic and get influenced by further residential amenities that determine the individual perception of living conditions in many ways. Gottlieb (1995) defines these amenities as "(…) place specific goods or services that enter the utility function of residents directly". Individual weightings of amenities depend on life-cycle aspects as well as personal circumstances, such as employment status, income, education, marital status, sex or health (Greenwood, 1985). Thus, migration decisions are a reaction to perceived unequal distributions of regional economic strength and individual weighted further amenities.

Mobility frictions in the spatial behavior hamper migration flows, due to migration costs, insecurities in the relocation process, local social commitments or immobile possessions that create a long-term relationship between regions and their residents and alleviate the disposition of moving to another region. Hence, migration numbers are rather small compared to the

dimension of spatial inequalities. Heise & Porzio (2018) refer to this as the "home-bias" of migration, which makes migration decisions inertial and less rational than stated above and supports the persistence of spatial inequalities. Therefore, individual migration decisions have to be provoked by changes in the personal environment that raise the perceived inequalities above a subjective threshold level. These can be either linked to specific individual chances in the destination area such as job offers, earnings, higher education opportunities and relationships, or are reactions to constraints in the current residence (e.g. regional unemployment and income level, availability and quality of social infrastructure and public services). In conclusion, regional net migration rates indicate the development of perceived regional living condition and cohesion dynamics should result in decreasing migration between regions.

Of course, regional inequalities are not the only trigger for migration. Interregional migration patterns are also determined by developments in common preference, such as changes in attitudes towards cities or the development of fashionable locations. Life-cycle aspects can alter the individual weighting of amenities and change place utilities without changes in the regional conditions. This brings shortcomings to the use of migration patterns as an indicator for living conditions, but does not restrict our approach in which we use the change in local migration balances as an indicator for changes in living conditions. The advantages in terms of representing the complexity and individuality of living conditions causes local migration rate changes to be the best indicator for our analysis. Moreover, migration behavior of specific demographic groups allows to draw further conclusions on which amenities triggered changes in the regional net migration. In addition, all place-based policies pursuing regional equity should aim at influencing migration streams since they can determine future economic potentials and inequalities. A constant negative local migration balance affects in particular the presence of skilled workforce, which are crucial for local innovative activities and endogenous regional growth potentials (Lucas, 1988, Romer, 1990). Out-migration causes further problems, such as

real estate vacancies, investment backlogs and declining supply of public infrastructure, while workforce inflow and growth is self-enforcing in prosperous regions, what amplifies the polarization of regional development. This brings further interest to our analysis and migration rates become a reliable and comparable indicator stabilizing endogenous regional potentials and monitoring policy success.

4. THEORETICAL CONSIDERATIONS AND RESEARCH HYPOTHESIS

A broad literature focusses on explaining migration dynamics. Since we are interested in changes in the regional migration balances, we focus on its local determinants and ignore more detailed approaches explaining complex migration patterns and interactions between regions. Overall, policy funding should enhance local factors and generate changes in the regional migration flows towards recipient regions provoked by adjustments in regional amenities. The different strategic orientations and intended goals of the place-based policies result in different funding specifications and efficiency expectations, implying different research hypotheses.

One basic assumption of this study is that place-based policies are not the actual key factor for individual migration decisions, but single structural improvements in the personal environment initiated by place-based policies can become decisive in both directions by changing the individual factor-balance. Hence, the focus is set on local characteristics that are potentially affected by policy implementations and determine the migration dynamics of regions by working as push and pull factors. Place-based policies are set to change the composition of regional push and pull factors in a direct or indirect way. Hence, to derive detailed hypotheses on policy effects, we consider various push & pull determinants (amenities) and match them with their expected reaction to both place-based policies. Summarized expectations towards policy effects are displayed in Figure 2.

4.1. Economic implications

Economic incentives and financial advantages are well-known as key factors of internal migration in high-developed countries (Greenwood, 1975; Hunt & Mueller, 2004). Economically growing regions will gain more jobs and offer additional returns to skills over time. The former is found to attract mainly less-skilled workforce, while the latter predominantly attracts high-skilled workers (Arntz, 2010). Vice versa, shrinking local economies with high unemployment rates lose high and less skilled population to thriving markets due to income maximizing behavior. Especially the high educated labor force is more sensitive to income inequalities (Borjas, Bronars & Trejo, 1992; Hunt & Mueller, 2004; Arntz, 2010). These mobility patterns manifest long-term inequalities and labor market imbalances (Kanbur & Rapoport, 2005, Granato, Haas, Hamann & Niebuhr, 2015).

Structural funds, such as GRW, are designed to reduce the productivity gap between economically prosperous and lagging regions and induce firms and their employees to locate in regions with lower productivity or efficiency (Kline & Moretti, 2014). The majority of studies confirm this with regard to per capita output and employment development (Eberle et al., 2019; Dettmann et al., 2016; Rhoden, 2016 and others). Productivity growth should enable firms to raise wages. This enhances individual capabilities plus long-term career chances and decreases migration insecurities. Considering that unemployment and income opportunities are the main reasons for labor migration, GRW funding should create incentives to stay, respectively move to funded regions. The growth effects should in particular affect the high skilled and educated workforce, but less often those who already started a family, since families make migration decisions more rigid and economic returns to migration decrease over time (Hunt & Mueller, 2004). Hence, we should observe clear positive effects of GRW funding for the age groups 18-30 years, lower effects on groups above 30 years and no effects on retired persons. Predictions on specific economic consequences of the equalization scheme are difficult, due to limited

information. The findings from Eberle (2019) suggest that regional employment effects are existent, which should have slightly positive effects on migration balances. As the policy is not designed for triggering economic growth, direct effects on prosperity cannot be expected to be large.

In addition, it has to be considered, that regional income benefits are potentially lower than the nominal income gap and offset by higher prices in high-income regions (Glaeser & Gottlieb, 2008). Especially higher housing prices can displace people from attractive cities, while shrinking regions in many cases cannot offer adequate housing supply due to lower returns of investments for owner and developer and resulting investment backlogs.

4.2.Residential amenities

Regional infrastructure and further non-economic residential amenities affect perceived regional living conditions in a direct way. German municipality task and expenditure structure is split into obligatory public tasks (e.g. fire protection, waste disposal, energy, water supply and school authority) and optional tasks (e.g. public transport, traffic infrastructure, public social infrastructure). Local governments can decide about the amount of expenditures for the latter and, in theory, abolish their supply if financial capacities are exhausted. An insufficient supply of optional municipality tasks in the form of public infrastructure, public services (medical care, child care) or leisure opportunities (recreation areas, public libraries, museums, public pools, sport facilities) can arise as major push-factor in particular from rural areas. Fiscal equalization transfers should enable local governments to ensure long-term affordability and maintenance of public sourced social and socioeconomic infrastructure, regardless of their local economic situation and possible tax income crises (Kline & Moretti, 2014).

Moreover, education infrastructure is a key settlement factor for families and high-potentials determining future earning potentials, offering individual development potentials and creating

freedom to pursue individual life-goals. Although the educational system is basically comparable within Germany, spatial inequalities are created by local availability and by its federalistic organization. Since municipalities are school authorities paying for public school infrastructure, while federal states bear the costs for the teaching staff, we assume that an increased municipality budget from equalization transfer potentially improves local school infrastructure (Brückner & Böhm-Kasper, 2010). The local quality, reputation and distance to primary and secondary schools can be a large settlement factor for couples and young families. Concurrently it is feasible that higher levels of education result in increasing out-migration from recipient regions in the long-term, due to higher skill-returns in donor regions (Zukowska-Gagelmann, 2013).

Migration decisions are affected by natural conditions such as the local landscape, climate, sunshine hours or air pollution (Greenwood, 1985). While socioeconomic-based policies should not affect natural characteristics, public or industrial construction projects might have positive or negative impact on the constructed environment. Especially additional land sealing by industry investments can have negative effects on perceived living conditions. Although we have poor indications for the actual importance of residential amenities as migration determining factors, it is well known that maintenance of public infrastructure is declining in lots of German regions that are challenged by demographic change and outward migration. In line with the strong impact of the "home-bias" (Heise & Porzio, 2018), it seems reasonable that additional supply of local amenities and public infrastructure increases the number of "stayers" especially in those regions and offsets lower income opportunities to a certain point.

H1: *Fiscal equalization transfers do not affect economic disparities in a significant way, but improve regional living conditions by enabling regions to maintain an adequate quality and supply of public infrastructure and public services. Especially regions with low fiscal income capacities are expected to profit from this. Effects are not limited to certain age groups.*

H2: *GRW subsidies reduce the economic gap between regions. Potential labor market and income effects cause significant effects on the net migration balance in the age groups 18-30 years in funded regions, lower effects on 30-50 year olds and no effects on retired persons.*

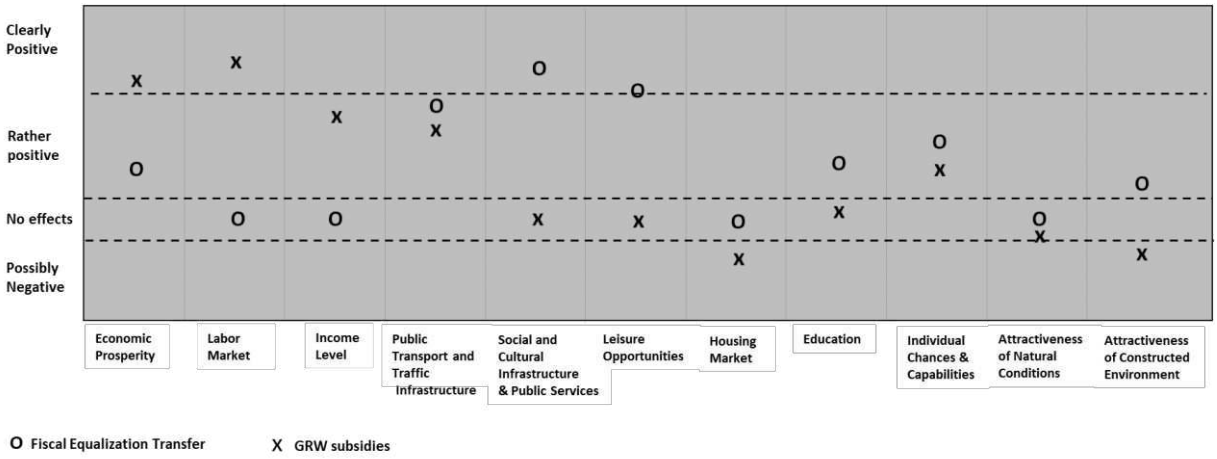

FIGURE 2: Expected reaction of important Push & Pull Factors for interregional Migration in Germany to the considered place-based policies

5. DATA AND DESCRIPTIVE STATISTICS

We test the identified research hypotheses in an econometric analysis using a balanced panel data set on the spatial level of 258 German labor market regions.[4] In this structural unit administrative districts are bundled due to economic ties and commuting flows. Their main advantage is that short distance movements driven by life-cycle phenomena, such as suburbanism, are excluded from the analysis. To enhance the informative value, based on the theoretical considerations, it is adequate to include only migration acts that involve extensive personal relocations. Concurrently, the chosen regional units are small enough to expect measurable effects from local policy input.

Our main outcome variable is the annual regional net migration rate from the official German migration statistics. This includes all registered interregional inflow and outflow of persons moving within Germany. We exclude abroad movements, as immigrant location decisions are

[4] Official Classification of labor market regions by the German Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) (Status 31.12.2015).

known to be driven by different factors, so as chain migration and ethnic networks in the host country (Barthel, 1989; Haug, 2008). The net migration rate at different age groups is used in comparative analysis to additionally explore the relationship of place-based policies and internal migration at different stages of the life-cycle. While 18-24 year olds are expected to move in majority by educational reasons, labor market is decisive for many 25-29 year olds. Reasons for middle-aged are heterogeneous, persons between 50-64 can be expected to move in preparation to retirement. Registration behavior brings some weakness to the dataset. The census of 2011 revealed mismatches and time lags between registered and real movements. Assuming that the occurring error is equally distributed over years, this produces negligible errors on the annual change. Administrative second-residences registrations cause bias, if they are actually used as first-residence[5]. Finally, we had to omit the Göttingen region due to a major data bias. As the administration for their matters is located in this area, ethnic German late re-settlers from former soviet states get registered near Göttingen first. Their distribution all over Germany afterwards causes constant implausible statistical within-German out-migration from the region. The time period from 2000 to 2014 is chosen, because the first strong wave of relocations from east to west after German reunification was abated in 2000 and from 2015 onwards the increasing refugee migration would cause problems. [6]

The two considered policies are investigated in separate estimations and normalized by the regional GDP. Furthermore, we incorporate variables to the equations that are expected to influence interregional migration decisions based on the considerations in section 4. We include three economic variables: 1) the regional employment rate to account for increasing/decreasing

[5] The amount of this bias is in particular visible in regions with high student rates. The first-residence registration in Münster and Gießen significantly increased, after they implemented a taxation on second-residence registrations.

[6] Similar to the problem with Göttingen, refugee-registration stations for refugee migration (e.g. Fürth region) are problematic. However, these effects bring only minor limitations to our dataset as they are marginal until 2014, which we chose as the end of the analyzed time period.

numbers of jobs, 2) the disposable household income to consider individual profit maximizing behavior, and 3) the gross domestic product to consider the general local economic dynamics. As variables that represent the development of further local amenities, we include 1) the number of elementary and secondary schools to take into account changes in the local education infrastructure, 2) the prices of land that is ready for development to control for the regional level of housing prices, and 3) the number of overnight stays, as a proxy for the development of natural and environmental quality. All indicators and data sources are displayed in Table 1. The selection especially of the non-economic variables is limited by the availability of reliable data within the whole research period (e.g. rental prices) and the lack of adequate indicators.

TABLE 1: Variable description and data sources of variables

Acronym	Variable Description	Data Source
LFT	Unconditional financial assignments to municipalities as part of the municipal fiscal equalization scheme ("Schlüsselzuweisungen) in relation to regional GDP *Fiscal Assignments in €/GDP in €*	Fiscal Transfer: Quarterly Cash Statistics of the federal government and the federal states GDP: Working Group „National Accounts oft he Federal States. - "Arbeitskreis Volkswirtschaftliche Gesamtrechnungen der Länder
LGRW	Total GRW funding intensity *GRW Industry funding + GRW Infrastructure funding in €/GDP in €*	GRW: Federal Office for Economic Affairs and Export Control (BAFA) GDP: Working Group „National Accounts oft he Federal States. - "Arbeitskreis Volkswirtschaftliche Gesamtrechnungen der Länder
LOVN	Overnight stays in tourism businesses *Overnight stays in tourism businesses/population*	Monthly Tourism Survey of Federal Government and Federal States
LSCO	General education schools per 10.000 inhabitants Sum of general education schools (Elementary + Secondary Schools)/Population*10.000	Statistical Office of Federal Government and Federal states
LEMPL	Employment rate at workplace *Employees total /Population aged 15 to 64 years*	Employees: Institute for Employment Research (IAB) Population (15-64): Statistical Office of Federal Government and Federal states
LINC	Mean disposable household Income *Disposable income of private households/population*	National Accounts of Federal States ("Volkswirtschaftliche Gesamtrechnung der Länder")
LLAPR	Prices of sold land plots ready for development per m² Total purchase value of sold land ready for development in €/sold land ready for development in m²	Statistical Office of Federal Government and Federal states
LGDP	Nominal gross-domestic product per capita *GDP in €/population*	Working Group „National Accounts oft he Federal States. - "Arbeitskreis Volkswirtschaftliche Gesamtrechnungen der Länder

LMIG	Internal net migration balance *(in-movers – out-movers from/to German regions)/ population*	Migration statistic of the federal government and the federal states
LMIG18-24 **LMIG25-29** **LMIG30-49** **LMIG50-64** **LMIG65**	Internal net migration balance of 18-24 (25-29; 30-49* ;50-64; >65)-year olds. *(in-movers – out-movers in age group from/to German regions)/ population in age-group* **LMIG 30-49 also includes underaged*	Migration statistic of the federal government and the federal states

All variables are set to the natural logarithm (ln), except for the net migration balance, due to the occurring negative numbers. The presence of non-stationarity in the time-series (unit roots) can become a serious problem for panel data with long time periods (Im, Pesaran & Shin, 2003). The corresponding test detected unit roots for the variable LEMPL and the spatial lags of LINC and LMIG (see section 6 for computing and use of spatial lags). For this reason, we created stationarity in these variables by eliminating linear time-trends in the variables LEMPL, LINC and LMIG and their spatial lag variables. Summary statistics of all variables are given in Table 2.

TABLE 2: Summary Statistics of Variables 2000 to 2014

Acronym	Observations	Min	1. quarter	Mean	3. Quarter	Max	Std. Dev.
LMIG	3855	-0.370	-0.023	0.003	0.039	0.263	0.058
LMIG18-24	3855	-1.009	-0.194	-0.080	0.049	1.340	0.241
LMIG25-29	3855	-0.665	-0.156	-0.070	0.037	1.062	0.172
LMIG30-49	3855	-0.424	-0.020	0.013	0.051	0.269	0.060
LMIG50-64	3855	-0.178	-0.005	0.015	0.032	0.173	0.031
LMIG65	3855	-0.238	-0.000	0.021	0.039	0.183	0.035
LFT	3855	-6.908	-4.668	-4.339	-3.960	-2.681	0.599
GRW	3855	-18.421	-18.421	-13.232	-6.690	-2.576	5.941
LOVN	3855	-0.693	0.693	1.278	1.825	3.764	0.850
LSCO	3855	0.793	1.250	1.410	1.562	2.296	0.234
LEMPL	3855	-0.949	-0.630	-0.532	-0.423	-0.202	0.145
LINC	3855	6.875	7.073	7.145	7.224	7.547	0.114
LLAPR	3855	0.793	3.800	4.327	4.845	6.847	0.748
LGDP	3855	9.393	9.962	10.139	10.309	11.115	0.266

**To overcome problems with zeros in the data sets, zeros in the policy input variables are replaced by very small numbers prior calculation of the ln*

6. ECONOMETRIC APPROACH

The variety of considered regional policy effects represents the complex mutual interactions between economic and socioeconomic variables in time and space. This impedes model building and is reflected in the variety of methodological approaches in place-based policy evaluation. We follow a flexible vector-autoregressive (VAR), first proposed by Sims (1980), that has

become a standard part in econometric modelling of time series forecasting and recently drew some attention in related spatial policy analysis, used by Eberle et al. (2019) and Mitze et al. (2018). Our model basically follows their recent SpVAR approaches that include two main advancements that adapt the VAR for panel data analysis and account for the explicit spatial dimension by correcting for spatial autocorrelation (Holtz-Eakin, Newey & Rosen, 1988; Beenstock & Felsenstein, 2007; Di Giacinto, 2010). The models main advantages are its ability to analyze dynamic direct and indirect relationships among variables while having marginal a priori model restrictions and the visualization of relationships between variables in impulse response functions (IRF). Moreover, the approach is able to consider that actual migrations are time lagged to changes in the push and pull factors of migration.

VAR estimations are based on the assumption that every variable depends on its own past and the past values of every other variable in the system. Variables are given in Table 1, LFT and LGRW as well as LMIG and its sub-variations define alternative models and are not used in the same equation models. Migration and inflation dynamics, trade cycle effects, especially the economic crisis beginning in 2008, and cross-sectional heterogeneity in the dataset require to control for regional and time fixed effects (μ and τ). Hence, we specify a panel VAR equation system with M *(=8)* equations that can be aggregated to the following form by matrix notation (Rickmann, 2010; Mitze et al., 2018):

$$y_{it} = \mu_i + \tau_t + \mathrm{A}y_{it-1} + \varepsilon_{\mathrm{it}} \quad (1)$$

Where *A* is a M*M matrix of regression coefficients that describes the relationship between past values and current values, ε is a vector of error terms with the covariance matrix Σ_e and i and t represent region and time. The considered lag length is 1 as AIC tests prove that further lags have no additional explanatory power. However, the lack of theoretical assumptions treats all variables as completely endogenous. This is not appropriate for policy analysis since real

reciprocal relations are ignored and over-parametrization results in biased impulse-response-functions (Di Giacinto, 2010, Rickmann, 2010). The structural VAR (SVAR) model uses a priori theoretical assumptions to the endogeneity of variables to account for the economic structure of variables and gain orthogonalized shocks for calculating impulse response functions (Bernanke, 1986). In line with the mentioned papers we use a recursive causal ordering on ascending endogeneity of variables to impose a correct specification and perform a triangular Choleski identification scheme to the covariance matrix of the residuals from the reduced form VAR. The variable ordering is used as in Table 1 based on theoretical assumptions on ascending endogeneity and indications from Granger-Causality test for panel data (proposed by Dumitrescu & Hurlin (2012); results reported in Table A1). Results confirm, that in particular GRW is exogenous, while the exogeneity of fiscal transfers is limited. The other variables in the VAR show mutual granger causality.

We account for the spatial dimension to overcome problems with spatial dependency and regional spillovers as done in Beenstock & Felsenstein (2007), Di Giacinto (2010), Mitze et al. (2018) and Eberle et al. (2019). Applying a Morans-I Test we found evidence for spatial autocorrelation in every variable except LEMPL. For this reason, we apply a Spatial-Durbin-Model and include spatial lag variables as additional independent variables to the M-equations of (1):

$$y_{it} = \mu_i + \tau_t + \mathrm{A}y_{it-1} + HWy_{it-1} + \varepsilon_{it} \tag{2}$$

where H is a M*M matrix of regression coefficients equivalent to A and W is a region specific identity spatial weight matrix representing neighboring regions and constant over all M-equations and over time, which means that the spatial lag of y_{it} represent the mean value of y_t in all neighboring regions. Only the coefficients of A are important for the further analysis, whereas H is only used to calculate unbiased coefficients of A.

6.1. Impulse-Response Functions

In the next step, we calculate impulse-response-functions of every variable *m* in the VAR to uncorrelated exogenous changes (shocks) in other variables based on the results of *(2)* (Lütkepohl 2005). To assess the statistical significance of the resulting IRFs we calculated confidence intervals by performing Monte Carlo simulations, and applied the approach to randomly generated data sets of same size that result from a redraw (with reclines) of random regions from the original data set with all their attributes over time, while the isolated initial shocks are hold constant.

Since regions are heterogeneous in their economic strength and living conditions, we examine conditional effects and different regional or structural transmission paths by running the presented SpVAR model separately for different sub-samples of our dataset. Subsamples represent the former Western and Eastern regions[7] (**SWEST; SEAST**), structural types of labor market regions (urban (**SURBAN**), rural regions with areas of concentrated population (**SRUCO**) and rural region (**SRURAL**)[8]) and different levels of municipal tax income/capita **(STAXLOW; STAXMED; STAXTOP; separated according to quantiles).** Visualizations of subsamples are given in Figure A1. It might be considered that the average fiscal equalization transfers and GRW funding are larger in the subsamples with lower fiscal capabilities. Thus, latter sample building is not completely exogeneous. However, there is no indicator that allows to account for economic strength or regional living conditions and proves complete exogeneity from the used variables. Again, shocks are constant for all subsamples.

[7] Berlin is excluded due to its history in both subdivisions.
[8] Official Classification of labor market region types according to settlement structure by the German Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR, Status 31.12.2015).

6.2. Robustness Checks

To test the robustness of our results we applied the following checks. First we tested the results of fiscal equalization policy by calculating the equalization grants in € per capita to control for possible correlation of transfer grants with regional GDP development. Second, we tested the robustness of GRW effects by estimating a SpVAR that includes only regions that received any GRW funds. Finally, we added the regional endogenous tax revenues and policy grants from the Federal Urban Development, Fiscal Equalization and GRW program as additional exogenous variables to the underlying estimation to make further controls on additional income sources. All results reported in section 7 are verified by these tests.

7. EMPIRICAL RESULTS

As we will show in this section, results from both policies differ strongly. However, all impulse-responses that do not involve policy inputs remain remarkably robust in comparison of both SpVAR-models, which confirms adequate choice of the model and included variables. The results suggest that shocks in schools, GDP and in particular in the household income have significant positive effects on the regional net migration rate, respectively living conditions, while an increased number of jobs and land prices have no significant effects on the migration balance *(Figure A4).*

7.1. Fiscal Equalization Effects

We start by studying the impulse-responses of fiscal equalization payment input shocks. Results prove, that the reaction of regional migration balances to fiscal equalization inputs *(shocks)* is positive from one year after funding up to four years after, whereas fiscal transfers have no significant positive effects on other variables except schools (*Figures 3 and A2*). The response of GDP/capita on fiscal transfers is found to be significantly negative. This may be explained by the increasing population due to the positive migration effect. The fiscal transfer seems to make

the region more attractive, so that more people stay without implying more jobs, at least in the short run. As a consequence, the economic activity per inhabitant decreases. Overall, we do not observe any fiscal transfer induced economic growth effects.

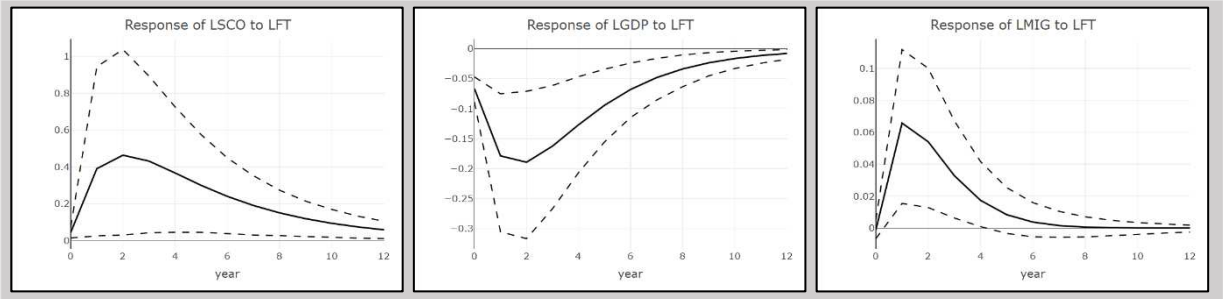

FIGURE 3: Impulse Responses to isolated fiscal transfer shocks based on SpVar Estimation with fiscal transfer inputs. Note: Estimated Impulse response functions are solid lines. Dashed lines represent 95% coefficient intervals from Monte Carlo Simulations with 500 repetitions. IRFs display responses to a shock = Standard deviation of impulse variables. Responses are given in percent.

Studying the subsamples explained in section 6, net migration responds significant positive to equalization grants up to nine years after the initial funding in the eastern regions **(SEAST),** which have on average lower population density, are weaker in terms of regional economic situation and predominantly experience constant out-migration (*Figure 4*). Results are positive but not significant in the West **(SWEST)**. In line with this, net-migration responds in particular positive in regions with low tax income **(STAXLOW)**, which supports the hypothesis that especially regions with low tax income are able to improve their living conditions due to enhanced fiscal capacities. Considering settlement structures, significant positive effects of fiscal transfers on migration are only found for urban regions **(SURBAN).** Combining these findings, we can conclude that especially urban regions with low tax income can improve their attractiveness through fiscal transfers.

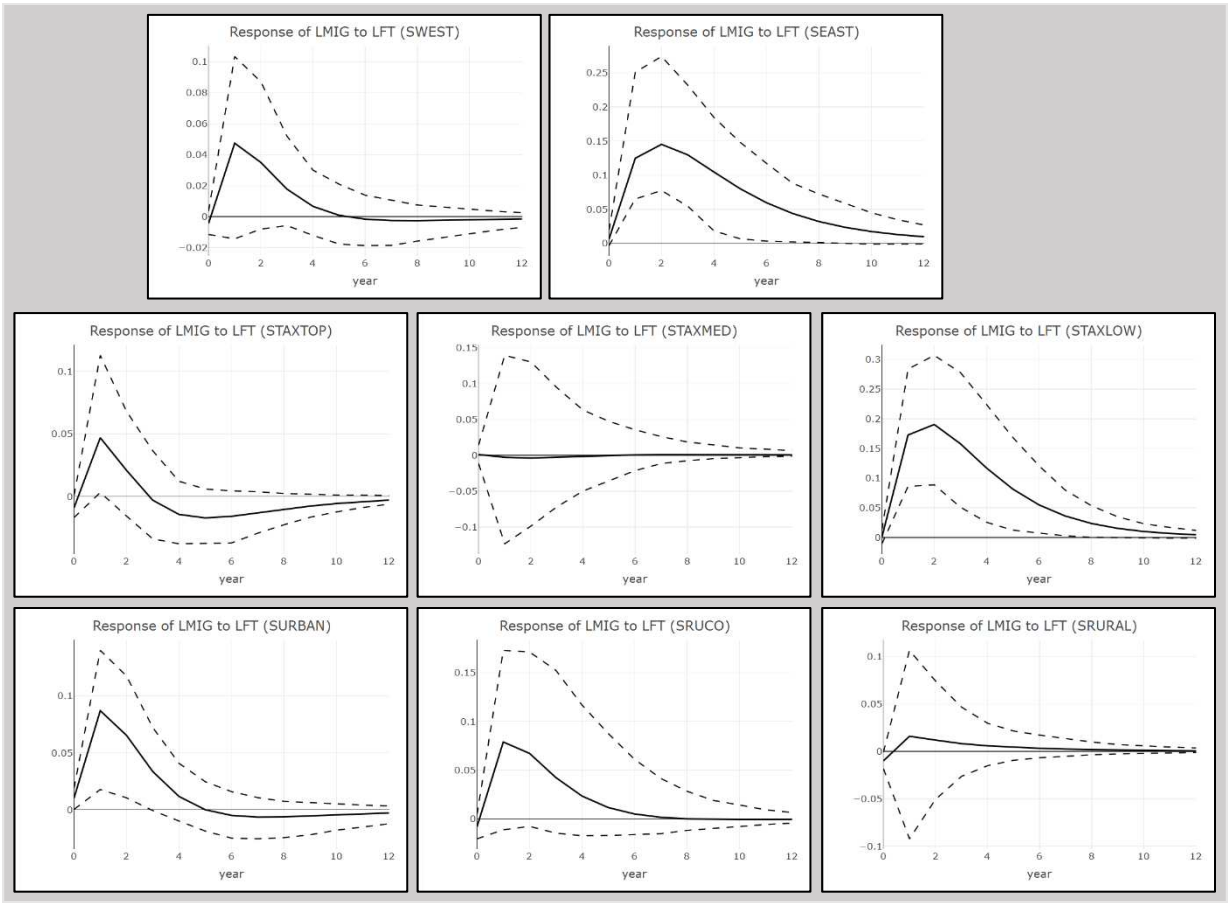

FIGURE 4: Response of Net migration to fiscal transfers in subsamples. Specifications equal Figure 3. Policy shocks are hold constant over subsamples

We conclude, that these findings primarily result from decreasing out-migration from structurally weak regions due to reductions of local push factors. Equalization grants seem to encourage regions that have poorer living conditions and normally derive outward migration to improve living conditions and stabilize migration dynamics. As we found no evidence for labor market or income effects, improvements in the supply and quality of non-economic local amenities seem to cause this effect. This results confirm the home-bias to be an important mechanism. Personal income opportunities are offset as long as local amenities do not fall below an individual threshold level.

Applying the SpVAR to the migration rates across age groups provides evidence that significant positive responses in the net migration rate persist for the groups LMIG25-29 and LMIG30-49. Responses of 18-24 year olds are visible, but not significant in the total sample (*Figure 5*).

Migration decisions of above 50 year olds show no reaction to additional amenities created by equalization grants. Thus, **H1**, stating effects for all age groups is not confirmed. However, it might also be the case that effects for older people are not observed, because they rarely migrate anyhow. Detailed information for significant results in all subsamples and age-subgroups are given in table 3.

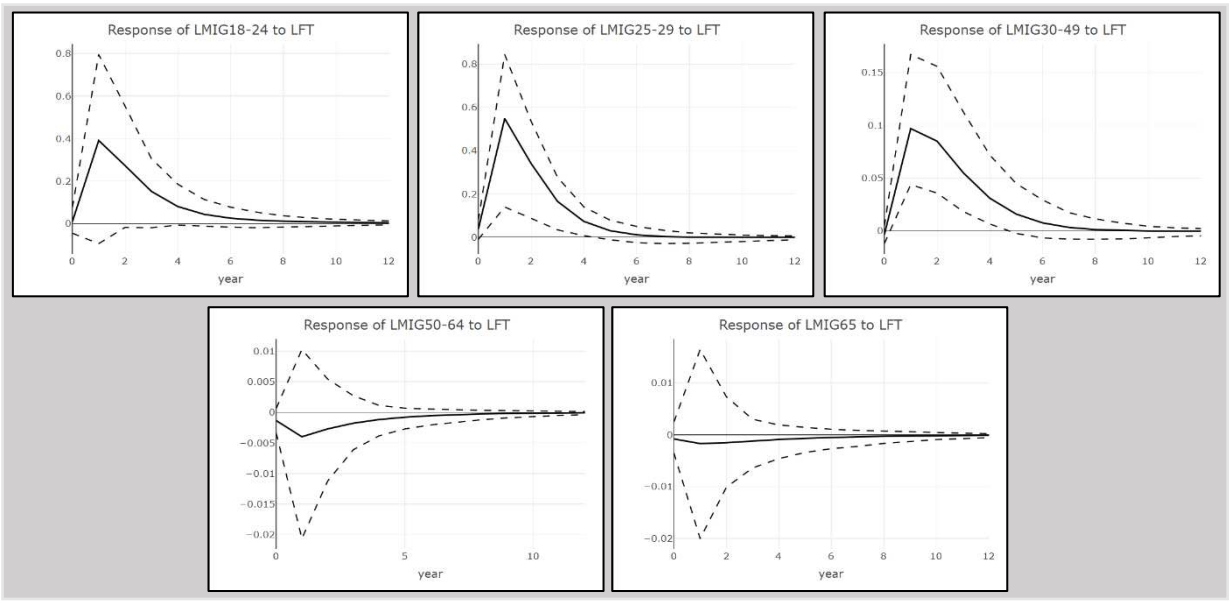

FIGURE 5: Responses of Net Migration in different age groups to fiscal transfer shock. Specifications equal Figure 3.

The results indicate that equalization grants are an adequate instrument to reduce disparities in perceived regional living conditions. The rate of young and middle-age persons that decide to stay in underperforming regions instead of searching for better conditions elsewhere can be increased by shifting financial resources to regions with low endogenous income. The above findings suggest, that equalization transfers are able to stabilize the demographic balance of the affected regions to a certain point, although they do not appear to reduce economic inequalities. The reduced out-migration should result in increasing regional labor-supply and endogenous economic growth effects in the long run, if the additional population is linked to increasing human capital.

7.2. GRW Effects

In the case of GRW, we find that there is no significant overall relationship between funding and regional net migration rates. The respective Granger-Causality-Test also indicates that GRW effects can only appear due to indirect transmission channels (see Table A1). The impulse-responses depicting the reactions of the various variables to GRW inputs are shown in Figure 6 and A3. The results indicate that GRW has negative impact on regional tourism, what might be provoked by additional industry infrastructure that possibly affects the attractiveness of a region in a negative way. Furthermore, we detect a significant negative response of schools in the funding year. Both employment and GDP responses show an immediate negative not significant reaction to GRW. The reaction of both variables turns into a positive response after a few years (significant in the case of employment), but total effects are not necessarily positive. However, GRW funding seems to improve the economic situation in the long-term. The household income indicates no significant response to GRW as well as the net migration rate. This remains true for both GRW-Industry and GRW-Infrastructure scheme subsidies.

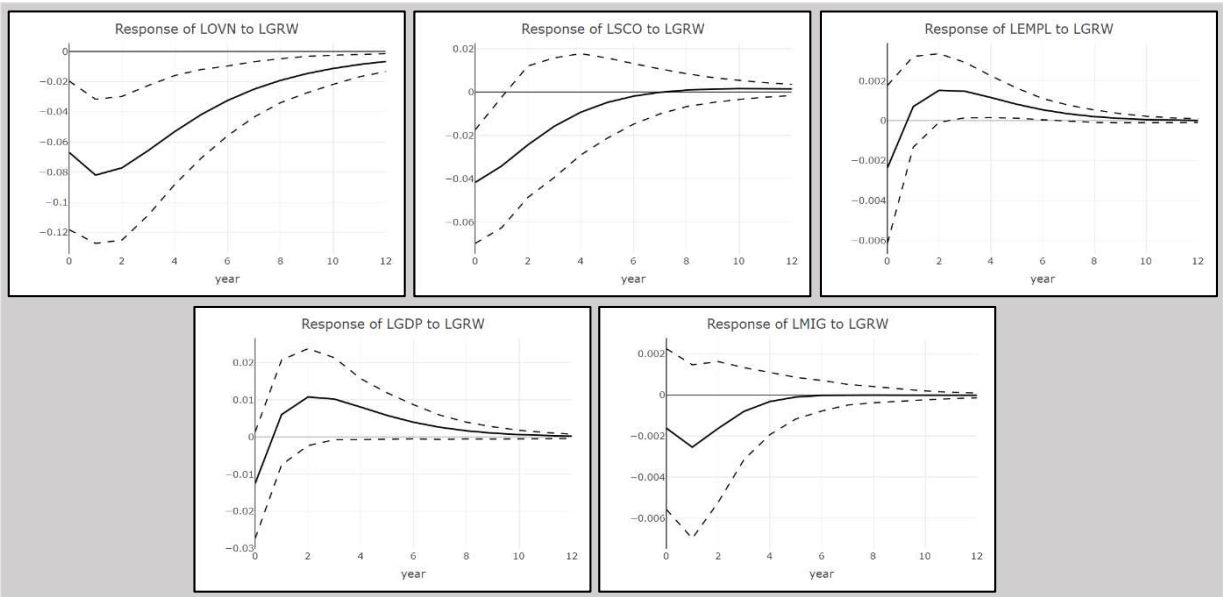

FIGURE 6: Impulse-Responses to isolated GRW shocks based on SpVar Estimation with GRW subsidies (LGRW). Specifications as in Figure 3.

Further results do neither indicate significant responses of net migration rates to GRW funds in West- nor in East-German regions. Short-time significant effects appear in the year of funding in the subsample **STAXTOP,** but not in regions with lower tax income. Since only 5 out of 86 regions in the **STAXTOP** subsample received any GRW subsidies, results are built on small numbers. The significant positive response of net migration in rural regions (**SRURAL)** up to three years after funding indicates that GRW has positive effects on living conditions in rural regions, although we find no evidence that this is accompanied by a significant GRW induced economic growth effects. The subsamples **SURBAN** and **SRUCO** do not respond in a significant matter.

A look into the age groups within different subsamples reveals positive responses to GRW funding for the age group 25-29 in the intersection of **STAXTOP, SRUCO** and **SRURAL.** This proves the hypothesis **H2** stating age group 25-29 to be most sensitive to GRW funding, probably due to the economic effects. Against this hypothesis, we observe slight positive short-time migration responses for the age group 50-64 in the East and in rural regions. This might be caused by supporting low-level jobs in these regions. Less explainable, significant effects for persons older than 65 years are found one year after funding in the western regions. Detailed information for significant effects in all subsamples and age-subgroups are again given in Table 3.

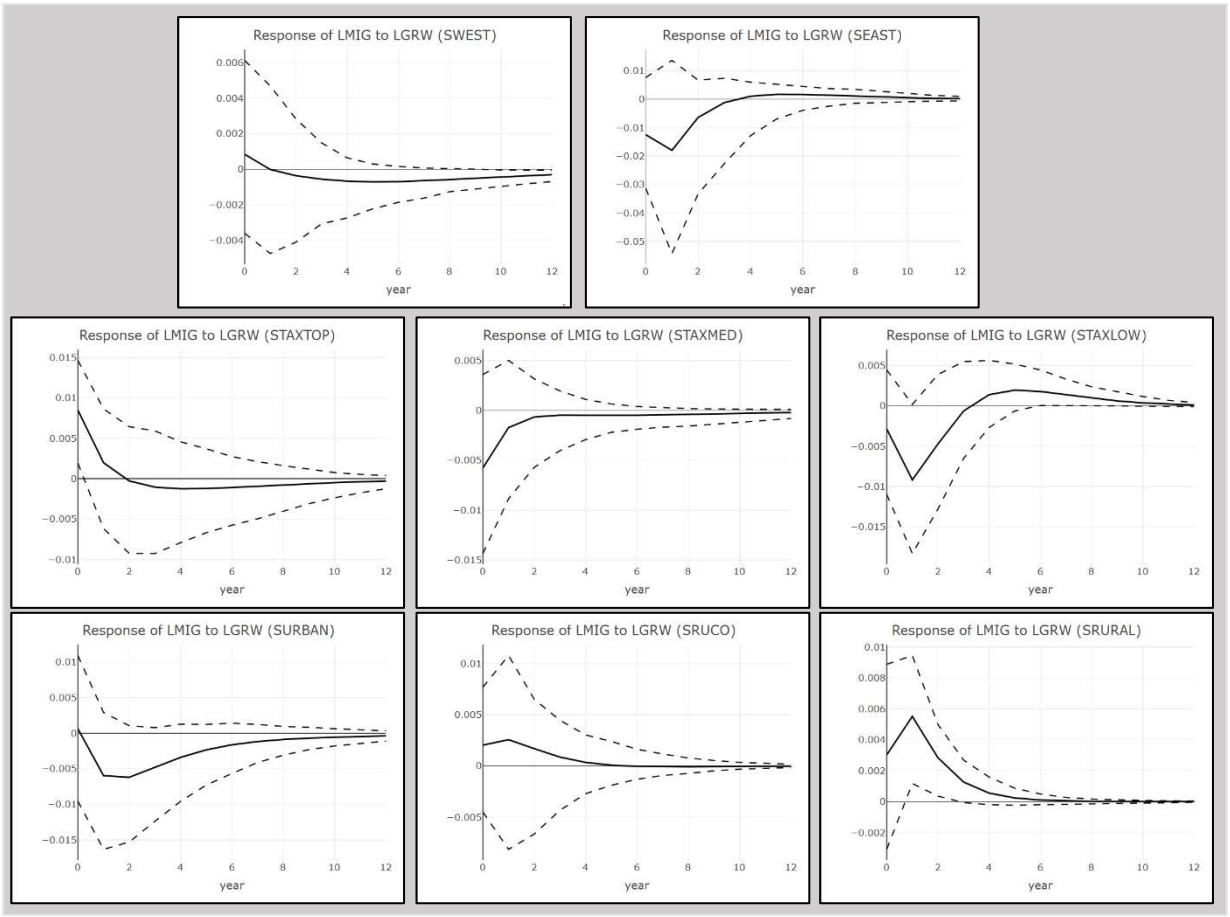

FIGURE 7: Response of Net migration to GRW subsidies in subsamples. Specifications equal Figure 6. Policy Shocks are hold constant over subsamples.

We can conclude that GRW funding has only small effects on regional living conditions as there is no significant response in the total sample and only few significant responses in specific subsamples. Present effects are found mainly for regions with high tax income and for rural regions, which indicates differing mechanisms between GRW and equalization grants. With respect to living conditions (measured by migration), GRW does not satisfy the equity criterion of funding, as regions with low endogenous capabilities do not profit in a measurable way. At the same time GRW seems to have positive effects mainly in rural areas, while fiscal equalization funds are most effective in urban areas (see Table 3).

TABLE 3: Summary of estimated Impulse-Responses of LMIG variations to policy input in subsamples. Results are verified by robustness checks. Bold variations respond significant positive within the whole time period.

Effect strength	**significant positive response (at least one time point)**	
Policy	***LFT***	***GRW***
Total Sample	*Total* *25-29* *30-49*	-
SWEST	*30-49*	*65+*
SEAST	***Total*** ***18-24*** ***25-29*** *30-49*	*50-64*
STAXTOP	-	*25-29*
STAXMED	-	
STAXLOW	***Total*** *18-24* ***25-29*** ***30-49***	-
SURBAN	*Total* *25-29* *30-49*	-
SRUCO	*30-49*	*25-29*
SRURAL	-	*Total* *25-29* *50-64*

8. CONCLUSIONS

The central aim of this paper is to investigate whether German redistribution policies contribute to their regional equity goal and improve the perceived living conditions in the supported regions. Changes in regional net migration rates are used as indicator for the development of regional living conditions. The results from a SpVAR-model applied to 257 German labor market regions in the time period 2000-2014 provide new insights, pointing to very different effects of fiscal equalization and structural GRW funding. Given their different aims this not surprising but the detailed differences in their effects on the living conditions have not been studied before.

First, we find empirical evidence that the fiscal equalization scheme is an appropriate and effective policy to enhance regional equity between German regions, since it is able to significantly improve migration development in particular in regions with low endogenous fiscal capacities and for all age groups up to 50-year-old persons. Especially municipalities with small

tax incomes that predominantly experience outward migration and are structurally lagging behind seem to benefit from the additional financial capabilities. As no evidence for substantial economic growth is found, we conclude that the higher degree of financial freedom allows to enhance or maintain supply and quality of public services and public infrastructure financed by the municipal budget. This results in enhancements in the perceived living conditions on the individual level to a measurable share of people and hampers outward migration from structurally weak regions. Because our model has some limitations in terms of selection and availability of appropriate indicators displaying non-economic amenities, future research can refer to these findings and attain a detailed look into the actual transmission paths and the underlying mechanisms.

Second, we find no evidence for an overall impact on perceived living conditions of GRW policy. In contrast to fiscal equalization grants, some positive effects on regional migration rates are found in rural regions and regions with higher endogenous tax revenues. We find no evidence that GRW funding increases equity in the form of improving living conditions in poor regions. Taking into account all findings, both examined policy measures contribute to equal living conditions in a specific way. Fiscal equalization seems to have no short- or medium-run economic effects but is quite effective in regions with low fiscal income to improve living conditions, especially in urban areas. In contrast, GRW funding rather impact on the economy and is most effective in rural regions with comparably high fiscal income.

Our results point out, that there is a very strong positive relationship between household income and regional migration rates across all subsamples. Hence, policies that work towards cohesion of regional incomes appear to be efficient strategies to adjust experienced inequalities in the living conditions. The model can be easily extended to further place-based policies. For instance, we did not find any empirical evidence for significant effects on living conditions of the German Federal Urban development program in any of the presented subsamples. Further research

interest is obtained by EU cohesion policy. It would be interesting to apply our approach to the EU structural cohesion funds.

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Appendix

Tables

Table A1: Panel Granger Causality Test (lag =1)

GRANGER CAUSES →	LFT		*LGRW*		LUDP		LOVN		LSCO		LEMPL		LINC		LLAPR		LGDP		LMIG	
↓	value	p-value	*value*	*p-value*	value	p-value	value	p-value	value	p-value	value	p-value	value	p-value	value	p-value	value	p-value	value	p-value
LFT	x	x	-	-	-	-	5.647	0.000	7.805	0.000	12.25	0.000	-2.70	0.007	0.821	0.411	-0.40	0.689	6.666	0.000
LGRW	-	-	x	x	-	-	1.679	0.093	2.983	0.003	4.114	0.000	-0.36	0.717	2.066	0.039	-0.26	0.788	1.309	0.191
LUDP	-	-	-	-	x	x	6.102	0.000	3.618	0.000	8.631	0.000	0.638	0.524	2.545	0.011	-1.53	0.125	2.513	0.012
LOVN	11.76	0.000	7.962	0.000	7.217	0.000	x	x	11.16	0.000	25.89	0.000	0.054	0.957	3.086	0.002	2.259	0.024	18.14	0.000
LSCO	5.240	0.000	3.079	0.002	5.776	0.000	16.42	0.000	x	x	21.39	0.000	2.808	0.005	2.424	0.015	5.93	0.000	6.174	0.000
LEMPL	1.614	0.107	-1.39	0.163	-1.18	0.237	6.359	0.000	9.565	0.000	x	x	8.891	0.000	0.555	0.579	5.961	0.000	19.31	0.000
LINC	-0.02	0.977	-2.34	0.019	-1.38	0.166	3.782	0.000	4.304	0.000	3.863	0.000	x	x	0.773	0.439	9.307	0.000	7.561	0.000
LLAPR	1.084	0.279	1.889	0.059	1.659	0.097	4.348	0.000	2.769	0.006	5.994	0.000	1.953	0.051	x	x	1.135	0.257	1.661	0.096
LGDP	17.06	0.000	12.39	0.000	10.59	0.000	25.41	0.000	9.617	0.000	29.73	0.000	-4.89	0.000	10.64	0.000	x	x	10.29	0.000
LMIG	1.139	0.255	-1.32	0.186	-0.54	0.584	3.158	0.002	2.441	0.015	6.392	0.000	3.301	0.001	-6.85	0.493	-1.41	0.158	x	x

Note: Granger Causality Test is performed for every region, test as given in Dumitrescu/Hurlin (2012)
Alternative hypothesis = Granger causality given for at least one region
For LFT, LGRW_IND, LGRW_INF and LUDP: Only regions that are not =0 get tested

Table A2: Regression results of SpVar Fixed Effects Panel Models with Fiscal Equalization grants and time lag =1

DEPENDENT VARIABLES / REGRESSORS (T-1)	LFT	LOVN	LSCO	LEMPLL	LINC	LLAPR	LGDP		LMIG
LFT	0.491***	-0.020*	0.016*	-3.45e^{-4}	0.001	-0.012	-0.009*		0.005*
	(0.000)	(0.012)	(0.015)	(0.796)	(0.671)	(0.581)	(0.013)		(0.037)
LOVN	0.001	0.758***	-0.037***	0.002	0.003	0.099**	0.006		0.006**
	(0.967)	(0.000)	(0.000)	(0.282)	(0.097)	(0.001)	(0.254)		(0.091)
LSCO	0.134**	-0.027	0.727***	0.002	0.004	-0.045	0.005		0.010
	(0.001)	(0.113)	(0.000)	(0.557)	(0.088)	(0.324)	(0.480)		(0.055)
LEMPL	0.249	-0.160	-0.193	0.524***	-0.007	0.230	-0.106*		0.029
	(0.250)	(0.080)	(0.802)	(0.000)	(0.590)	(0.350)	(0.010)		(0.279)
LINC	-0.266	-0.031	0.010	0.115***	0.627***	0.263	0.061		0.145***
	(0.296)	(0.774)	(0.915)	(0.000)	(0.000)	0.361	(0.208)		(0.000)
LLAPR	0.021	-0.003	-0.003	-0.001	-0.002	0.272***	-0.003		3.04^{e-6}
	(0.160)	(0.687)	(0.528)	(0.384)	(0.101)	(0.000)	(0.270)		(0.987)
LGDP	-0.607***	0.016	0.068**	0.025***	-0.006	-0.226**	0.657***		0.037***
	(0.000)	(0.597)	(0.008)	(0.000)	(0.191)	(0.005)	(0.000)		(0.000)
LMIG	-0.226	0.022	-0.004	0.005	-0.022**	0.002	-0.080**		0.374***
	(0.098)	(0.703)	(0.930)	(0.618)	(0.009)	(0.988)	(0.002)		(0.000)
SPL_FT	0.021	0.028*	0.038***	0.003	-0.004*	-0.030	0.004		-0.005*
	(0.481)	(0.026)	(0.000)	(0.187)	(0.047)	(0.367)	(0.443)		(0.149)
SPL_OVN	-0.038	0.001	0.003	-0.004	0.001	-0.171***	-0.016		-0.003
	(0.407)	(0.966)	(0.833)	(0.248)	(0.693)	(0.001)	(0.064)		(0.654)
SPL_SCO	0.071	-0.026	-0.038	-0.023***	-0.004	0.110	-0.019		-0.014*
	(0.221)	(0.292)	(0.062)	(0.000)	(0.325)	(0.092)	(0.067)		(0.045)
SPL_EMP	-0.574	-0.025	0.337**	-1.45e^{-4}	0.019	0.224	0.014		-0.227***
	(0.109)	(0.870)	(0.008)	(0.995)	(0.389)	(0.581)	(0.839)		(0.000)
SPL_INC	0.403	0.145	0.378*	-0.012	-0.168***	-0.243	-0.091		-0.001
	(0.337)	(0.412)	(0.012)	(0.676)	(0.000)	(0.609)	(0.253)		(0.988)
SPL_LAPR	0.057*	0.028*	-0.017	-0.007***	-0.004*	0.194***	-0.012*		-0.006
	(0.30)	(0.012)	(0.072)	(0.000)	(0.015)	(0.000)	(0.018)		(0.057)
SPL_GDP	-0.364**	0.063	0.114*	-2.88e^{-4}	-0.021*	-0.549***	0.087***		2.34^{e-4}
	(0.005)	(0.256)	(0.014)	(0.975)	(0.012)	(0.000)	(0.000)		(0.989)
SPL_MIG	-0.446	0.038	0.067	0.027	-0.153***	-0.601	-0.043		-0.071*
	(0.112)	(0.748)	(0.505)	(0.174)	(0.000)	(0.058)	(0.417)		(0.042)
N	3598	3598	3598	3598	3598	3598	3598		3598
R^2	0.428	0.794	0.714	0.714	0.596	0.159	0.944		0.278

*Notes: Number of Regions = 257, P-values are given in parentheses, Significance codes: *** p<0.001 **p<0.01, *p< 0.05.*

Table A3: Regression results of SpVar Fixed Effects Panel Models with GRW subsidies and time lag = 1

DEPENDENT VARIABLES / REGRESSORS (T-1)	LFT	LOVN	LSCO	LEMPLL	LINC	LLAPR	LGDP	LMIG
LGRW	0.491***	-0.002**	0.001	$1.84e^{-4}$	$5.87e^{-5}$	$-3.28e^{-4}$	0.001**	$-1.30e^{-4}$
	(0.000)	(0.001)	(0.265)	(0.075)	(0.521)	(0.843)	(0.008)	(0.477)
LOVN	-0.226	0.759***	-0.038***	0.002	0.003	0.100**	0.008	0.005**
	(0.440)	(0.000)	(0.000)	(0.212)	(0.109)	(0.001)	(0.134)	(0.143)
LSCO	-0.325	-0.037*	0.732***	0.002	0.005	-0.048	0.002	0.012*
	(0.448)	(0.031)	(0.000)	(0.582)	(0.064)	(0.291)	(0.744)	(0.021)
LEMPL	1.946	-0.151	-0.030	0.524***	-0.007	0.231	-0.106**	0.029
	(0.401)	(0.098)	(0.701)	(0.000)	(0.598)	(0.348)	(0.010)	(0.281)
LINC	2.570	-0.021	0.020	0.113***	0.626***	0.261	0.059	0.145***
	(0.345)	(0.843)	(0.823)	(0.000)	(0.000)	0.365	(0.218)	(0.000)
LLAPR	-0.358*	-0.002	-0.002	-0.001	-0.002	0.270***	-0.003	$-2.53e^{-5}$
	(0.023)	(0.785)	(0.680)	(0.443)	(0.078)	(0.000)	(0.259)	(0.989)
LGDP	-2.365**	0.033	0.044	0.025***	-0.006	-0.207**	0.670***	0.031***
	(0.001)	(0.250)	(0.069)	(0.000)	(0.155)	(0.007)	(0.000)	(0.000)
LMIG	-0.857	0.024	-0.015	0.005	-0.022*	0.003	-0.080**	0.375***
	(0.557)	(0.675)	(0.763)	(0.641)	(0.011)	(0.983)	(0.002)	(0.000)
SPL_GRW	0.068	-0.001	-0.001	$2.418e^{-4}$	$9.06e^{-6}$	-0.006*	$-1.27e^{-4}$	$2.01e^{-4}$
	(0.002)	(0.465)	(0.329)	(0.095)	(0.943)	(0.015)	(0.743)	(0.431)
SPL_OVN	-0.057	-0.011	-0.011	0.004	0.002	-0.185***	-0.016	-0.001
	(0.907)	(0.582)	(0.501)	(0.193)	(0.460)	(0.000)	(0.059)	(0.901)
SPL_SCO	0.671	-0.012	-0.020	-0.021***	-0.005	0.090	-0.019	-0.017*
	(0.262)	(0.603)	(0.319)	(0.000)	(0.126)	(0.157)	(0.079)	(0.017)
SPL_EMP	-7.695*	-0.082	0.249	$-4.349e^{-5}$	0.025	0.236	0.023	-0.226***
	(0.043)	(0.584)	(0.051)	(0.999)	(0.255)	(0.559)	(0.731)	(0.000)
SPL_INC	0.038	0.154	0.424**	-0.012	-0.170***	-0.254	-0.094	$-1.99e^{-4}$
	(0.993)	(0.385)	(0.005)	(0.698)	(0.000)	(0.593)	(0.235)	(0.997)
SPL_LAPR	0.446*	0.027*	-0.011	-0.007***	-0.004*	0.192***	-0.012*	-0.006
	(0.101)	(0.015)	(0.229)	(0.000)	(0.010)**	(0.000)	(0.015)	(0.058)
SPL_GDP	-1.815	0.021	0.056	-0.003	-0.015*	-0.514***	0.083***	0.006
	(0.173)	(0.61)	(0.213)	(0.699)	(0.049)	(0.000)	(0.000)	(0.644)
SPL_MIG	-6.019*	0.028	0.018	0.025	-0.151***	-0.558	-0.036	-0.071*
	(0.044)	(0.814)	(0.858)	(0.205)	(0.000)	(0.078)	(0.490)	(0.040)
N	3598	3598	3598	3598	3598	3598	3598	3598
R^2	0.259	0.794	0.711	0.714	0.596	0.160	0.944	0.278

*Notes: Number of Regions = 257, P-values are given in parentheses, Significance codes: *** p<0.001 **p<0.01, *p< 0.05*

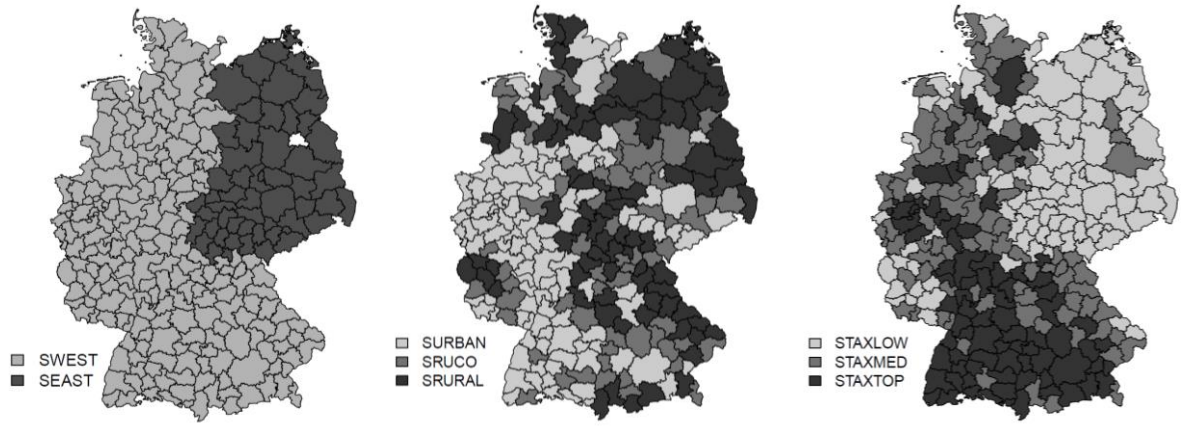

Figure A1: Subsamples used for SpVAR analysis.

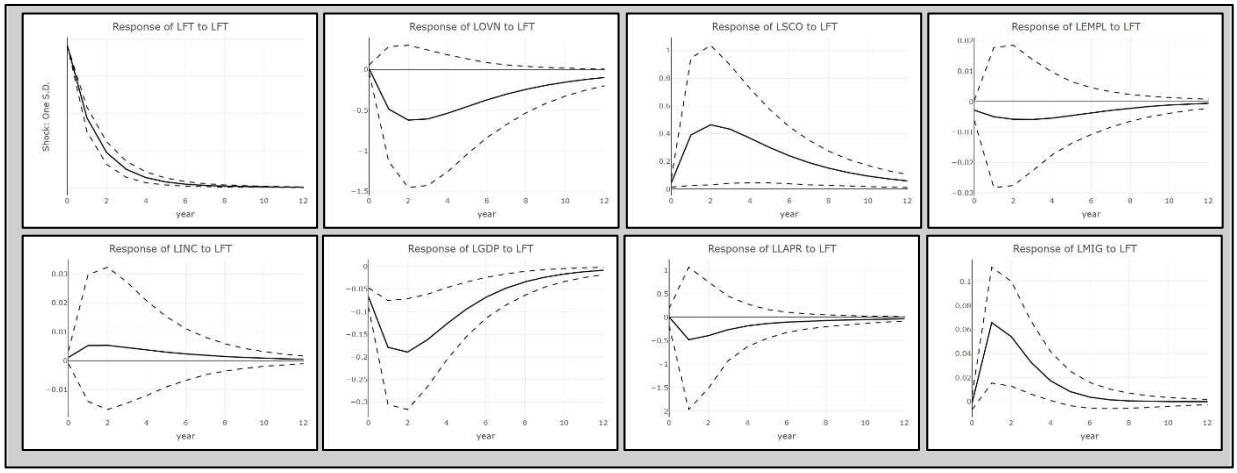

Figure A2: Impulse Responses to isolated fiscal transfer shocks based on SpVar estimation with fiscal transfer inputs in total subsample.
Note: Estimated Impulse response functions are solid lines. Dashed lines represent 95% coefficient intervals from Monte Carlo Simulations with 500 repetitions. IRFs display responses to a shock = Standard deviation of impulse variables. Responses are given in percent.

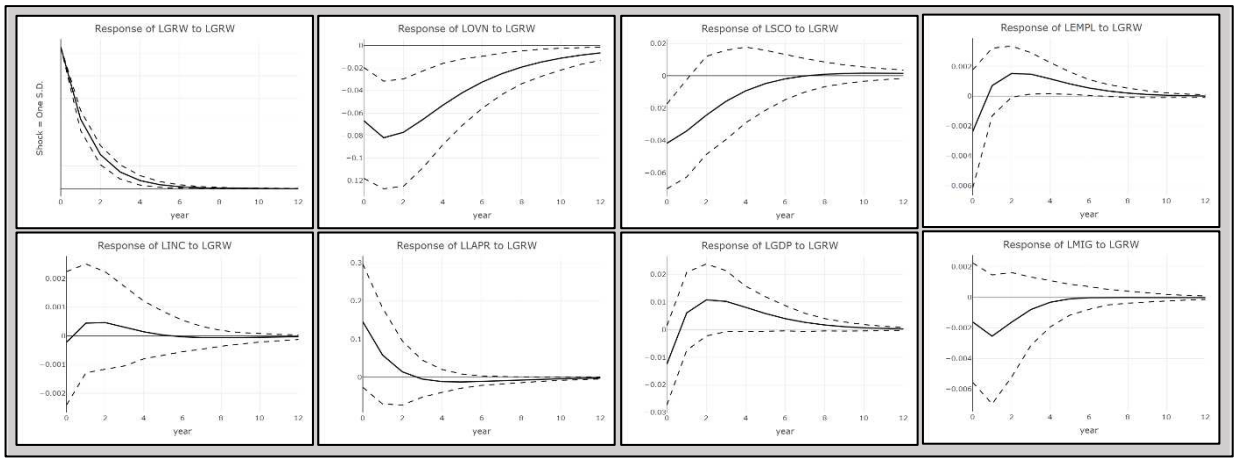

Figure A3: Impulse Responses to isolated GRW shocksba sed on SpVar estimation with fiscal transfer inputs in total subsample.
Note: Estimated Impulse response functions are solid lines. Dashed lines represent 95% coefficient intervals from Monte Carlo Simulations with 500 repetitions. IRFs display responses to a shock = Standard deviation of impulse variables. Responses are given in percent.

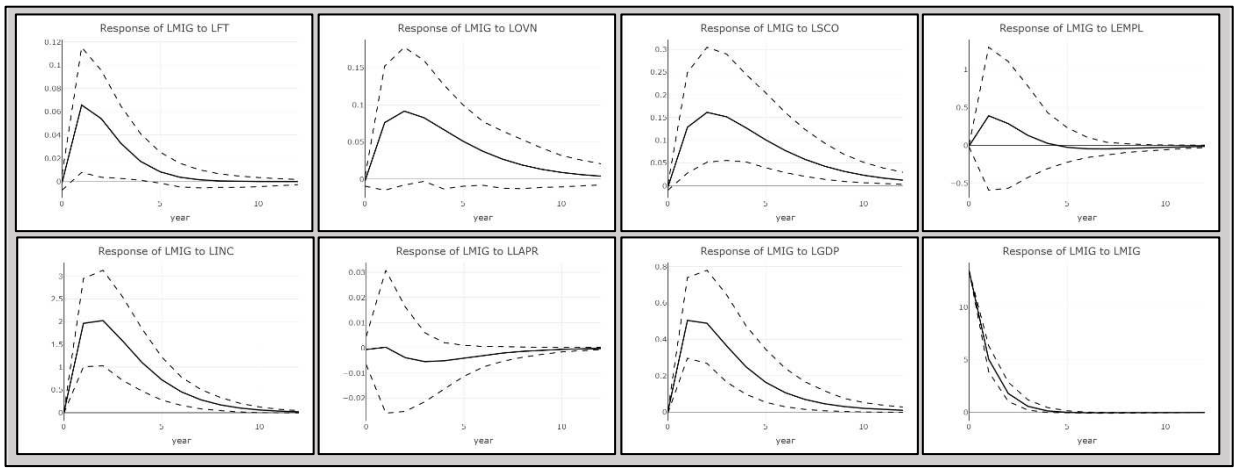

Figure A4: Impulse Responses to isolated variable shocks on regional net migration rates based on SpVar estimation with fiscal transfer inputs in total subsample.
Note: Estimated Impulse response functions are solid lines. Dashed lines represent 95% coefficient intervals from Monte Carlo Simulations with 500 repetitions. IRFs display responses to a shock = Standard deviation of impulse variables. Responses are given in percent.