In Search of Tiebout's "Vote with Their Feet" Mechanism in Bavaria

by

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Abstract: This paper analyzes the Bavarian population's demand for nature conservation. Drawing on the approach of revealed preferences, in particular Tiebout's (1956) "vote with their feet" mechanism, migration patterns in Bavarian counties are examined to assess the role of biodiversity in migration decisions. The results show a clear pattern of demand for natural amenities within the migration decision. However, other factors, for example, employment opportunities, should not be ignored as their importance may outweigh the desire for biodiversity.

Keywords: migration, biodiversity, Bavaria

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1. Introduction

In 2010, the European Commission ordered a survey of Europeans' attitudes toward the issue of biodiversity (EC 2010). German respondents to this survey tend to be well informed and interested in biodiversity compared to other European citizens. However, their awareness of the Natura 2000 network or the role of nature protection areas is at a level below the EU average. While the German respondents stated that there is a moral responsibility to protect biodiversity and pointed out the recreational value of biodiversity (both above the European average), they did not perceive biodiversity as a source of goods (food, fuel, medicine) nor do they undertake efforts to conserve it (both lower than the EU average). Instead, German respondents demanded stricter regulation of the economy as well as an increase in nature conservation areas or financial rewards, e.g., for farmers (all above the EU average). In general, this survey revealed that across the EU the threat to biodiversity is more seen as a global issue rather than a local one and, in particular, even though individuals claim not to experience any impact of biodiversity loss on their daily life, they are in general agreement that there is a moral duty to protect biodiversity (e.g., in respect to their children). According to this survey, there is a rather general demand for biodiversity conservation, which is in line with Farzin and Bond (2006), who claim that social attitudes toward nature conservation are motivated by the wish to secure amenities rather than to improve the actual state of nature. Thus, it may appear at first glance that rising income leads to an increase in demand for biodiversity, but this growing environmental awareness seems to be based on the desire to maintain the attained living standard (e.g., visiting parks) (Farzin/Bond 2006).

One way to calculate the demand for nature conservation (such as biodiversity) is to conduct surveys, a method categorized as "stated preferences." Another way is to use "revealed preferences."[1] Under this method, individuals' actual activities are used as indicator of their preference structure. Within the realm of "revealed preferences," this paper draws on the theory proposed by Tiebout (1956), which states that people select themselves into clubs by "voting with their feet," i.e., migration. In this paper, it is argued that individuals who migrate to Bavaria may do so due to the local abundance of biodiversity in Bavaria and therewith are revealing a preference for environmental aspects (in addition to income and/or employment considerations). Whether biodiversity adds to the explanation of variance in migration data is the subject of the following empirical research. Therefore, after a literature survey of research

[1] For a more detailed discussion of the advantages and disadvantages of different preference measurement methods, see Münch et al. (2010).

in the realm of Tiebout (1956), migration patterns in Germany are described. This general discussion is followed by an empirical analysis of the impact of biodiversity on migration behavior, with particular focus given to the question of whether migration patterns in Bavaria can be traced back to biodiversity.

2. Literature Review

In his work of 1956, Tiebout argues that under special circumstances one may detect a population's preferences for the provision of public goods by allowing people to "vote with their feet." He refers to public goods restricted by nature (e.g., the length of beaches) but also to those provided on a local basis such as police or fire protection. Under the assumptions that individuals (1) are fully mobile and (2) possess perfect knowledge, they may choose the community in which to live that best satisfies their preference pattern for public goods. Therefore, (3) there will be a large number of communities from which to choose. Furthermore, (4) restrictions due to, e.g., employment opportunities, and (5) externalities between communities are not considered. Additionally, (6) the optimal community size is based on natural constraints. Thus, (7) communities below optimal size seek to attract new residents to lower average costs, and those above optimum size do just the opposite (e.g., raise taxes or housing prices). Hence under these seven assumptions, a kind of selection process should reveal the true preferences for the provision of public goods if consumers are rational. The greater the number of communities and the greater the variance among them, the closer the consumer will come to fully realizing his or her preferences (including non-economic variables) and with this disclose his or her real demand for the provision of public goods. Local governments may seek to attract consumers in order to reach optimal community size but thereby the revenue-expenditure pattern remains constant. Although this pattern seems plausible, it has attracted criticism for several reasons. As Hirschman (1980) notes, the theory does not take into consideration that people may also reveal their preferences by using their voice, e.g., voting in local elections or engaging in local clubs, to influence local development instead of "just" leaving the community and moving to one that better suits their preferences. Hirschman (1978) also notes that both exit and voice may serve as feedback for local government. Thus, the local government may use public goods as a means to induce exit or to increase the loyalty of its population. Hence, the constant revenue-expenditure pattern assumed by Tiebout (1956) is here proposed to be increasing as a reaction to the exit of population. Thus, Tiebout's theory that people "vote with their feet" may not serve as a general theory for the provision of public goods as additional aspects (e.g., rent, wages) enter the individual utility function together with the public good provision (Bewley 1981; Mueller 2003). However, Tiebout's notion of "voting with their feet" may provide some insight into why people migrate and how they choose their new location and this in turn may provide an indication of preferences for public goods.

Empirical research reveals that not all public goods are suitable for revealing preferences. Tiebout's mechanism is shown for some local public goods, e.g., school quality (Edel/Sclar 1974, Munley 1982), air quality (Banzhaf/Walsh 2008; Brooks/Sethi 1997; Harrison/Rubinfeld 1978), and crime or poverty rate (Bayer/Ross 2009). For others, however, such as school expenditure, road maintenance (Edel/Sclar 1974), or hazardous waste cleanup (Greenstone/Gallagher 2008), either no effect is found, or only a weak impact for certain aspects, such as, e.g., job proximity (Bayer/Ross 2009).

Hirschman (1980) emphasizes that the ability to engage in voice and/or exit are not equally distributed in the population, but may depend on issues such as segregation, exit fatigue, band-wagon effects, or income. For example, Brooks and Sethi (1997) point out that black communities in the United States are mostly located in areas with greater exposure to air pollution. Moreover, geographic differences in social benefit provision (e.g., Aid to Families with Dependent Children (AFDC)) does not tend to incentivize black families to move (Cebula/Avery 1983). Orbell and Uno (1972), who found that blacks use voice more extensively than the exit option, therefore argue that segregation still plays a role and hampers mobility. Furthermore, the Tiebout mechanism seems to differ not only in respect to ethnic groups but also regarding urban and rural areas. For example, in a survey of Michigan households, Gramlich and Rubinfeld (1982) discover that the public good demand in urban areas conforms to the public good provision and that people with similar demand are grouped in communities. However, this effect only holds strongly for urban areas; it is weak in rural areas. Arguments to explain these selective effects of the Tiebout mechanism mostly refer to income disparity or to changes in public demand related to increasing age. Grubb (1982b) uncovers that upper-income residents (who are mainly white) tend to leave central cities and move to suburban areas. Hence, lower-income residents (and nonwhites) are remaining in city centers. This development can be described as a self-reinforcing process of "class flight," which interacts with employment opportunities ("jobs follow people" and "people follow jobs"), but seems not to depend on public services or tax rates. Grubb (1982b) bases his empirical findings on migration data from 1960–1970; Rebhun and Raveh (2006) extend this line of research by distinguishing between interstate migration of 1965–1970 and that of

1985–1990. They observe that income became less significant over time as a predictor for migration and that migration developed into a widespread phenomenon among different socioeconomic groups in the United States. In respect to gender, the probability of a female-headed household with little outside income leaving an area with low welfare payments and low wages is much higher than the probability of leaving a high-welfare, high-wage area (Blank 1988). In contrast, Andrienko and Guriev (2004) note that migration in Russia is generally constrained by a lack of financial liquidity. Thus regions may become poverty traps as people living in them do not have the funds to migrate to regions with greater job opportunities.

The probability to migrate therefore seems to depend on the degree to which the quality of life at the destination exceeds that of the current location, which implies that individuals compare their choices of residence based on a bundle of features (Douglas/Wall 1993). It is further observed that the destination's characteristics are more determinative of migration than are the features of the current residence (Dowding/John 1996; Michalos 1997). In regard to destination characteristics, in general, immigrating individuals seem to be attracted by the prospect of higher welfare benefits (particularly AFDC payments) (Cebula/Koch 1989; Gramlich/Laren 1984), lower costs of living (Cebula 1979), higher wage levels (Hoch/Drake 1974), higher government spending (e.g., on public education), and a lower tax burden (Cebula/Kafoglis 1986; Cebula 1990, 2002; Dowding/John/Biggs 1994; John/Dowding/Biggs 1995; Dowding/John 1996), as well as the availability of parks, recreation facilities, warmer temperatures (Graves 1980; Cebula 2005), and less violent crime (Cebula 2005). However, factors such as, e.g., the crime rate, have different impacts for different income groups. Households with higher incomes react more strongly to crime rate (especially violent crime) with emigration than do middle-income households, while a positive relationship is found for low-income households and crime rate (Tita/Petras/Greenbaum 2006).

Age of the head of household seems to slow down mobility (Graves/Linneman 1979). Thus, migration tends to be highly selective with respect to age. In a study of Venezuela, Levy and Wadycki (1971) illustrate that wage and education levels of the destination create a stronger incentive to migrate for young individuals than for their older counterparts. Moreover, the effects of economic opportunity on migration are found to decline with age, whereas past migration experience seems to increase the chance that persons over 65 migrate (Morgan/Robb 1982). When migrating, elderly people generally express a strong preference for states without personal income taxes (Cebula 1990). However, these results tend to be very sensitive to the choice of migration measure and the degree to which the public sector is represented as the preference pattern within the population group over 65 seems to be heterogeneous (Conway/Houtenville 1998).

To this point, only literature using migration data or surveys to directly identify attributes that may influence migration decisions has been discussed. However, the mechanism proposed by Tiebout (1956) also resulted in the application of indirect methods, such as the application of hedonic prices. In this approach, housing prices or wage levels are used to estimate preferences for public goods. Based on the assumption that a high immigration rate reflects the demand for the public goods bundle offered in that location, prices for houses and wages should then result in the optimal provision of public goods (i.e., prices will regulate the market such that supply meets demand). Thus, there are no direct prices for the public good, but prices for houses or wage rates can be used as substitutes as they regulate the demand-supply nexus for public good provision in the community. Empirically, Leggett and Bockstael (2000) find a significant effect of water quality on property values, whereas Anderson and Crocker (1971) obtain a negative relationship between air pollution, property values and rentals. Geoghegan, Wainger, and Bockstael (1997) detect that individuals value the diversity and fragmentation of land use around their homes (i.e., increasing prices). Florida and Mellander (2010) note that having high proportions of Bohemian or gay people settled in a region raises housing values. However, in their study, they admit that income seems to drive the results indirectly, as the constructed Bohemian-Gay Index is directly positively correlated with income (Florida/Mellander 2010). Furthermore, while Brasington and Hite (2005) observe that nearby hazardous waste sites depress house prices in Ohio (USA), Greenstone and Gallagher (2008) are not able to find an impact of cleanups of hazardous waste sites on house prices in a larger sample of Superfund-sponsored cleanups in the United States (using, however, a different methodology). Considering wage levels, Suedekum (2005) points out that unemployment rates are higher in peripheral areas, whereas European centers of agglomeration have low unemployment rates. According to theory, migration of labor from the periphery to the center should lead to a decrease in wages in the center and unemployment in the periphery (wage curve relation). However, according to empirical data, the wage curve is stable over time and does not vanish as workers move, but is instead reinforced by migration (Suedekum 2005). Thus, wages do not seem appropriate for use in the hedonic price approach.

In general, while it may be possible to model a robust demand function, the hedonic price approach tends to be sensitive to specifications (see Harrison/Rubinfeld 1978). For example, if the approach assumes a single hedonic price equation and identical structural parameters across markets, the estimations may be prone to inaccuracy (Brown/Rosen 1982). Additionally, the hedonic price approach tends to be feasible only when the substitution effect (between private and public good) can be disentangled from the income effect (Bradford/Hildebrandt 1977). Moreover, the aggregation level of the analysis may affect results (Banzhaf/Walsh 2008). Goodman (1978) points out that the aggregation of hedonic price coefficients into standardized units yields significantly higher housing prices in the central city than in its suburbs as well as differential effects of structural and neighborhood improvements among submarkets. Additionally, housing prices in general seem to react differently to changes in demand. Kuminoff (2009) points out that the value of most homes near the agricultural-urban edge increases but that this effect is not equal for all types of homes. The increase seems to depend on the type of houses if location is more or less the same. Furthermore, land is immobile, which may enable the local administration to absorb some of the rents and thus influence housing prices (Epple/Zelenitz 1981). Thus, using housing prices as hedonic prices may restrict the interpretation as well as lead to under- or overestimation of the true preference structure within the community and with this to an inefficient supply of public goods. Therefore, Brookshire et al. (1982) emphasize that the hedonic approach and surveys should be used as supplements to each other when possible.

In addition to arguing that migration (as a proxy for demand) and public good provision (as a proxy for supply) affect housing prices and wages, Tiebout’s theory proposes that people with similar preferences select themselves into those local communities that best satisfy their demands. Thus, to some degree, homogenous communities will be created within this selection process. This, in turn, may lead to a stronger demand for the preferred public goods and thus shape local jurisdictions (Alesina et al. 2004) and with this the provision of public goods (e.g., clean air). In particular, as individuals may choose to commute (e.g., within metropolitan areas in the United States) and therefore show a higher degree of flexibility, the residential choice may depend on local public goods provision (Ellickson 1971). Empirically, higher homogeneity in respect to income within the community than across communities is observed (Eberts/Gronberg 1981; Grubb 1982a). However, segregation by age shows only a weak effect and other community characteristics (e.g., race, land use) do not seem to lead to active separation (Grubb 1982a). Another stream of research identifies clusters of stated subjective well-being that seem to depend not only on income, but also on local amenities such as climate, environmental, and urban conditions (Brereton/Clinch/Ferreira 2008; Moro et al. 2008; Welsch 2006, 2007). For example, the higher a country's number of bird or mammal species, or the lower the percentage of bird species threatened, the more satisfied the people (Rehdanz 2010). Kahn (2000) argues that smog reduction leads to an increase in quality of life. Thus, people (particularly the well-educated and pensioners) are attracted by cleaner air and migrate into suburbs. For these individuals, commuting is how they access the labor market. But as commuting also creates costs, the benefits of moving may be reduced and decisions about migration become even more complex (Bayer/McMillan 2010). Moreover, considering only income as a segregation force may lead to biases in the conclusion. For instance, Voss, Hammer, and Meier (2001) point out that in their data set immigrants seem to be poor and therefore add to the number and rate of persons in the county living in poverty. However, a high fraction of these immigrants possessed a high school degree and were enrolled in post-secondary schooling at the time of the census. In short, these migrants were mainly college students. Additionally, due to decreasing costs of moving in recent years, heterogeneity within communities tends to be reduced further regarding government action (spending on public education/local taxes and revenues) and as to individual preferences (age, education, election outcome, home ownership, income, race, and religion), and thus the stratification process of communities appears to be enhanced in recent years (Rhode/Strumpf 2000).

Taken as given that peer-group effects drive neighborhood characteristics (Evans/Oates/Schwab 1992; Harding 2003), additional migration may be incentivized, which in turn may lead to inefficiency (costs) that cannot be totally overcome by the land price differential (regarding the hedonic price approach) (de Bartolome 1990). In contrast, regarding voluntary sorting into communities, Page, Putterman and Unel (2005) uncover in public good experiments that endogenous group formation incentivizes higher contributions for public goods, thus enhancing efficiencies and mitigating free-rider behavior. This, in turn, raises the question of optimal group selection, i.e., whether overprovision (or underprovision) of public goods may occur when communities become too homogenous (or too heterogeneous); in particular, this issue arises if the voting rule is the decisive factor in public good provision (Oates/Schwab 1988). Moreover, the selection process may influence economic growth of the region. Significant growth-enhancing effects are observed for the case of high-skilled labor immigration (Ozgen/Nijkamp/Poot 2010). This voluntary spatial sorting of skills, in turn, tends to be reflected in wages (Combes/Duranton/Gobillon 2008). However, assuming that high-skilled workers are low-skilled-worker averse, amenities provided by the local government are not able to offset sorting dynamics if the ratio of low-skilled worker becomes too large. Economic decline may set in if too many low productive people are attracted to an area (Mathur/Stein 2005).

Most of the empirical studies thus far discussed were conducted in the United States. Variation in migration within Europe can be explained by differences in employment protection, international migration, the share of owner-occupied housing, and the average regional size of a country (Huber 2004). Moreover, clusters of subjective well-being are found in West Europe, which can be also traced back to air pollution (Welsch 2006, 2007). Regarding rural-urban migration, Fielding (1989) observes that urbanization was the dominant redistribution trend in in the 1950s in West Europe, followed by a trend of counter-urbanization in the mid-1960s, first in northwest Europe and later in south and west Europe (into the 1970s). In particular, in West Germany and Italy, counter-urbanization persisted in the 1980s, whereas in other west European countries, no clear evidence for urbanization or counter-urbanization was found. Counter-urbanization was detected to be mainly due to changes in transport and communications technology; jobs and housing opportunities were created when commuting increased. Additionally, state action aimed at extending public goods provision in rural areas increased. Considering individual preferences for migration, Fielding (1989) notes that people initially attracted by the bright lights of the city (around 1970s) later found the city environment to be too stressful, dangerous, and distasteful, and so moved to rural areas or small towns, particularly retired people with sufficient wealth and mobility as well as economically active people without work, wealth, or family constraints. Like Suedekum (2005), Fielding (1989) also recognizes that wage levels have stayed constant over time and thus are not a cause of counter-urbanization as rural areas generally have higher unemployment rates and lower average wages. Moreover, public policy may have incentivized migration decisions, particularly during the 1960s when political efforts were intensified to promote economic growth in rural regions. But as these expenditures were relatively small compared to other state spending, they cannot fully explain counter-urbanization. It seems more likely that individual preferences tend to change not only with age, but also over time due to increasing income and living standards. At the same time, economic growth also resulted in a new spatial division of labor during the 1960s and early 1970s that was characterized by spatial separation of tasks within the production process, i.e., the separation of command from execution and of white-collar employees from blue–collar ones. One of the effects of this change was to produce a shift toward regional sectorial diversification (de-concentration theory). It also implied a deindustrialization of the major cities, which led to a reduction in the migration of less skilled people to the principal cities as these cities experienced disinvestment (especially in manufacturing industry) (Fielding 1989). This process of counter-urbanization (or decentralization) can be still found in West Germany (former FDR) (Kontuly 1991). Also after German Reunification, suburbanization continued in West Germany (former FDR), while urban areas in the former GDR experienced a distinct magnet effect in regard to migration (Kemper 2003). In general, migration in Germany seems to be driven by employment considerations rather than housing or lifestyle aspects (Kemper 2004; Mitze/Reinkowski 2010). Differences in wages, however, cannot be related to migration patterns (Parikh/van Leuvensteijn 2003). Migration behavior in Germany also depends on aspects such as age structure (Mitze/Reinkowski 2010) or risk attitudes (Jaeger et al. 2010). Hence, younger and less risk-averse individuals tend to migrate interregionally, whereas commuting seems to partly balance out the effects of migration (Mitze/Reinkowski 2010). Therefore, labor migration accounts for a great deal of the migration pattern in Germany, in which sectorial differences can be detected (Van Leuvensteijn/Parikh 2002).

In this paper, it is argued that individuals who migrate to Bavaria may choose to do so based on biodiversity abundance and therewith reveal a preference for environmental aspects (in addition to income and/or employment considerations). Whether biodiversity adds to the explanation of variance in migration data is the subject of the following empirical research. Hence in a first step, factors for immigration to Bavarian counties are identified; the second step seeks to detect selection dynamics as pointed out in the theoretical discussion. Moreover, spatial effects are considered as well as differences in migration and demand patterns having to do with age and gender. Within Bavaria, variations in county or community policy exist, but due to data restrictions regarding biodiversity, community-level analyses are not feasible and therefore county-level analyses are conducted in this paper.

3. Empirical Analysis

3.1. Data

Panel data on migration across county borders for the 96 counties of Bavaria (including cities) for the period 1998–2008 were obtained from the Federal Statistical Office.[2] As data aggregated for age groups are available, five age groups are used in the following to capture variations due to increasing age: (1) under 18 years old (dependent children, indicating family

[2]All variables were obtained from the Federal Statistical Office for the years 1998–2008, unless otherwise stated.

migration), (2) 18–25 years old, (3) 25–30 years old, (3) 30–50 years old, (4) 50–65 years old, and (5) older than 65 years. Since 2001, these data are also sorted by gender.

As the empirical results reviewed above made clear, results can be sensitive to method as well as to indicator. Moreover, high direct correlation can be observed between emigration and immigration rates (for a discussion on this effect, see Mueser/White 1989). In this dataset, the correlation between immigration rate and emigration rate is 0.96. Including net migration rate is another option, but as our interest here is to identify the drivers behind settlement in a specific region and not to discover why people leave, only the *immigration rates* are considered.

Data on *population* are also included, and the same categories as for migration (i.e., female vs. male and age groups) are available. The population numbers will help identify selection processes based on age groups; in other words, they will allow answering the question of whether people are more likely to migrate to regions having a higher fraction of their own age group. Figures on *out-commuter* over county border (separated by sex) relative to employees in the region are integrated as well.

To control for the economic opportunities of a region, the variable “available income per capita” (*avIncpc*) is introduced, whereas the rate of employees in *manufacturing* captures differences due to sectorial composition of the region. As in the hedonic price approach literature, the link between land price, hazardous waste, and migration is discussed; these variables are considered here in the form of average price per square meter construction area (*land price*) and produced hazardous *waste* within the county per capita (2001–2008).

As the purpose of the analysis is to link natural amenities (e.g., biodiversity) and migration, all *butterfly* species in Bavaria (sample size 143) according to Voith, Bolz, and Wolf (2007) are taken as an indicator of biodiversity (relatively to county size). Butterfly species are chosen as they are assumed to be sensitive to environmental change and the most recent data are available. Generally, it is argued that biodiversity in rural areas is different than urban areas. But excluding cities from an analysis of migration patterns hardly seems appropriate and so urban areas are included (see also Öckinger/Dannestam/Smith 2009). The long-term average *temperature* for the years 1961–1990 is incorporated to capture other aspects of natural amenities (taken from the German Weather Service). Both variables are constant over time.

The statistical properties of the variables used in this paper can be found in Table 4 and 5 of the Appendix.

3.2. Method

Starting with a fixed effect model (including time dummies), results are first tested for correlation in the time dimension within the error term. A test for autocorrelation in panel data (according to Wooldridge 2002) yields significant F-statistic values; thus autocorrelation seems to drive the results and will be accounted for in the estimations.

Because of the potential selection effects discussed in the theoretical section of this paper, the model is tested, second, for cross-sectional correlation (i.e., correlation in the space dimension) by applying the Pesaran test (according to de Hoyos/Sarafidis 2006). This test produces robust results even in the case of dynamic panel settings. This test detected correlation within the error terms, indicating general cross-sectional correlation. As spatial correlation is assumed to be a special case of cross-sectional correlation, this result may be driven by spatial heterogeneity or spatial dependency (see Anselin 2010). While spatial heterogeneity may create “only” heteroskedasticity of the error term and can be corrected with standard econometric methods, spatial dependence may lead to more severe estimation issues. As to my knowledge, there is no test that can detect spatial dependence in panel data, Morans’s I and Geary’s C are calculated for the dependent variable (immigration) for each year. The results clearly show strong (global) spatial correlation (dependence; see also Table 6 and & in the Appendix), which needs to be considered in obtaining robust and correct estimates, thus ruling out severe model misspecification (Baltagi 2008).

Several approaches have been proposed to account for spatio-temporal autocorrelation within panel data, including spatial-ML (Baltagi 2008; Franzese/Hays 2008), general method of moments (GMM) estimation (Kelejian/Prucha 1999; Kapoor/Kelejian/Prucha 2007; Bell/Bockstael 2000), and the spatial two-stage least-square approach (2-SLS) (Kelejian/Prucha 1998), all of which have been widely applied and tested (Baltagi 2008; Franzese/Hays 2007; Drukker/Egger/Prucha 2010). The GMM and the 2-SLS approach are based on instrumental variables. The problem is to find a suitable instrument that is not correlated with the error term (see Franzese/Hays 2007). GMM, spatial-ML, and 2-SLS seem to perform equally well, although different assumptions are made to account for both dimensions (time and space) (e.g., spatio-autocorrelation considered on dependent vs. independent variable) (Franzese/Hays 2007, Baltagi 2008).

The strength of spatial interdependence is of interest here as it may shed some light on the hypothesized selection dynamic outlined above (or common spatial external driver), and so the spatio-temporal model of Franzese/Hays (2008) is employed. In this spatial ML-approach, interdependence between time and space is assumed to be the dominant factor regarding the dependent variable and is therefore integrated on the right-hand side. However, spatial correlation might be caused by either interdependence or a common third variable. Implementing one nexus into the estimation may lead to overestimation of the included correlation type and underestimation of the other. Thus, if migration is driven by a common external "shock" (or variable) rather than by interdependence (i.e., A reacts to B, and B reacts to A within time), interdependence may be overestimated. However, in both cases, spatial correlation is driving the estimates. If not taken into account, the model may be seriously misspecified (Baltagi 2008; Anselin 2010).

The model applied here is as follows (see Franzese/Hays 2007, 2008):

$$y = \rho\mathbb{W}\mathbb{y} + \varphi\mathbb{M}\mathbb{y} + \mathbb{X}\beta + \varepsilon \text{ with } \varepsilon \sim N(0, \sigma^2\mathrm{I}),$$

where y denotes the dependent variable (NT × 1 vector), ρ the spatial autoregressive coefficient, and $\mathbb{W}$ the spatial-weighting matrix (NT × NT, neighboring matrix), so that $\mathbb{W}\mathbb{y}$ stands for the spatial lag (of each observation). Moreover, φ represents the temporal autoregressive coefficient, $\mathbb{M}$ is a block-diagonal time matrix (NT × NT), so that $\mathbb{M}\mathbb{y}$ is the (first-order) time lag. The matrix $\mathbb{X}$ contains the observations of k independent variables (NT × k) as well as columns for the domestic, contextual factor (d_{it}), for the external common shock (s_t), and for the context-conditional factors ($d_{it} \times s_t$). βserves as coefficient. Due to this specification of $\mathbb{X}\beta$, the regression model accounts for non-spatial components at the domestic level as well as exogenous-external and context-conditional factors. Thus, while the identification of interdependency between units (here, counties) is the main focus of the estimation, the external influence is still taken into account within $\mathbb{X}\beta$, although not calculated directly.

Furthermore, robust standard errors are calculated to reduce the effects of outliers and address statistical issues such as heteroskedasticity to the extent possible (the Breusch-Pagan/Cook-Weisberg test yields significant results for heteroskedasticity). To control for multicollinearity, the variance inflation factor is calculated and regressions with a factor above six are removed (see Hill/Adkins 2001).

3.3. Results

In a first step, factors for immigration to Bavarian counties are identified by implementing the spatial-ML approach. Results can be found in Table 1. In all regressions, biodiversity (measured as butterfly species per hectare) seems to significantly explain immigration to Bavaria, irrespective of age or gender. Hence, areas with a high level of biodiversity seem to attract immigration. It appears, therefore, that biodiversity is valued as a natural amenity, as demand does not alter in the regression models.

Immigration		**Age Groups**					
	Total	**under 18**	**18-25**	**25-30**	**30-50**	**50-65**	**above 65**
avIncpc	-0.00120	**-0.00779****	**-0.0352*****	**0.0504*****	**0.0186*****	0.00221	-0.00163
	(0.00301)	(0.00321)	(0.00991)	(0.00841)	(0.00377)	(0.00139)	(0.00114)
Butterflies	**0.00683*****	**0.00910*****	**0.0236*****	**0.0198*****	**0.00698*****	**0.00138*****	**0.000790*****
	(0.000494)	(0.000419)	(0.00192)	(0.00143)	(0.000548)	(0.000213)	(0.000211)
Land Price	**0.00780*****	**0.00360*****	**0.0226*****	**0.0217*****	**0.00919*****	**0.00252*****	**0.00163*****
	(0.000597)	(0.000499)	(0.00220)	(0.00172)	(0.000671)	(0.000250)	(0.000238)
Manufacture	**-0.0112*****	**-0.00462*****	**-0.0469*****	**-0.0133*****	**-0.00574*****	**-0.00330*****	**-0.00206*****
	(0.00155)	(0.00128)	(0.00596)	(0.00401)	(0.00140)	(0.000576)	(0.000489)
Out-Commuter	**-0.00254*****	**0.00234*****	**-0.0198*****	0.00286	0.000250	**-0.00136*****	**0.000645*****
	(0.000592)	(0.000510)	(0.00236)	(0.00176)	(0.000578)	(0.000251)	(0.000233)
Temperature	**0.0235*****	**0.00785*****	**0.0704*****	**0.0511*****	**0.0151*****	**-0.00403*****	**-0.00324*****
	(0.00317)	(0.00265)	(0.0121)	(0.00807)	(0.00300)	(0.00128)	(0.00118)
Waste	**-0.000615****	1.68e-05	**-0.00284*****	**-0.00159***	-0.000165	-0.000200	-0.000115
	(0.000293)	(0.000272)	(0.00110)	(0.000904)	(0.000319)	(0.000127)	(0.000112)
Constant	-0.0386	0.0876***	0.166*	-0.560***	-0.209***	-0.0156	0.0247**
	(0.0291)	(0.0312)	(0.0964)	(0.0824)	(0.0377)	(0.0136)	(0.0115)
Rho	0.188***	0.207***	0.125***	0.0672**	0.217***	0.371***	0.194***
	(0.0324)	(0.0317)	(0.0366)	(0.0336)	(0.0314)	(0.0307)	(0.0339)
Sigma	0.00716***	0.00632***	0.0275***	0.0199***	0.00747***	0.00309***	0.00271***
	(0.000240)	(0.000245)	(0.000888)	(0.000745)	(0.000251)	(8.27e-05)	(8.39e-05)
Observations	743	743	743	743	743	743	743
Wald-Chi² (7)	2142***	1803***	1504***	1986***	2696***	967.3***	356.1***
Ll	2613	2705	1613	1857	2580	3229	3335

Table 1: Spatial-ML Estimation with Immigration Rate as Independent Variable
Robust standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$; independent variables enter the model as a natural logarithm.

Temperature also seems to have a positive influence on immigration. However, upon closer examination of the age groups, it is observed that at higher ages (above 50), temperature is negatively related to immigration, i.e., older people move into areas with lower average temperatures. Land price is also positively correlated with immigration rates, whereas hazardous waste tends to reduce immigration rates. More specifically, land prices tend to reflect the demand for construction land; hazardous waste only matters in the migration decisions of individuals between 18–30 years old. Regarding sectorial composition, counties with higher employment rates in manufacturing tend to be less favored as an immigration destination. The variable “out-commuter” actually strengthens the argument that natural amenities play a role when deciding where to settle; however, this effect depends on age. Families (with children under 18 years old) seem to move into regions with lower available income, higher biodiversity, and higher temperatures, despite having to commute to work over county borders. As both parents generally fall within the age group of 25–50 years old, there is no gender-specific effect of out-commuting. However, there are other gender-specific differences in migration patterns (see Table 8 in the Appendix). For example, female migrants between 25–50 years old tend to move into regions from which they will have to commute to work. The younger generation (18–25 years old), however, seems to move close to the place of employment (both males and females).

Considering the model specification on spatial interdependency, rho is always significant; thus immigration is clustered in space and seems to attract immigration to neighboring regions as well. The strongest cluster effect can be found for families (children under 18 years) as well as for immigrants between 30–65 years old. One exception is the group of women between 18–30 years old. The models for this immigration age and gender yield no significant rho; hence strong spatial dependence of this population group cannot be inferred. However, as sigma yields significant positive results for this group, its spatial dependency might be more due to spatial heterogeneity than to spatial interdependency, but the spatial assumption of the model still appears to be justified (see Table 8 in the Appendix).

The second step is to detect selection dynamics. As discussed in the theoretical section of this paper, age groups may select themselves into regions. To test this hypothesis, the above model is extended by implementing the respective age group within the population as an independent variable Results can be seen in Table 2. It is observable that an increasing fraction of the population in the age group living in the area seems to attract more immigration by the same age group. With increasing age, this effect (regarding strength of the coefficient) tends to decrease.

It could be argued that specific features of an area not captured in these models are driving the results. However, that the model specification regarding spatial interdependence (rho) is significant and positive for all age groups makes it plausible that immigration is attracted by characteristics in the area that are similar to those possessed by the migrants themselves. For example, as is shown above, migration tends to cluster by age and gender. This clustering may be caused by similar general demands for natural amenities. Specifically, the presence of people of the same age or characteristics of the surrounding environment may positively influence decisions to migrate to a particular region.

Immigration age	**under 18**	**18-25**	**25-30**	**30-50**	**50-65**	**above 65**
avIncpc	-0.000794	8.83e-05	**0.00364*** **	**0.00911*** **	**0.000608** **	-0.000315
	(0.000598)	(0.000865)	(0.000497)	(0.00123)	(0.000294)	(0.000265)
Butterflies	**0.00164*** **	**0.00185*** **	**0.00112*** **	**0.00236*** **	**0.000267*** **	**0.000161*** **
	(8.13e-05)	(0.000163)	(8.59e-05)	(0.000159)	(4.07e-05)	(4.36e-05)
Land Price	**0.000638*** **	**0.00232*** **	**0.00106*** **	**0.00217*** **	**0.000476*** **	**0.000317*** **
	(9.10e-05)	(0.000179)	(0.000108)	(0.000205)	(4.73e-05)	(4.75e-05)
Manufacture	**-0.000536** **	**-0.00242*** **	-0.000200	**-0.00191*** **	**-0.000571*** **	**-0.000446*** **
	(0.000213)	(0.000429)	(0.000267)	(0.000412)	(0.000113)	(9.64e-05)
Out-Commuter	**0.000617*** **	**-0.00111*** **	**0.000368*** **	-0.000233	**-0.000222*** **	7.30e-05
	(0.000100)	(0.000186)	(0.000100)	(0.000180)	(4.65e-05)	(4.58e-05)
Temperature	0.000424	0.000242	**0.00113** **	**0.00239** **	**-0.00101*** **	**-0.000677*** **
	(0.000445)	(0.000968)	(0.000482)	(0.000947)	(0.000260)	(0.000262)
Waste	5.60e-06	**-0.000346*** **	-5.53e-05	4.28e-05	-2.99e-05	-2.44e-05
	(4.93e-05)	(9.02e-05)	(5.12e-05)	(9.91e-05)	(2.36e-05)	(2.14e-05)
Population Under 18	**0.0317*** **					
	(0.00388)					
Population 18-25		**0.362*** **				
		(0.0188)				
Population 25-30			**0.214*** **			
			(0.0130)			
Population 30-50				**0.100*** **		
				(0.00895)		
Population 50-65					**0.0107*** **	
					(0.00284)	
Population Above 65						**0.0100*** **
						(0.00135)
Constant	0.00621	-0.0342***	-0.0461***	-0.120***	-0.00612**	0.00292
	(0.00605)	(0.00878)	(0.00495)	(0.0131)	(0.00268)	(0.00239)
Rho	0.255***	0.139***	0.0664**	0.202***	0.338***	0.158***
	(0.0332)	(0.0340)	(0.0294)	(0.0303)	(0.0305)	(0.0356)
Sigma	0.00111***	0.00227***	0.00118***	0.00224***	0.000579***	0.000520***
	(4.11e-05)	(8.22e-05)	(4.64e-05)	(7.64e-05)	(1.59e-05)	(1.64e-05)
Observations	743	743	743	743	743	743
Wald-Chi² (8)	1319***	2158***	2987***	2637***	972.7***	550.5***
Ll	3992	3466	3952	3475	4474	4562

Table 2: Spatial-ML Estimation on Selection Effect of Immigration Regarding Age
Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; independent variables enter the model as a natural logarithm; threshold for VIF is up to 10.

It could also be argued that the results shown here are driven by the "magnet effect" of urban areas. In other words, considering that urban areas tend to have higher species abundance, higher land prices, and lower levels of manufacturing, the results may be only reflecting immigration into urban areas that is motivated by urban amenities (see Heberle 1938). To test whether this is a valid objection, another regression model is set up that incorporates a dummy variable for rural areas (1 denotes rural counties; 0 cities). This dummy captures significant differences in

Immigration	Total	Age Groups					
		under 18	18-25	25-30	30-50	50-65	above 65
avIncpc	0.00223	**-0.00211*** **	**-0.00445*** **	**0.00199*** **	**0.00478*** **	**0.00121*** **	**0.000490** **
	(0.00314)	(0.000588)	(0.00129)	(0.000646)	(0.00114)	(0.000283)	(0.000247)
Butterflies	**0.00394*** **	**0.00135*** **	**0.00123*** **	9.68e-05	**0.00102*** **	0.000123	**0.000342*** **
	(0.000855)	(0.000149)	(0.000362)	(0.000182)	(0.000253)	(8.01e-05)	(8.09e-05)
County-D.	**-0.00821*** **	-0.000153	**-0.00244*** **	**-0.00314*** **	**-0.00225*** **	**-0.000505*** **	0.000190
	(0.00191)	(0.000344)	(0.000859)	(0.000409)	(0.000616)	(0.000173)	(0.000166)
Land Price	**0.00784*** **	**0.000720*** **	**0.00132*** **	**0.00153*** **	**0.00307*** **	**0.000470*** **	**0.000135*** **
	(0.000586)	(9.25e-05)	(0.000250)	(0.000122)	(0.000214)	(4.91e-05)	(4.23e-05)
Manufacture	**-0.0101*** **	9.82e-05	**-0.00621*** **	**-0.00149*** **	**-0.00140*** **	**-0.000458*** **	**-0.000529*** **
	(0.00166)	(0.000226)	(0.00108)	(0.000390)	(0.000473)	(0.000118)	(0.000105)
Out-Commuter	**-0.00160*** **	**0.00101*** **	**-0.00221*** **	**-0.000624*** **	**0.000511** **	**-0.000135*** **	-4.44e-05
	(0.000612)	(9.24e-05)	(0.000299)	(0.000142)	(0.000200)	(4.83e-05)	(4.21e-05)
Temperature	**0.0192*** **	0.000297	**0.0107*** **	**0.00605*** **	**0.00503*** **	**-0.00164*** **	**-0.00131*** **
	(0.00338)	(0.000492)	(0.00200)	(0.000710)	(0.00101)	(0.000258)	(0.000252)
Waste	**-0.000633** **	1.60e-05	**-0.000295** **	**-0.000161*** **	-8.78e-05	-2.16e-05	-1.20e-05
	(0.000285)	(5.09e-05)	(0.000134)	(6.18e-05)	(9.96e-05)	(2.35e-05)	(2.22e-05)
Constant	-0.0604**	0.0252***	0.0190*	-0.0326***	-0.0577***	-0.00837***	-0.000992
	(0.0298)	(0.00583)	(0.0109)	(0.00601)	(0.0114)	(0.00278)	(0.00243)
Rho	0.173***	0.330***	0.0726*	0.156***	0.292***	0.335***	0.159***
	(0.0320)	(0.0353)	(0.0381)	(0.0402)	(0.0308)	(0.0309)	(0.0365)
Sigma	0.00705***	0.00117***	0.00331***	0.00159***	0.00241***	0.000582***	0.000539***
	(0.000259)	(4.22e-05)	(0.000184)	(6.79e-05)	(9.41e-05)	(1.66e-05)	(1.70e-05)
Observations	743	743	743	743	743	743	743
Wald-Chi^2 (8)	2217	1089***	1021***	1701***	2216***	886.5***	406.9***
Ll	2624	3954	3188	3733	3417	4471	4535

Table 3: Spatial-ML Estimation with Immigration as Dependent Variable; Including County Dummy
Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; independent variables enter the model as a natural logarithm; threshold for VIF is up to 10.

migration between rural and urban areas. However, note that by integrating another constant variable into the model, which is also correlated with the other dependent variables, estimations may be not as efficient as before. Results can be found in Table 3. When comparing the extended model with the results of the former regressions, it is seen that the findings are generally the same. However, the significance for biodiversity is reduced. In particular, individuals of working age (18–65) tend to favor urban areas when moving (negative sign of the dummy variable means less immigration in rural areas). On the contrary, families with dependent children (see age groups under 18 and 30–50) appear to migrate to biodiversity-rich areas, therefore increasing the number of out-commuters. Thus, while biodiversity does not seem to be much of a factor in the migration decisions of individuals between 25–30 and 50–65 years old, migration rates of the other age groups are positively affected by species abundance. Results are thus robust to different specifications.

In summary, estimations from all models show that biodiversity significantly enhances immigration to a region. Although migration is clustered in space and interdependence can be shown, path dependency (i.e., correlation over time) also needs to be taken into consideration when migration is examined quantitatively.

4. Conclusion

This paper investigates the demand for biodiversity and its conservation. In the literature, either methods of stated preferences or revealed preferences are used to measure this demand. Stated preferences methods involve asking respondents directly and have been severely criticized. However, despite all the drawbacks of the stated preferences method, it can reveal some aspects of a population's attitude toward biodiversity and nature. Another way of discovering such attitudes is to examine actual behavior. This method, the revealed preferences approach, focuses on what individuals actually do, rather than on what they say they do or will do, often referred to as "cheap talk" or "social conformity." In the political economics literature, it is proposed that individuals' actions reveal their "true" preferences as action is more costly than replying to a survey. Based on Tiebout's (1956) political economic approach, this paper examines in more detail the supposed selection effect by focusing on perhaps the mostly costly way of revealing one's preferences: migration. It is argued that people may choose to migrate to communities with characteristics or public goods that best meet their preferences. Analyzing data on migration in Bavaria, it is observed that, in general, biodiversity seems to explain immigration. Regardless of gender or age, significant positive results for biodiversity are obtained, whereas the coefficients for other variables (e.g., out-commuting, available income, or temperature) varied across age groups in both sign and significance. Thus, it is concluded that migration can to some degree be traceable to a general demand for biodiversity and natural amenities.

Other aspects of the Tiebout hypothesis, such as that demand for public goods may be reflected in increasing land prices, also find some support in this work. Land is more costly in regions with higher immigration rates. Introducing additional time lags so as to account for causality issues does not change the effect (estimation results here not shown). Moreover, empirical support is found for the supposed selection effect, i.e., people with similar preferences and/or characteristics select themselves into the same communities. In this paper, the selection effect is tested in respect to age and it is found that it is especially younger people, as well as families, who tend to consider the existence of age peers as a crucial factor in their migration decisions. Higher coefficients are obtained for these age groups. Older people appear to be less concerned with the age makeup in the destination area, more positive about an abundance of biodiversity, and be more negatively affected by temperature. Considering sectorial dependence of migration decisions, none of the age groups studied in this paper favors migration destinations having a high proportion of manufacturing. Commuting seems to be a popular way of separating work from home life and allows a balance between a better paying job in a more urban area and a greater abundance of natural amenities, such as biodiversity, found in a more rural area. However, the precise level of demand for biodiversity remains the subject of future research.

Biodiversity is significantly related to migration behavior: people tend to prefer regions with high species abundance when migrating, irrespective of age or gender. Even rural-urban migration can be explained by biodiversity, but in this case the demand may be a more general one for a certain number of natural amenities, as economic considerations seem to be the dominant driver of migration in this direction. The results of this paper are in agreement with Farzin and Bond (2006), who find that social behavior tends to be motivated by securing amenities rather than by improving actual biodiversity. Hence, even though biodiversity appears to be valued, economic considerations may take precedence in the actual location decision. Therefore, the question arises of how institutions can be designed to ensure a sustainable usage of nature, seeing as relying on mankind’s moral inclinations to do so is of doubtful efficacy.

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Appendix

Table 4: Descriptive Statistic

Variable	Obs	Mean	Std. Dev.	Min	Max
Immigration total	1056	0.044777	0.016914	0.017670	0.110957
Immigration under 18	1056	0.006969	0.002231	0.002207	0.015575
Immigration 18-25	1056	0.009543	0.006005	0.003046	0.042820
Immigration 25-30	1056	0.007288	0.003461	0.002304	0.021020
Immigration 30-50	1056	0.015252	0.005687	0.005428	0.036544
Immigration 50-65	1056	0.003448	0.001092	0.001346	0.007201
Immigration above 65	1056	0.002277	0.000716	0.000898	0.005793
avIncpc	1056	17651.570	2254.881	12815.000	29938.000
Butterflies	1056	0.268791	0.328760	0.044507	1.264045
Land Price	1029	129.432	118.445	0.000	1296.840
Manufacture	1056	0.356172	0.094646	0.135903	0.649718
Out-Commuter	1056	0.393771	0.260594	0.077807	1.230725
Temperature	1056	7.636631	0.735213	5.232290	9.229030
Waste	768	0.126890	0.189048	0.003785	3.078202

Table 5: Correlation Matrix

	Immigration total	Immigration under 18	Immigration 18-25	Immigration 25-30	Immigration 30-50	Immigration 50-65	Immigration above 65
Immigration total	1						
Immigration under 18	**0.80**	1					
Immigration 18-25	**0.89**	0.55	1				
Immigration 25-30	**0.95**	**0.65**	**0.89**	1			
Immigration 30-50	**0.93**	**0.83**	**0.67**	**0.85**	1		
Immigration 50-65	**0.77**	**0.65**	0.52	**0.64**	**0.79**	1	
Immigration above 65	0.59	0.57	0.42	0.43	0.55	**0.80**	1
avIncpc	0.44	0.29	0.22	0.42	0.56	0.53	0.36
Butterflies	**0.67**	0.56	**0.69**	**0.65**	0.49	0.46	0.46
Land Price	**0.64**	0.42	0.44	**0.64**	**0.73**	0.60	0.30
Manufacture	**-0.64**	-0.45	-0.55	-0.57	-0.60	**-0.61**	-0.52
Out-Commuter	-0.21	0.04	-0.35	-0.23	-0.05	-0.25	-0.23
Temperature	0.36	0.32	0.33	0.42	0.35	0.00	-0.06
Waste	0.11	0.12	0.11	0.11	0.10	0.04	0.02

	avIncpc	Butterflies	Land Price	Manufacture	Out-Commuter	Temperature	Waste
avIncpc	1						
Butterflies	0.17	1					
Land Price	0.55	0.21	1				
Manufacture	-0.38	-0.39	-0.51	1			
Out-Commuter	0.05	-0.41	-0.08	0.06	1		
Temperature	0.13	0.30	0.17	-0.04	0.14	1	
Waste	-0.04	0.12	0.09	-0.02	-0.10	0.16	1

Figure 1: Mean Immigration Rate in Bavaria (1998-2008)

Migration across County Borders

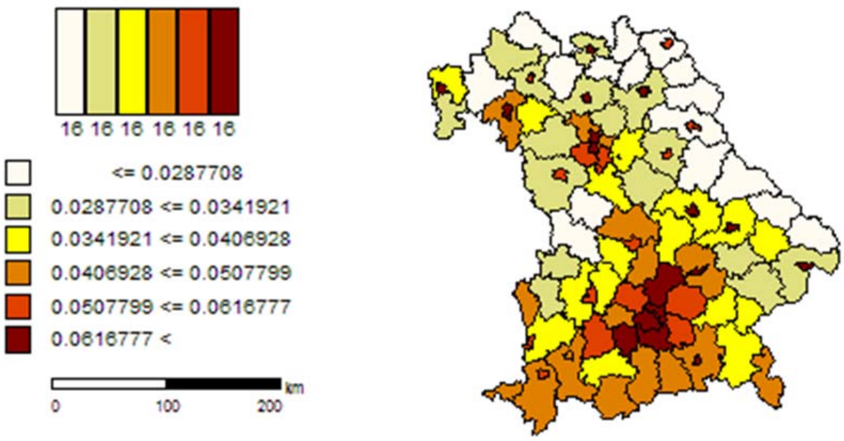

Figure 2: Mean Net-Migration Rate in Bavaria (1998-2008)

Migration across County Borders

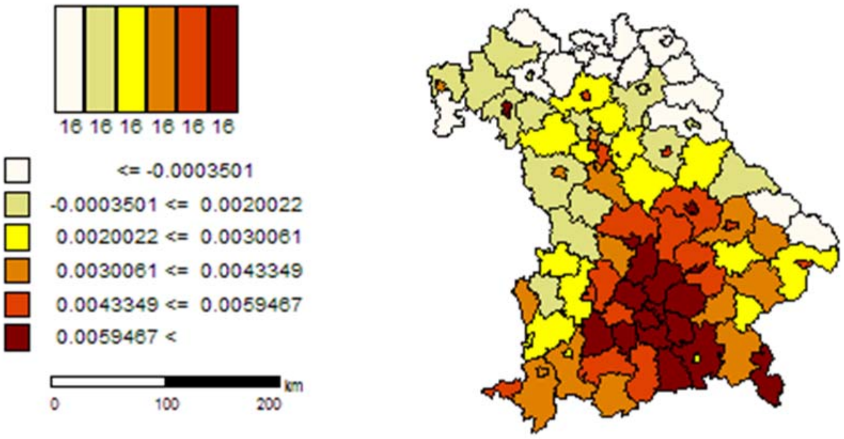

Table 6: Moran's I for Immigration Rate

(computed per year)

Year	I	E(I)	sd(I)	z	p-value*
1998	0.223	-0.011	0.077	3.030	0.002
1999	0.228	-0.011	0.077	3.094	0.002
2000	0.248	-0.011	0.077	3.347	0.001
2001	0.217	-0.011	0.077	2.959	0.003
2002	0.219	-0.011	0.077	2.979	0.003
2003	0.233	-0.011	0.077	3.168	0.002
2004	0.228	-0.011	0.077	3.091	0.002
2005	0.240	-0.011	0.077	3.234	0.001
2006	0.238	-0.011	0.077	3.215	0.001
2007	0.235	-0.011	0.077	3.181	0.001
2008	0.208	-0.011	0.077	2.819	0.005

*2-tail test

Table 7: Geary's C for Immigration Rate

(computed per year)

Year	C	E(c)	sd(c)	z	p-value*
1998	0.634	1.000	0.092	-3.962	0.000
1999	0.622	1.000	0.096	-3.944	0.000
2000	0.610	1.000	0.092	-4.234	0.000
2001	0.640	1.000	0.095	-3.777	0.000
2002	0.633	1.000	0.096	-3.810	0.000
2003	0.613	1.000	0.095	-4.055	0.000
2004	0.625	1.000	0.091	-4.107	0.000
2005	0.616	1.000	0.089	-4.340	0.000
2006	0.611	1.000	0.092	-4.238	0.000
2007	0.623	1.000	0.090	-4.199	0.000
2008	0.645	1.000	0.088	-4.049	0.000

*2-tail test

Table 8: Spatial-ML Estimates for Immigration Rate per Age Group and Gender

	Immigration total			Immigration under 18	Immigration 18-25			Immigration 25-30		
	All	Female	Male		All	Female	Male	All	Female	Male
avIncpc	-0.00120	0.00343	0.00251	**-0.00779****	**-0.0352*****	-0.0149	**-0.0325*****	**0.0504*****	**0.0715*****	**0.0383*****
	(0.00301)	(0.00298)	(0.00375)	(0.00321)	(0.00991)	(0.0113)	(0.0114)	(0.00841)	(0.00904)	(0.0105)
Butterflies	**0.00683*****	**0.00669*****	**0.00697*****	**0.00910*****	**0.0236*****	**0.0277*****	**0.0197*****	**0.0198*****	**0.0190*****	**0.0207*****
	(0.000494)	(0.000471)	(0.000578)	(0.000419)	(0.00192)	(0.00206)	(0.00202)	(0.00143)	(0.00133)	(0.00172)
Temperature	**0.0235*****	**0.0187*****	**0.0302*****	**0.00785*****	**0.0704*****	**0.0551*****	**0.0893*****	**0.0511*****	**0.0342*****	**0.0743*****
	(0.00317)	(0.00292)	(0.00354)	(0.00265)	(0.0121)	(0.0127)	(0.0124)	(0.00807)	(0.00709)	(0.0100)
Land Price	**0.00780*****	**0.00672*****	**0.00839*****	**0.00360*****	**0.0226*****	**0.0245*****	**0.0185*****	**0.0217*****	**0.0187*****	**0.0234*****
	(0.000597)	(0.000579)	(0.000732)	(0.000499)	(0.00220)	(0.00245)	(0.00241)	(0.00172)	(0.00165)	(0.00223)
Manufacture	**-0.0112*****	**-0.0107*****	**-0.0122*****	**-0.00462*****	**-0.0469*****	**-0.0450*****	**-0.0485*****	**-0.0133*****	**-0.0129*****	**-0.0128****
	(0.00155)	(0.00142)	(0.00184)	(0.00128)	(0.00596)	(0.00615)	(0.00649)	(0.00401)	(0.00370)	(0.00512)
Out-Commuter	**-0.00254*****			**0.00234*****	**-0.0198*****			0.00286		
	(0.000592)			(0.000510)	(0.00236)			(0.00176)		
Out-Commuter (female)		-0.000712				**-0.0120*****			**0.00785*****	
		(0.000494)				(0.00216)			(0.00137)	
Out-Commuter (male)			**-0.00426*****				**-0.0250*****			-0.00225
			(0.000745)				(0.00267)			(0.00229)
Waste	**-0.000615****	-0.000458	**-0.000735***	1.68e-05	**-0.00284*****	-0.00157	**-0.00374****	**-0.00159***	-0.00137	**-0.00263***
	(0.000293)	(0.000281)	(0.000400)	(0.000272)	(0.00110)	(0.00120)	(0.00146)	(0.000904)	(0.000871)	(0.00135)
Constant	-0.0386	-0.0683**	-0.0932***	0.0876***	0.166*	0.0182	0.0783	-0.560***	-0.701***	-0.504***
	(0.0291)	(0.0300)	(0.0360)	(0.0312)	(0.0964)	(0.114)	(0.109)	(0.0824)	(0.0887)	(0.101)
rho	0.188***	0.137***	0.153***	0.207***	0.125***	0.0460	0.0998***	0.0672**	-0.00615	0.0984**
	(0.0324)	(0.0379)	(0.0368)	(0.0317)	(0.0366)	(0.0452)	(0.0370)	(0.0336)	(0.0358)	(0.0386)
sigma	0.00716***	0.00639***	0.00782***	0.00632***	0.0275***	0.0287***	0.0268***	0.0199***	0.0174***	0.0228***
	(0.000240)	(0.000194)	(0.000298)	(0.000245)	(0.000888)	(0.000978)	(0.00110)	(0.000745)	(0.000562)	(0.00110)
Observations	743	653	653	743	743	653	653	743	653	653
Wald-Chi² (7)	2142***	1785***	2023***	1803***	1504***	1257***	1318***	1986***	1645***	1706***
ll	2613	2371	2239	2705	1613	1391	1436	1857	1717	1542

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; independent variables enter the model as natural logarithm

Table 8 (continued)

	Immigration 30-50			Immigration 50-65			Immigration above 65		
	All	**Female**	**Male**	**All**	**Female**	**Male**	**All**	**Female**	**Male**
avIncpc	**0.0186*** **	**0.0224*** **	**0.0283*** **	0.00221	0.00137	**0.00576*** **	-0.00163	-0.00103	0.000401
	(0.00377)	(0.00347)	(0.00513)	(0.00139)	(0.00155)	(0.00176)	(0.00114)	(0.00147)	(0.00115)
Butterflies	**0.00698*** **	**0.00629*** **	**0.00734*** **	**0.00138*** **	**0.00151*** **	**0.00132*** **	**0.000790*** **	**0.000821*** **	**0.000611*** **
	(0.000548)	(0.000450)	(0.000736)	(0.000213)	(0.000247)	(0.000242)	(0.000211)	(0.000249)	(0.000205)
Land Price	**0.00919*** **	**0.00695*** **	**0.0109*** **	**0.00252*** **	**0.00221*** **	**0.00306*** **	**0.00163*** **	**0.00180*** **	**0.00119*** **
	(0.000671)	(0.000550)	(0.000896)	(0.000250)	(0.000297)	(0.000286)	(0.000238)	(0.000283)	(0.000221)
Manufacture	**-0.00574*** **	**-0.00465*** **	**-0.00811*** **	**-0.00330*** **	**-0.00246*** **	**-0.00411*** **	**-0.00206*** **	**-0.00195*** **	**-0.00298*** **
	(0.00140)	(0.00112)	(0.00194)	(0.000576)	(0.000629)	(0.000703)	(0.000489)	(0.000555)	(0.000522)
Out-Commuter	0.000250			**-0.00136*** **			**0.000645*** **		
	(0.000578)			(0.000251)			(0.000233)		
Out-Commuter (female)		**0.00175*** **			**-0.000510** **			**0.00131*** **	
		(0.000441)			(0.000257)			(0.000250)	
Out-Commuter (male)			-0.000783			**-0.00225*** **			**-0.000416***
			(0.000820)			(0.000314)			(0.000235)
Temperature	**0.0151*** **	**0.00440***	**0.0268*** **	**-0.00403*** **	**-0.00659*** **	-0.00185	**-0.00324*** **	-0.00154	**-0.00551*** **
	(0.00300)	(0.00242)	(0.00376)	(0.00128)	(0.00151)	(0.00148)	(0.00118)	(0.00125)	(0.00134)
Waste	-0.000165	-0.000153	0.000126	-0.000200	-0.000136	**-0.000343** **	-0.000115	-0.000122	-0.000100
	(0.000319)	(0.000273)	(0.000460)	(0.000127)	(0.000156)	(0.000169)	(0.000112)	(0.000139)	(0.000123)
Constant	-0.209***	-0.216***	-0.330***	-0.0156	-0.000359	-0.0582***	0.0247**	0.0180	0.00697
	(0.0377)	(0.0348)	(0.0512)	(0.0136)	(0.0153)	(0.0170)	(0.0115)	(0.0149)	(0.0111)
rho	0.217***	0.160***	0.148***	0.371***	0.370***	0.314***	0.194***	0.141***	0.256***
	(0.0314)	(0.0338)	(0.0356)	(0.0307)	(0.0343)	(0.0326)	(0.0339)	(0.0401)	(0.0361)
sigma	0.00747***	0.00580***	0.00926***	0.00309***	0.00323***	0.00358***	0.00271***	0.00296***	0.00260***
	(0.000251)	(0.000188)	(0.000318)	(8.27e-05)	(0.000103)	(0.000112)	(8.39e-05)	(0.000110)	(9.21e-05)
Observations	743	653	653	743	653	653	743	653	653
Wald-Chi² (7)	2696***	2121***	2202***	967.3***	480.9***	1127***	356.1***	363.8***	294.4***
ll	2580	2435	2129	3229	2808	2743	3335	2873	2955

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; independent variables enter the model as natural logarithm