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Abstract: This paper analysis the possible demand for nature conservation within the Bavarian population. Drawing on the approach of revealed preferences and the mechanism of 'vote with their feet' of Tiebout (1956) migration patterns in Bavarian counties are examined in more detail in order to assess the role of biodiversity for migration decision according to gender and age. The results show a clear pattern for the demand for natural amenities within the migration decision. However, other factors as e.g. employment option are not to neglect as they may even out-weight the demand for biodiversity.

Keywords: migration, biodiversity, Bavaria

JEL: Q21, J61

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1. Introduction

The European Commission ordered a survey on the attitudes of Europeans towards the issue of biodiversity in 2010 (EC 2010). German respondents in this survey tend to be well informed and interested in biodiversity compared to other European citizens. However, the awareness in Germany of the Natura 2000 network or the role of nature protection areas is indicated at a level under the EU-average. While the German respondents also stated a moral responsibility to protect biodiversity and pointed out the recreational value of biodiversity (both above European average), biodiversity is not perceived as a source of goods (food, fuel, medicine) or own efforts are undertaken to conserve biodiversity (both under EU-average). German respondents rather demanded stricter regulation of the economy as well as an increase in nature conservation areas or financial rewards for e.g. farmers (all above EU-average). In general, this survey revealed that all over the EU the thread to biodiversity is rather seen as a global issue than a local one, and in particular individuals do not experience any impact of biodiversity loss on their daily life and widely point to the moral motivation to protect biodiversity (e.g. in respect to their children). According to this survey, a rather general demand for biodiversity conservation is perceived. This would be in line with the argumentation of Farzin & Bond (2006), who claim that social behavior to nature conservation is motivated by the wish to secure amenities rather than to improve the actual status of nature. Thus, raising income may lead to an increase in demand for biodiversity on the first sight, but this growing environmental awareness seems to be based on the wish to retain the gained living standard (e.g. visiting parks) (Farzin/Bond 2006).

To calculate the demand for nature conservation (such as biodiversity) one method is to conduct surveys, which is a method categorized as “stated preferences”. Apart from such direct method to measure public demand, another way is to use “revealed preferences”[1]. Hereby, the actual activities taken up by individuals are used as indicator for 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 choose their residence within Bavaria based on biodiversity abundance and therewith reveal a preference on environmental aspects (besides income or/and employment considerations). Whether biodiversity may add to the explanation of variance in migration data or not shall be

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

subject of the following empirical research. Therefore, after the literature survey on the research in the realm of Tiebout (1956), migration patterns in Germany are described further. These more general discussion is then restricted to the empirical research analysis on the impact of biodiversity on migration behavior. In particular, focus is set on the question 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 preferences of the population for the provision of public goods by allowing people to 'vote with their feet'. Hereby he refers to public goods restricted on natural base (e.g. 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 pick the community to live in which best satisfies their preference pattern for public good. Therefore (3) a large number of communities to choose from shall exist. Furthermore, (4) restrictions due e.g. employment situations, and (5) externalities between communities are not considered. Additionally, (6) the optimal community size exists due to natural constraints. Thus, (7) communities below the optimal size seek to attract new residents to lower average costs, and those above the optimum size do just the opposite (e.g. raise tax/housing prices). Hence a kind of selection process would reveal under these seven assumptions 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 preference position (including non-economic variables) and with this disclose his real demand for the provision of public goods. Regarding the local government, they may seek to attract consumers in order to reach the optimal community size but thereby the revenue-expenditure pattern remains stable.

Although this pattern seems to be plausible, it has attracted criticism for several reasons. As Hirschman (1980) notes, this theory does not encompass that people may also reveal their preferences by using their voice, e.g. voting in local elections or engaging in local clubs, in order to influence local development instead of 'just' leaving the community and moving to the one which may suit better their preference pattern. Also noted by Hirschman (1978), exit and voice respectively may serve as feedback for local government. Thus, the local government may use public good as a means to incentivize exit but also to encourage staying or increase the loyalty of its population. Hence, the constant revenue-expenditure pattern as assumed by Tiebout (1956) is here proposed to be increasing as a reaction towards the exit of population. So, the theory of Tiebout 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, wage) 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 give an idea why people migrate and how they choose their new location and this in turn may provide an indication of preferences for public goods.

Regarding the empirical research, not all public goods seem to be suitable to reveal preferences of the population. So, empirically this mechanism could be 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 like school expenditure, road maintenance (Edel/Sclar 1974) or hazardous waste cleanup (Greenstone/Gallagher 2008) no effect was found or only a weak impact as for e.g. job proximity (Bayer/Ross 2009).

Already Hirschman (1980) emphasizes that the ability of voice and exit is not equally distributed in the population. It may depend on issues such as segregation, exit-fatigue, band-wagon-effects or simply income. Considering, for example, the black population in the USA, Brooks & Sethi (1997) point out that black communities are mostly located in areas with greater exposure to air pollution. Moreover, geographic difference in social benefit provisions (e.g. Aid to Family with Dependent Children (AFDC)) does not tend to incentivize black families to move (Cebula/Avery 1983). Orbell & 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 not only to differ in respect to ethnic groups but also regarding urban and rural areas. So, Gramlich & Rubinfeld (1982) detect in a survey of Michigan households 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, while it is weak in rural areas. Arguments to explain these selective effects of the Tiebout mechanism mostly refer to income disparity or to alterations in public demand with increasing age. So, Grubb (1982b) uncovers that upper-income residents (which are mainly white residents) are tending to leave central cities and moving 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. While Grubb (1982b) based his empirical findings on migration data from 1960-70, Rebhun & Raveh (2006) distinguish between interstate migration of 1965-1970 and 1985-1990. They therefore observe that income becomes less significant over time as a predictor for migration as it develops into a widespread phenomenon among different socio-economic groups in the USA. 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). Contrariwise to studies of the USA, Andrienko & Guriev (2004) note that migration in Russia is generally constrained by a lack of financial liquidity. Thus regions may be even locked in poverty traps as people do not possess the funds to migrate into regions with higher job opportunities.

The probability to migrate therefore seems to depend on the degree to which the quality of life at the destination exceeds the one in current location, which implies that individuals compare their choices of residence in respect to a bundle of features (Douglas/Wall 1993). It is further observed that the characteristics of the destination are more decisive for migration than the features of current residence (Dowding/John 1996, Michalos 1997). So, regarding the characteristics of the destination, immigrating individuals, in general, seem to be attracted by the prospect of higher welfare benefits (in particular AFDC recipient) (Cebula/Koch 1989, Gramlich/Laren 1984), lower costs of living (Cebula 1979), higher wage level (Hoch/Drake 1974), higher government spending (on e.g. public education) and 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 state parks, recreation facilities, warmer temperatures (Graves 1980, Cebula 2005), and lower degree of violent crime (Cebula 2005). However, factors as e.g. the crime rate again differ in impact for income groups. So, households with higher incomes react more strongly to crime rate (esp. violent crime) with emigration than middle-income households, while a positive relationship is found for low-income households and crime rate (Tita/Petras/Greenbaum 2006).

Apart from the income enhancing effect on migration, the 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. Levy & Wadycki (1971) illustrate that wage and education levels of the destination exert a stronger incentive to migrate for young individuals than for their older counterparts in Venezuela. 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 tend to express a strong preference for states without personal income taxes in general (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).

So far, literature is reviewed which uses migration data or surveys to identify directly attributes which may influence migration decisions. 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 the preferences in the population for public goods. Assuming that migration leads to selection in clubs, whereby a high immigration rate reflects the demand for the public good bundle offered, prices for houses and wages should then result in the optimal provision of public goods (i.e. prices will regulate the market such as supply meets demand). Thus, there are no direct prices for the public good, but prices for houses or wage rates shall be used as substitutes as they regulate the demand-supply-nexus for the public good provision in the respective community. Empirically, Leggett & Bockstael (2000) find a significant effect of water quality on property values, whereas Anderson & Crocker (1971) obtain a negative relationship between air pollution and property values and rentals and Geoghegan, Wainger & Bockstael (1997) detect that individuals value the diversity and fragmentation of land use around their homes (i.e. increasing prices). Florida & Mellander (2010) note that having high proportions of Bohemian or gay people settled in a region raises the 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 & Hite (2005) observe that nearby hazardous waste sites depress house prices in Ohio (USA), Greenstone & Gallagher (2008) are not able to find an impact of cleanups of hazardous waste sites on house prices by using a larger sample of the Superfund-sponsored cleanups in the USA (and different methodology). Considering wage levels, Suedekum (2005) points out that unemployment rates are higher in peripheral areas, whereas centers of agglomeration show low unemployment rates across Europe. 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, regarding the empirical data the wage curve is stable over time and does not vanish as workers move, but is rather reinforced by migration (Suedekum 2005). So, wages seem not to be feasible to use as 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). So e.g. assumptions of the approach are a single hedonic price equation and identical structural parameters across markets which may cause pitfalls in the estimations (Brown/Rosen 1982). Additionally, the hedonic price approach tends only to be feasible if the substitution effect (between private and public good) can be disentangled from the income effect (Bradford/Hildebrandt 1977). Despite specification issues, also the aggregation level of the analysis may affect results (Banzhaf/Walsh 2008). So, 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. Kuminoff (2009) points out that the value of most homes near the agricultural-urban edge increases but that this effect was not equal for all types of homes. The increase seems to depend on the type of houses if the location does not differ in the first place. Furthermore, land is immobile which may enable local administration to absorb some of the rents and with this to influence housing price (Epple/Zelenitz 1981). So, using housing price as hedonic prices may restrict the interpretation as well as leading to under- or overestimations 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 according to the available data.

Besides the argument that migration (as proxy for demand) and public good provision (as proxy for supply) affect housing prices or wages, the theory of Tiebout proposes also that people with similar preference patterns select themselves into those local communities which satisfy best their demand. 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 (as e.g. clean air). In particular, as individuals may choose to commute (e.g. within metropolitan areas in USA) and therefore show a higher degree of flexibility, the residential choice of the household may depend on local public good provision (Ellickson 1971). Regarding the empirical findings, higher homogeneity in respect to income within the community than across communities could be observed (Eberts/Gronberg 1981, Grubb 1982a). However, segregation of the population by age shows only a weak effect, while other community characteristics (e.g. race, land use) do not seem to lead to active separation (Grubb 1982a). Another stream of research further identifies clusters of stated subjective well-being which 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). So, e.g. 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 are (Rehdanz 2010). Kahn (2000) argues that smog reduction leads to an increase in quality of life. Thus, people (in particular the well-educated and pensioners) are attracted by cleaner air and migrate into suburbs. Commuting serves for them as a means to enter the labor market. But as commuting also creates costs, benefits of moving may be reduced and decisions about migration get even more complex for households (Bayer/McMillan 2010). Moreover, considering only income as a segregation force may lead to biases in the conclusion. For instance, Voss, Hammer & Meier (2001) point out that in their data set also 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. That is, principally, these migrants were 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 regarding individual preferences (age, education, election outcome, home ownership, income, race and religion), thus the stratification process of communities seems to be enhanced lately (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) which cannot be usurped totally by the land price differential (regarding the hedonic price approach) (de Bartolome 1990). In contrast, regarding voluntary sorting into communities, Page, Putterman & 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 over-provision (or under-provision) 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 for the public good provision (Oates/Schwab 1988). Moreover, the selection process may also 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, tend to be reflected within wages (Combes/Duranton/Gobillon 2008). However, assuming that high-skilled worker 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 gets too large. Economic decline dynamics may open up if too many low productive people are attracted (Mathur/Stein 2005).

So far, most of the empirical studies presented above are conducted in the USA. Regarding migration process within Europe, today's variance in inter-regional migration can be explained by differences in employment protection, international migration, the share of ownership 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 population in the 1950s in West-Europe, followed by a trend of counter-urbanization in the mid-1960s firstly in North-West Europe and later in South and West Europe (into the 1970s). In particular, in West Germany and Italy counter-urbanization persisted in the 1980s, while in other West-European country no clear evidence for urbanization or counter-urbanization was found. Reasons for counter-urbanization were mainly found in changes in transport and communications technology, thus jobs and housing opportunities were created while commuting activities expanded. Additionally, state activities extended regarding the public good provision in rural areas. Considering individual preferences for migration, Fielding (1989) notes that people had been attracted by the bright lights of the city (around 1970s) and later found the city environment to be too stressful, dangerous and distasteful, and moved to rural areas or small towns, in particular retired people with sufficient wealth and mobility as well as economically active people without work, wealth or family constraints chose to migrate. Like Suedekum (2005), Fielding (1989) also recognizes that wage levels have stayed constant over time and thus do not serve as reasons for counter-urbanization as rural areas display higher unemployment rates and lower average wages. Moreover, public policy may have incentivized migration decisions, as in particular during the 1960s political efforts were intensified to promote economic growth in rural regions. But as these expenditures were relatively small compared to other state spending, it may not serve as full explanation for the observed counter-urbanization. It seems therefore 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 which 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. One of the effects of this change was to produce a shift towards 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 the reunification process, suburbanization continued in West Germany (former FDR), while the area of the former GDR experiences a distinct magnet effect of urban regions for 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 towards migration patterns (Parikh/van Leuvensteijn 2003). Migration behavior in Germany also depends on aspects like age structure (Mitze/Reinkowski 2010) or risk attitude (Jaeger et al. 2010). Hence, younger and less risk-averse individuals tend to migrate interregionally, whereas commuting seems to balance out partly effects of migration (Mitze/Reinkowski 2010). Therefore, labor migration widely accounts for migration patterns in Germany, whereby sectorial differences can be detected (Van Leuvensteijn/Parikh 2002).

In this paper, it is argued that individuals who migrate to Bavaria may choose their residence within Bavaria based on biodiversity abundance and therewith reveal a preference on environmental aspects (besides income or/and employment considerations). Whether biodiversity may add to the explanation of variance in migration data or not shall be subject of the following empirical research. Hence in a first step, factors for immigration into Bavarian counties shall be identified, whereas the second step seeks to detect selection dynamics as pointed out in the theoretical discussion. Moreover, spatial effects shall be considered as well as differences in migration and demand patterns regarding age and gender. Within Bavaria, variations in respect to regions, county or to community policy can be still found, but due to data restriction regarding biodiversity, community level analysis seems not feasible, therefore county level analysis is here chosen.

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 was obtained from the Federal Statistical Office.[2] As data aggregated for age groups is available, five age groups shall be used in the following to capture differences with increasing age: (1) under 18 years old (dependent children which indicates family migration), (2) 18-25 years old, (3) 25-30 years old, (3) 30-50 years old, (4) 50-65 years old, (5) above 65 years. Since 2001, this data is also split up according to gender.

Regarding the empirical results reviewed above, it is observable that results are sensitive to method as well as indicator. Moreover, high direct correlation can be observed between emigration and immigration rates (for a discussion on this effect see Mueser/White 1989). Also in this dataset the correlation between immigration rate and emigration rate is 0.96. To include net-migration rate would be another option. But as it is of interest here to identify the drivers for people to settle into a specific region and not why people leave, only the *immigration rates* are considered further.

Additional to the migration data, data on the *population* is included, whereby also the same categories as for migration (female vs. male & age groups) were available. These numbers shall help to identify selection processes according to age groups, i.e. to answer the question if people are more likely to migrate into regions with a higher fraction of their age group. Apart from the numbers on the population, figures on *out-commuter* over county border (separated between female and male) relative to employees in the region are integrated as well.

To control for economic opportunities of the region the variable ‘available income per capita’ (*avIncpc*) is introduced, whereas the rate of employees in *manufacture* shall capture differences due to sectorial composition of the region. As in the hedonic price approach literature the linkage between land price, hazardous waste and migration is discussed; these variables shall be 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).

[2] All variables in this chapter are obtained from the Federal Statistical Office for the years 1998-2008, if not stated otherwise.

As the subject 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 & Wolf (2007) are taken as a biodiversity indicator (relatively to county size). Butterfly species are chosen as they are assumed to be sensitive to environmental change and the most recent data is available. So far, it is argued that biodiversity in rural areas is different than urban areas. But analyzing migration patterns by excluding cities seems not to be a feasible option and therefore urban areas shall be included, as they may give some more insight (see also Öckinger/Dannestam/Smith 2009). As well as biodiversity, the long-term average of the *temperature* for the years 1961–1990 is incorporated in the analysis to capture other aspects of natural amenities (taken from the German Weather Service). Both variables are constant over time.

The statistical properties of the here used variables can be found in Table 4 & Table 5 (Appendix).

3.2. Method

Starting with a fixed effect model (including time dummies), results are firstly 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 shall be accounted for in the estimations.

As in the theoretical discussion, selection effects are discussed, the model is tested secondly for cross-sectional correlation (i.e. correlation in the space dimension) by applying the Pesaran test (according to de Hoyos/Sarafidis 2006). This test shall lead to robust results even in the case of dynamic panel settings. Also this test detected correlation within the error terms which points to 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 no test is known to the author, that detects the form of spatial dependence in panel data, Morans's I and Geary C's is calculated for the dependent variable (immigration) for each year. Here, clearly, results show strong (global) spatial correlation (dependence; see also Table 6 & Table 7, Appendix), which needs to be considered if estimates shall be robust and correct, thus severe misspecification of the model ruled out (Baltagi 2008).

In order to account for spatio-temporal autocorrelation within panel data, some approaches are already proposed. So Spatial-ML (Baltagi 2008, Franzese/Hays 2008), General Method of Moments (GMM) estimation (Kelejian/Prucha 1999, Kapoor/Kelejian/Prucha 2007, Bell/Bockstael 2000) or Spatial Two-Stage Least-Square approach (2-SLS) (Kelejian/Prucha 1998) approaches are 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 which therefore arises is to find a suitable instrument which does not correlate with the error-term (see Franzese/Hays 2007). Regarding the performance, GMM, Spatial-ML as well as 2-SLS seem to perform equally well although different assumptions are here made in order to account for both dimensions (time and space) (e.g. correlation tackled on dependent vs. independent variable) (Franzese/Hays 2007, Baltagi 2008).

The strength of spatial interdependence is of interest here as it may give a hint on the supposed selection dynamic as outlined above (or common spatial external driver), and so the spatio-temporal model of Franzese/Hays (2008) shall be applied. 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 on B, and B reacts on A within time), interdependence may be overestimated. However, in both cases spatial correlation is driving estimates. If not taken into account, the model may yield results under serious misspecification (Baltagi 2008, Anselin 2010).

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

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

whereby y denotes the dependent variable (NT×1 vector), ρ the spatial autoregressive coefficient, and $\mathbb{W}$ the spatial-weighting matrix (NT×NT, neighbouring-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 context-conditional factors ($d_{it} \times s_t$). β serves 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) are 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 as far as possible (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 into Bavarian counties are identified by implementing the Spatial-ML approach. Results can be found in Table 1. In general, biodiversity (measured as butterfly species per hectare) seems in all regressions to explain significantly immigration into Bavaria, irrespectively of age or gender. Hence, areas with a high level of biodiversity seem to attract immigration. It seems therefore that biodiversity is valued as natural amenity, as demand does not alter in the regression models.

Apart from biodiversity, temperature also seems to influence positively the rate of immigration. However, examining the age groups, it can be observed that with higher age (above 50) temperature is negatively related with immigration, i.e. older people move into areas with lower average temperature. Moreover, land price is also positively correlated with immigration rates, whereas hazardous waste tends to reduce immigration rates. It seems therefore that land prices tend to reflect the demand for construction land, whereas hazardous waste seems only to matter for the migration decisions of individuals between 18-30 years old. Regarding the sectorial composition, counties with higher employment rates in manufacture tend to less highly favored for immigration. The variable out-commuter actually strengthens the argument that natural amenities play a role when deciding on the region to settle in; however this effect depends on age. So, families (with children under 18 years old) seem to move into regions with lower available income, higher biodiversity and higher temperature, irrespective of the challenge to commute to work over county borders. As the parents should be correspondingly within the age group of 25-50 years old, no significant effect of out-commuting can be observed for both genders. Dividing the sample according to gender, results point to differences in immigration patterns across age groups as well as between genders (see Table 8, Appendix). So, not only families move into areas and thereby increase the rates of commuters, but in particular female migrants between 25-50 years old move into regions from which they have to commute to work. The younger generation (18-25 years old), however, tend to prefer to move close to their employment (female and male).

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 natural logarithm

Considering the model specification on spatial interdependency, rho is in each model significant, thus immigration is clustered over space and seems to attract further immigration also in neighboring regions. 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. As sigma yields significant positive results, spatial dependency of this group might be rather caused by spatial heterogeneity than spatial interdependency, but spatial assumption of the model seems still to be justified (see Table 8, Appendix).

The second step is to detect selection dynamics as pointed out in the theoretical discussion above. So, it is argued, age groups may select themselves into regions. To test this hypothesis, the model above 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 further immigration of the same age group. With increasing age this effect (regarding strength of the coefficient) tends to decrease. As one may argue that specific features of the area not captured in these models, may drive this results, it shall be pointed out, that the model specification regarding spatial interdependence (rho) is significant and positive for all age groups.

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 natural logarithm; threshold for VIF is up to 10.

It seems rather plausible, that immigration is attracted by characteristics in the area similar to the one the migrant possesses itself. Thus, at is shown above, migration tends to cluster according to age and gender. This clustering may be caused by similar general demands for natural amenities to live in. In particular, presence of people in the same age group or the surrounding nature may positively influence the decision to migrate into the region.

Another objection regarding these findings may be that results are driven by the 'magnet effect' of urban areas. Considering that urban areas tend to have higher species abundance, higher land prices and lower levels of manufacturing, results may only reflect immigration into urban areas motivated by urban amenities (see Heberle 1938). To test for this objection another regression model is set up which incorporates a dummy-variable for rural areas (i.e. 1 denotes rural counties; 0 for cities). This dummy shall capture significant difference in migration between rural and urban areas. However, it shall be noted 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.

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 natural logarithm; threshold for VIF is up to 10.

Comparing the extent model with the results of the former regressions, findings remain in general the same. It is, however, observed that the significance for biodiversity is reduced. In particular, individuals in the 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 group under 18 and 30-50) seems to migrate into biodiversity rich areas and therefore increasing the rate of out-commuters. Thus, while biodiversity seems not to be an aspect incorporated into the migration decision of individuals between 25-30 and 50-65 years old, migration rates of the other age groups are still positively affected by species abundance. Results seem therefore to be robust to different specifications.

To sum up, estimations in all models show that biodiversity significantly enhances immigration in the region. Although migration is clustered in space and interdependence can be shown, also path dependency (i.e. correlation over time) of migration is a factor to be taken into account when migration is examined quantitative.

4. Conclusion

The paper discusses social demand for biodiversity and its conservation respectively. In order to measure this demand, in general methods of stated preferences or revealed preferences are applied. While stated preferences involve asking the respondents directly, they are severely criticized. However, despite all the drawbacks of stated preferences, they show some aspects of the attitude within the population regarding biodiversity and nature. Another method instead of asking individuals for their demands or beliefs is to examine their behavior. Thus, the method focuses on what individuals are actually doing, rather than what they are saying by referring to the issue that stated reference may encompass ‘cheap talk’ and ‘social conformity’. In the political economics literature therefore it is proposed that actions of the individuals may reveal their ‘true’ preferences as action is more costly than replying to a survey. Referring to the political economic approach of Tiebout (1956) this paper examines in more detail the supposed selection effect by changing focus towards the more costly option to uncover preferences: migration. Thereby, it is argued that people may choose to migrate into communities with characteristics or offered public goods that best meet their preferences. Analyzing data on migration in Bavaria, it can be observed that biodiversity in general seems to explain immigration into the communities. Irrespective of gender or age, significant positive results for biodiversity could be obtained, whereas the coefficients for other variables (e.g. out-commuting, available income or even temperature) varied across the age groups in sign and significance. Thus, it can be concluded, that a general demand for biodiversity and natural amenities are traceable.

Aspects of the Tiebout hypothesis such as demand for public goods may be reflected in increasing land price could be shown here, as well. Land is more costly in regions with higher immigration rates. Introducing additional time lags in order 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 communities. This selection effect is here tested in respect to age. In particular younger people and families tend to consider similar patterns of the population as crucial for their migration decision. Higher coefficients are obtained for these age groups. Older people, on the contrary, tend to evaluate biodiversity positively, while temperature tends to negatively affect their migration decision. Considering sectorial dependence of migration decisions, none of the age groups favors here migration destination with a high proportion of the manufacturing sector. Commuting seems to be rather used as a means to divide between areas of working and areas of living, whereas the areas of living depend on natural amenities such as biodiversity. However, rendering more precisely the level of demand for biodiversity shall be the subject of future research.

Biodiversity is significantly related towards migration behavior. Thus, people tend to prefer regions with high species abundance when migrating, irrespective of age or gender. Taking into account rural-urban migration, variance of the migration rate is still explained by biodiversity. This demand, however, may be classified as a demand for natural amenities, as economic considerations seem to be here the dominant driver for migration.. Results seem to be in line with Farzin/Bond (2006) that social behavior tends to be motivated by securing amenities rather than by improving the actual biodiversity status. Hence, while biodiversity seems to be valued within the population, economic considerations may dominate the actual local decision taken. Therefore, the question arises of how institutions need to be shaped in order to enable sustainable usage of nature, if one does not want to rely on the moral responsibility of mankind.

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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

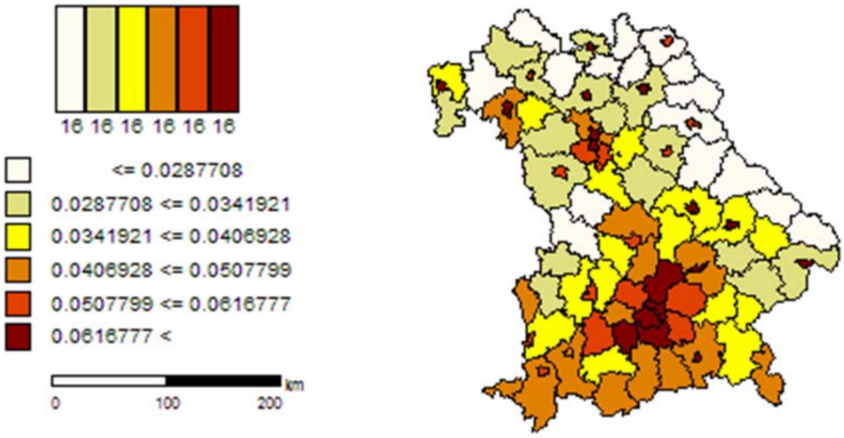

Figure 2: Mean Net-Migration Rate in Bavaria (1998-2008)

Migration across County Borders

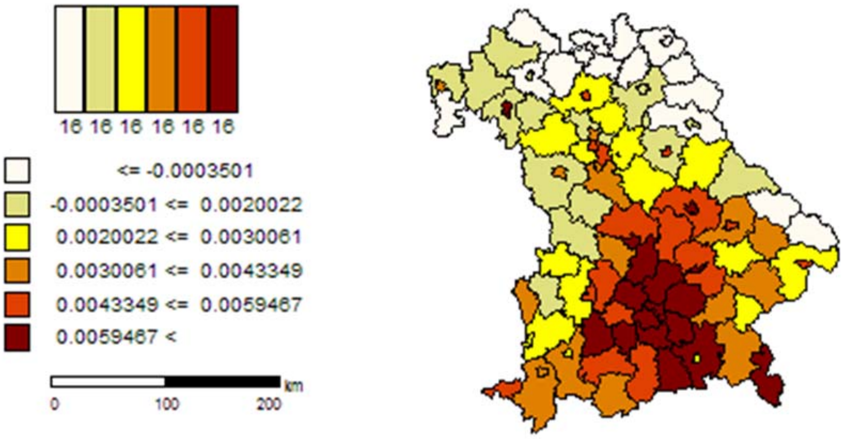

Table 6: Moran's I for Immigration Rate

(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