DECISION MAKING IN COMPETITIVENESS OF REGIONS

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Abstract

ESPON ATTREG project aims to investigate the motivation and behaviour of migration flows and daily commuting of students, tourists, aging population migrating to their secondary homes, students and other "part time" commuters – but especially behaviour of human resources in gross migrations and daily commuting – between regions. One of the key elements of the cohesion policy of the European Commission is the contribution of the development of new transport infrastructure to regional economic development. Extensive spending has taken place under ERDF, Cohesion Fund and ISPA to reduce disparities among regions. One of the prominent initiatives in the European Union in this respect is the development of the Trans-European transport networks (TEN-T), where also investments in Slovenian networks took place among priority list, which is based on the accessibility index value. In the case study of Slovenia decision support system is suggested for better forecasting the results of investments.

Key words: *competitiveness, attractiveness, regions, gravity model, spatial decision*

1. INTRODUCTION

The objective of our research is to describe and model comparative territorial attractiveness which could be used by regional policymakers. As stated in Inception report of ESPON ATTREG project (Atkinson et al., 2010), better conceptualization and measurement of territorial attraction will contribute insights into how the ESPON and other European Union policy documents can help build a more competitive and cohesive Europe. Through the indicators of territorial attractiveness we wish to measure a quality of regions and cities being a precondition for sustainable local development of region and city, having capacity to attract development factors (new residents or migrants, visitors, and some entrepreneurial activities). In our research we understand attractiveness of region or city as a set of territorial properties which attract different physical flows (here mostly people: families, commuters, students, tourists) or investments (not in particular interest here) and accessibility of this flows to the studied territorial unit. Therefore we studied some attraction of physical human flows of migrants (gross and net migrations) and visitors (daily commuting of human resources and students), trying to addresses the spatial and long term properties of such attraction processes. In this paper we are not interested to the attraction of economic activity and financial capital.

We understand attractiveness as a characteristic of regions or cities that varies spatially according to its environmental, social, cultural and economic components. Up to now we have studied especially accessibility and economic factors, partly also environmental factors (Bogataj and Drobne, 1997, 2005; Bogataj L. et al, 2004; Bogataj M. et al, 1995, 2009, 2010; Drobne and Bogataj, 2005; Drobne et al., 2008a, 2008b; Lisec et al., 2008).

2. ACCESSIBILITY MIGRATION AND ECONOMIC GROWTH

We supposed that first we have to differentiate two groups of factors: those which influence accessibility to region (or urban area) and internal factors which influence the quality of places.

2.1 ESPON research on Territorial Dynamics in Europe

Accessibility plays a significant role in European policy related to the development of territorial units. In several European policy documents as it is European Commission Green Paper on Territorial Cohesion or Territorial Agenda of the EU involving all EU Member States, accessibility is seen as key factor in improving attractiveness of Members States, their regions and cities. Accessibility and mobility are prerequisites for territorial economic development. Regions having a high accessibility to raw materials, suppliers and markets are in general economically more successful regions enjoying a more competitive position in the global market. If so, transport infrastructure improvement might be an important policy instrument to promote regional economic development (ESPON, 2006, 2008, 2009). We understand the accessibility "as the habit or power of getting near or into contact with …" (Oxford English Dictionary, 2003). When considering location it is focused on the influence of separation or distance in reducing access to a certain location from other locations. Accessibility is a measure of ease of access and in all of our previous research works it was assumed to be symmetrical. Converting distance to time spending or some other actual costs of access, we get a measure that may provide a changed ranking of localities by centrality. By accessibility in general we want to describe an integral view of locational qualities that result from nonlocal influences.

The term accessibility as used in ESPON (2009) expresses how easy people in one territorial unit can reach people in another territorial unit. Accessibility of a unit is indirectly a measure for the potential for activities and enterprises in the region to reach markets and activities in other regions and as consequence for development of territorial units. If we wish to collect the data for measuring and computing accessibilities we need, first, to decide a system of subareas (NUTS 2 or NUTS 3 regions) that subdivide a larger defined region (EU in this case), second, one or more sets of measurements of the pairwise separation of the subareas, and third, aerially distributed data sets of people, activities, or other entities of interest. In our studies these have been mostly commuters (workers and students) and families (gross and net migrations); see (Bogataj and Drobne, 1997, 2005; Bogataj L. et al., 2004; Bogataj M. et al., 1995, 2009, 2010; Drobne and Bogataj, 2005; Drobne et al., 2008a, 2008b).

ESPON data of accessibility are based on measurements of airline distance, route distances and rail distance and travel time, from which weighted combinations of these are derived. The potential accessibility of a NUTS 3 region is calculated by summing up the population in all other European regions, weighted by the travel time to go there. These measurements vary by mode and according to personal choice procedures for routes. Therefore, multimodal accessibility indexes on NUTS 3 level has been derived, where index for Europe is 100. Standardized values have been derived with the EU average (EU27=100), regions in better position got index more than 100 and those, being in worse position than the European average got index less than 100.

The accessibility trends for transport by air, road and rail have been analysed by ESPON independently to show differences between the different transport modes. These separate indexes have been combined into one indicator showing the multimodal potential accessibility of places as the joint effect of the three transport modes. Fig. 1 shows potential multimodal accessibility index for twelve Slovenian regions on NUTS 3 level and regions on the same level in neighbour countries for 2001.

The multimodal accessibility of regions has been used for investigating relationships between accessibility and economic development and between accessibility and migration, issues that are particular in focus in policy documents related to the European territory (ESPON, 2009).

The relation between multimodal accessibility and economic development in 2006 was studied by ESPON (2009), grouping regions with regard to GDP and accessibility. In relation to potential accessibility and GDP, 69% of the regions are in a double positive or double negative situation, i.e. they have both GDP and accessibility above respectively below European average (see Fig. A-1 in Appendix). Moreover, accessibility multimodal index and GDP shows a significant positive correlation of 0.52.

ESPON (2009) compared the potential multimodal accessibility of regions in 2001 with migration trends between 2001 and 2005. In total, 61% of the regions appear to be in a double positive or double negative situation, i.e. they have an above average accessibility and in-migration or they show below average accessibility and out-migration but correlation between these two variables was 0.14 only (see Fig. A-2 in Appendix).

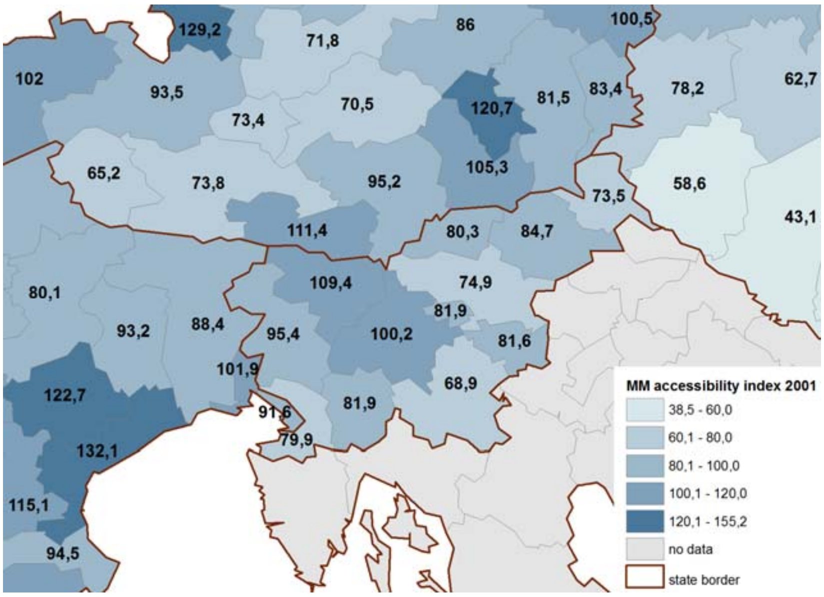

Figure 1: Potential multimodal accessibility index in Slovenian and neighbour regions on NUTS 3 level in 2001 (source of data: Spiekermann and Wegener, 2007)

2.2 Slovenian perspectives

2.2.1. Accessibility to EU regions and inside Slovenia on NUTS 3 level

ESPON results have revealed that accessibility seen from the European level might not reflect the same patterns as accessibility seen from a national or regional perspective. This can be shown also by Slovenian case study, where data on commuting and gross migrations were obtained from SURS (2002-2010). We found out that correlation between net migrations in Slovenian regions (y= $\sum_i GM_{ij}$ - $\sum_i GM_{ji}$) and multimodal index (x= MM index) is very low, R^2 is only 0.14 (see Fig. 2).

Therefore we have to study separately accessibility to European countries and between Slovenian regions inside the state. Also if we replace the MM indexes for 2006 the results are nearly the same. For study interstate flows we have used gravity model with more precise exponents. For this purpose we have defined accessibility as

$$A_j^F = \sum_i F_{ij} = \sum_i P_i^{\alpha^F} d_{ij}^{\beta^F} \quad (1)$$

Where F could be gross migrations $GM(family\_members)$, $GM(students)$, daily commuting $DC(workers)$, $DC(students)$ or some other flows from origin i to destination j. Here P_i is population in

i and d_{ij} time spending distance between regions (in Slovenia road distance accessibility index measured as in (1) is relevant for more than 86% of all travels as calculated R^2 has shown).

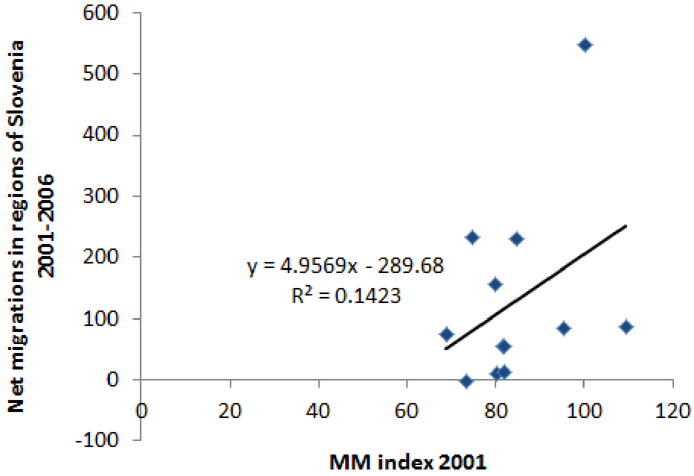

Figure 2: Regression model of net migration in region of Slovenia 2001-2006 according to European multimodal index in 2001.

2.2.2. Accessibility inside Slovenia on NUTS 3 level, GM and GDP

Using this approach we have studied gross migrations in Slovenia (average yearly 2000-2006) in dependence of GDP. Regression model of gross migration between regions in Slovenia is Lowry-like model (Lowry, 1966):

$$GM_{ij} = aP_i^{\alpha_1} P_j^{\alpha_2} d_{ij}^{\alpha_3} K_{GDP,i}^{\alpha_4} K_{GDP,j}^{\alpha_5} \tag{2a}$$

Regression Statistics	
Multiple R	0.9235
R Square	0.8528
Adjusted R Square	0.8469
Standard Error	0.5578
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-10.1543	1.6135	-6.2934	4.71E-09
P_i	0.8376	0.0863	9.7112	5.54E-17
P_j	0.8329	0.0862	9.6594	7.4E-17
d_{ij}	-1.3424	0.1014	-13.2397	1.3E-25
$K_{GDP,i}$	0.8970	0.3661	2.4505	0.01564
$K_{GDP,j}$	1.7088	0.3670	4.6564	8.04E-06

$$GM_{ij} = 3.89 \cdot 10^{-5} P_i^{0.84} P_j^{0.83} d_{ij}^{-1.34} K_{GDP,i}^{0.90} K_{GDP,j}^{1.71}\ ; \quad R^2 = 0.85 \tag{2b}$$

Here $K_{GDP,i}$ is the ratio between GDP per capita in NUTS 3 region i and GDP per capita on the state level - GDP_{state} (we can see that correlation is far higher than correlation of accessibility index with GDP_PPS p.c. on the EU level).

Accessibility for gross migrations A_j^{GM} can easy be calculated using formula (1):

$$A_j^{GM} = \sum_i P_i^{0.84} d_{ij}^{-1.34} \tag{3}$$

Some useful calculations:

Using second regression approach $K_{GDP,j}$ has been found as follows $K_{GDP,j} = bP_i^{\beta_1} P_j^{\beta_2} d_{ij}^{\beta_3} K_{GDP,i}^{\beta_4} GM_{ij}^{\beta_5}$:

Regression Statistics	
Multiple R	0.6821
R Square	0.4652
Adjusted R Square	0.4440
Standard Error	0.1251
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.5678	0.4117	-1.3793	0.170243
GM	0.0859	0.0185	4.6564	8.04E-06
P_i	-0.0621	0.0250	-2.4872	0.014182
P_j	0.0459	0.0252	1.8250	0.070375
d_{ij}	0.0806	0.0344	2.3426	0.020716
$K_{GDP,i}$	-0.1691	0.0826	-2.0465	0.04279

$$K_{GDP,j} = 0.566 \cdot P_i^{-0.062} P_j^{0.046} d_{ij}^{0.081} K_{GDP,i}^{-0.169} GM_{ij}^{0.086}; \quad R^2 = 0.44$$

If using linear regression model we also get better results as:

$$K_{GDP,j} = c + \gamma_1 P_i + \gamma_2 P_j + \gamma_3 d_{ij} + \gamma_4 K_{GDP,i} + \gamma_5 GM_j$$

Regression Statistics	
Multiple R	0.7320
R Square	0.5358
Adjusted R Square	0.5174
Standard Error	0.1184
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.86529	0.0756	11.4419	3.1649E-21
GM	5.4880E-04	0.0002	2.7226	7.3948E-03
P_i	-4.8899E-08	0.0000	-0.3867	0.6996
P_j	7.7195E-07	0.0000	7.2705	3.3336E-11
d_{ij}	1.2132E-04	0.0002	0.5343	0.5941
$K_{GDP,i}$	-0.1280419	0.0871	-1.4705	0.1439

Considering only relevant indicators ($P - value < 0.05$) we got the following results $K_{GDP,j} = c + \gamma_2 P_j + \gamma_4 K_{GDP,i} + \gamma_5 GM_j$;

$$K_{GDP,j} = 0.865 + 7.72 \cdot 10^{-7} P_j - 0.128 K_{GDP,i} + 5.49 \cdot 10^{-4} GM_j; \quad R^2 = 0.52;$$

$$k_{GDP,j}^{GM} = \gamma_5 GDP_{state}; \quad \Delta GDP_j = k_{GDP,j}^{GM} \Delta GM_j = 4.77 \cdot 10^{-4} GDP_{state} \Delta GM_j .$$

2.2.3. Accessibility inside Slovenia on NUTS 3 level, DC and GDP

The best data of daily commuting *DC* in Slovenia are available from Census 2002. Regression model of daily commuting (Census 2002) between regions in Slovenia is

$$DC_{ij} = aP_i^{\alpha_1} P_j^{\alpha_2} d_{ij}^{\alpha_3} K_{GDP,i}^{\alpha_4} K_{GDP,j}^{\alpha_5} \tag{4a}$$

Regression Statistics	
Multiple R	0.8948
R Square	0.8006
Adjusted R Square	0.7927
Standard Error	0.9745
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-10.4923	2.8187	-3.7223	0.000296
P_i	0.8979	0.1507	5.9588	2.38E-08
P_j	1.3070	0.1506	8.6762	1.75E-14
d_{ij}	-2.3512	0.1771	-13.2744	1.07E-25
$K_{GDP,i}$	0.3706	0.6395	0.5796	0.563251
$K_{GDP,j}$	2.2173	0.6411	3.4584	0.000742

$$DC_{ij}(\text{workers}) = 2.77 \cdot 10^{-5} P_i^{0.90} P_j^{1.31} d_{ij}^{-2.35} K_{GDP,i}^{0.37} K_{GDP,j}^{2.22}; \quad R^2 = 0.79 \tag{4b}$$

Using (1) it follows that accessibility for workers who commute is

$$A_j^{DC\text{workers}} = \sum_i P_i^{0.90} d_{ij}^{-2.35} \tag{5}$$

<u>*Some useful calculations:*</u>

The tendency of economic growth could be calculated through the second regression $K_{GDP,j} = bP_i^{\beta_1} P_j^{\beta_2} d_{ij}^{\beta_3} K_{GDP,i}^{\beta_4} DC_{ij}^{\beta_5}$:

Regression Statistics	
Multiple R	0.6539
R Square	0.4276
Adjusted R Square	0.4049
Standard Error	0.1294
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1.1315	0.3813	-2.9677	0.0036
DC	0.0391	0.0113	3.4584	0.0007
P_i	-0.0245	0.0225	-1.0887	0.2784
P_j	0.0747	0.0244	3.0618	0.0027
d_{ij}	0.0548	0.0361	1.5174	0.1317
$K_{GDP,i}$	-0.1131	0.0844	-1.3389	0.1830

$$K_{GDP,j} = 0.323 \cdot P_i^{-0.025} P_j^{0.075} d_{ij}^{0.055} K_{GDP,i}^{-0.113} DC_{ij}^{0.039}; \quad R^2 = 0.40$$

Or using linear regression model $K_{GDP,j} = c + \gamma_1 P_i + \gamma_2 P_j + \gamma_3 d_{ij} + \gamma_4 K_{GDP,i} + \gamma_5 DC_j$

Regression Statistics	
Multiple R	0.7299
R Square	0.5328
Adjusted R Square	0.5142
Standard Error	0.1188
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.8248	0.0757	10.8963	6.9261E-20
DC	3.0944E-05	1.2097E-05	2.5581	1.1710E-02
P_i	3.0004E-08	1.1956E-07	0.2509	0.8023
P_j	8.1006E-07	1.0024E-07	8.0811	4.4934E-13
d_{ij}	5.4275E-05	2.1987E-04	0.2468	0.8054
$K_{GDP,i}$	-8.0734E-02	0.0865	-0.9334	0.3524

$$K_{GDP,j} = 0.825 + 3 \cdot 10^{-8} P_i + 8.1 \cdot 10^{-7} P_j + 5.43 \cdot 10^{-5} d_{ij} - 8.07 \cdot 10^{-2} K_{GDP,i} + 3.09 \cdot 10^{-5} DC_j$$

$$R^2 = 0.51$$

Including only significant indicators we got the following regression outputs

$$K_{GDP,j} = c + \gamma_2 P_j + \gamma_5 DC_j; \quad k_{GDP,j}^{DC} = \gamma_5 GDP_{state}; \quad \Delta GDP_j = k_{GDP,j}^{DC} \Delta DC_j :$$

Regression Statistics	
Multiple R	0.7265
R Square	0.5279
Adjusted R Square	0.5206
Standard Error	0.1180
Observations	132

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.7618	1.7289E-02	44.0640	1.2702E-79
DC	2.8793E-05	1.0946E-05	2.6305	9.5631E-03
Pj	8.2066E-07	9.7513E-08	8.4160	6.3950E-14

$$K_{GDP,j} = 0.762 + 8.21 \cdot 10^{-7} P_j + 2.88 \cdot 10^{-5} DC_j; \quad R^2 = 0.52;$$

$$k_{GDP,j}^{DC} = 2.88 \cdot 10^{-5} GDP_{state}; \quad \Delta GDP_j = 2.88 \cdot 10^{-5} GDP_{state} \Delta DC_j .$$

Some other useful calculations and dependency between accessibility and investments or accessibility and environmental factors are available in (Bogataj et al., 2009), the influence of accessibility achieved by improved transportation corridors is presented in (Lisec et al., 2008) and (Drobne et al., 2008a). The details on accessibility on NUTS 5 level are given in (Drobne and Bogataj, 2005). As some partners of ESPON

ATTREG project exposed the importance of influences of Schengen, we also calculated the influence of Schengen border on cross border commuting flows, based on the paper of (Drobne et al., 2008a). The impact of taxation on attractiveness has been especially well elaborated in (Bogataj D. and Bogataj M., 2010).

3. STRATEGIC EVALUATION ON TRANSPORT INVESTMENT PRIORITIES UNDER STRUCTURAL AND COHESION FUNDS

After enlargement of the EU to 25 Member States disparity levels within the EU have increased substantially. In order to strengthen its economic and social cohesion, the Community aim is reducing the disparities between the levels of development of various regions. This aim lies at the core of the Commission's regional policy. One of the key elements of the cohesion policy of the Commission is the contribution of the development of new transport infrastructure to regional economic development. Extensive spending has taken place in this domain under ERDF, Cohesion Fund and ISPA. One of the prominent initiatives in the European Union in this respect is the development of the Trans-European transport networks (TEN-T). In 2003 the Commission has identified the 30 priority projects of the TEN-T up to 2020. The priority projects include: *"the most important infrastructures for international traffic, bearing in mind the general objectives of the cohesion of the continent of Europe, modal balance, interoperability and the reduction of bottlenecks"*. For the new programming period 2007-2013 the Commission seeks to strengthen the strategic dimension of cohesion policy to ensure that Community priorities are better integrated into national and regional development programs.

Among three specific objectives which have been formulated for period 2007-2013 was also to identify and evaluate potential investment priorities of structural and cohesion funds for the programming period 2007-2013 and it should be done also on the strategic level till 2030. Future areas for priority transport investments were identified based on European multimodal accessibility index, which does not show the real priorities for Slovenia, but only for EU (ECORYS, 2006). The method is suggested here to improve the model.

Let us assume that we have n possible locations to invest in accessibility of Slovenian NUTS 3 regions: $L_1, L_2, ...L_n$. For each year of planning period we have available investment sources $B_1, B_2, ...B_m$ cumulatively assured at the beginning of planning horizon. In the year r we shall invest in location s needed amount of investments c_s $(x_{rs} = 1)$ or not $(x_{rs} = 0)$, so that $\sum_s c_s x_{rs} \le B_r - \sum_{i=1}^{r-1} X_i$ where $X_i = \sum_{s=1}^{n} c_s x_{is}$ is sum of all yearly investments as given in allocation Tab. 1.

If local decision makers will be involved in decision making they would like to influence economic growth - not only to make region accessible for Europe but also to enable better accessibility to different internal flows like interregional gross migrations of different groups and interregional commuting of different groups dependent their contribution to economic growth (criterions could be extended to multi-criterion decision making especially by including environmental indicators in criterion function). Let us consider now, how the local decision maker will contribute to economic growth through attraction of different flows.

Table 1: Allocation of investments

location	L_1	L_2	$...L_s...$	L_n	limit of sources
Year 1					B_1
Year 2					$B_2 - X_1$
Year r			x_{rs}		....
Year m					$B_m - \sum_{i=1}^{m-1} X_i$
	c_1	c_2	c_j	c_n	

Local decision makers could decide

$$\max\left\{\sum_{r=1}^{m}\sum_{s\in i\leftrightarrow j} x_{rs}\left[\sum_{j=1}^{J}\left(\sum_{act}\Phi_j(GDP,act)\right)+\left(q_{j0}k_{GDPj}\Delta A_j(r)-c_s e^{5\rho}\right)\right]\cdot e^{-\rho(r+5)}\right\}$$

Here we have assumed 5 years time lag between investment and its impact on flows.

$$\sum_{\substack{i=1\\i\neq j}}^{J} q_{ij}k_{GDPij}^{act}\Delta act_{ij}(r)=\Phi_j(GDP,act)e^{-\rho(r+5)}$$

$$\sum_{\substack{i=1\\i\neq j}}^{J} q_{ij}+q_{j0}=1$$

and activity act could be gross migrations, daily commuting of workers or students, flow of tourists…

$act = GM$, DC(workers), DC(students), TUR, ...

J is number of regions

Here, we considered the influence of I different flows (*act*).

How to find $\Phi_j(GDP,act)$ which describe how investment in s influence accessibility? To determine time spending distances between centers, before and after investments in road infrastructure, GIS tools or software for transport planning could be used.

So, using (2a) and (4a), where instead d_{ij} Δd_{ij} is analyzed, we get ΔGM_{ij} and ΔDC_{ij} (workers) :

$$\Delta GM_{ij} = aP_i^{\alpha_1} P_j^{\alpha_2} \Delta d_{ij}^{\alpha_3} K_{GDP,i}^{\alpha_4} K_{GDP,j}^{\alpha_5}$$

$$\Delta DC_{ij}(\text{workers}) = aP_i^{\alpha_1} P_j^{\alpha_2} \Delta d_{ij}^{\alpha_3} K_{GDP,i}^{\alpha_4} K_{GDP,j}^{\alpha_5}$$

which influence GDP in the region j

$$K_{GDP,j} = \frac{GDP_j}{GDP(SI)}$$

$$k_{GDP,j}^{GM} = 4.77 \cdot 10^{-4} \cdot GDP(SI)$$

$$k_{GDP,j}^{DC(\text{workers})} = 2.88 \cdot 10^{-5} \cdot GDP(SI)$$

4. THE OPTIMIZATION PROCEDURE

The optimization procedure for the problem discussed in the paper is suggested as follows:

1. Choose first investment possibility.
2. Determine the minimum time spending distance between pairs of regions before and after investment using appropriate GIS tool or software for transport planning (for our purposes the shortest path algorithm in OmniTrans has been applied). Determine d_{ij} and Δd_{ij} where

   $\Delta d_{ij} = d_{ij}(before\_investment) / d_{ij}(after\_investment)$.
3. Calculate increase of flows between all regions as ratio between flow after investment and flow before investment $(\Delta GM_{ij}, \Delta DC_{ij}, \Delta TUR_{ij} ....)$ for all kind of flows which could be influenced for the most significant time lag (we used 5-years of time lag).
4. Find $k_{GDP,j}^{act}$.
5. Continue for all investment possibility.
6. Evaluate the maximum net present value.
7. Negotiate q_{ij} and q_{j0}.

5. CONCLUSIONS

Access to markets, to human resources or reverse to jobs, to social services, to tourist attractions, to attractive wilderness, wildlife and national parks is an important determinant of economic status and welfare. Measurement of access is therefore of great importance for policy analysis and planning of investments. Accessibility could be measured by a potential modal or multimodal accessibility index, which has been developed and evaluated from European perspective. These indexes are gauging connectivity of an individual region to other European regions while taking into account the population of the regions and the transportation facilities and logistics service level to reach them. Accessibility indexes have been gradually gaining acknowledgement of policy makers as one of the most important monitoring instruments of development and is the indicator of specific interest also in ESPON programs. From the perspective of a certain European state accessibility index as an ingredient of ESPON database does not describe accessibility between regions on the level of this state properly.

In a classic gravity model, which has been commonly used in the analysis of trade flows between regions and countries, the interaction between two places is proportional to the size of the two places as measured by population, GDP PPS, employment and/or some other index of social or economic activity, and inversely proportional to some measure of separation such as Euclidian distance or time spending distance or even cost to travel. The closer two countries or regions are and the larger they are, the more different flows of higher intensity between them is expected. There are not available up-to-date results of flows intensity for EU regions on NUTS2 or NUTS3 level, based on a classic gravity model, but in Slovenia we have made intensive studies on forecasting the flows of gross migrations, and daily commuting between NUTS3, NUTS4 and NUTS5 spatial units, based on the classic gravity model or so called Lowry-like models. An accessibility seen from the European level does not reflect the same patterns as accessibility seen from a national or regional perspective. This reality has been shown also by Slovenian case study. Therefore we suggest that for planning purposes and investments strategies ESPON accessibility indexes have to be combined by accessibility indexes of individual states or macro-regions and negotiations on different levels have to lead to the proper criterion function.

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Appendix

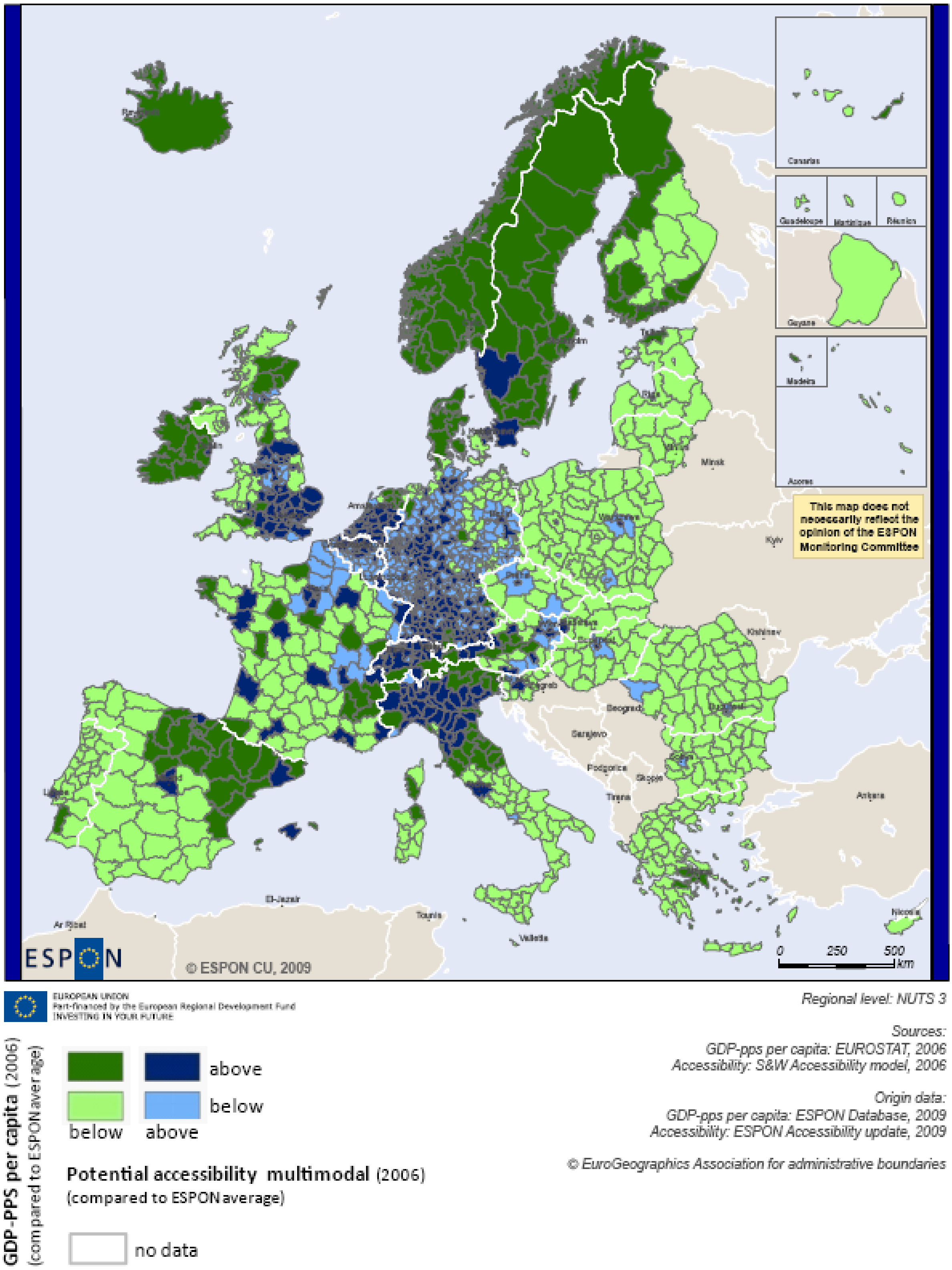

Figure A-1: GDP-PPS per capita versus potential multimodal accessibility (ESPON, 2009: 20)

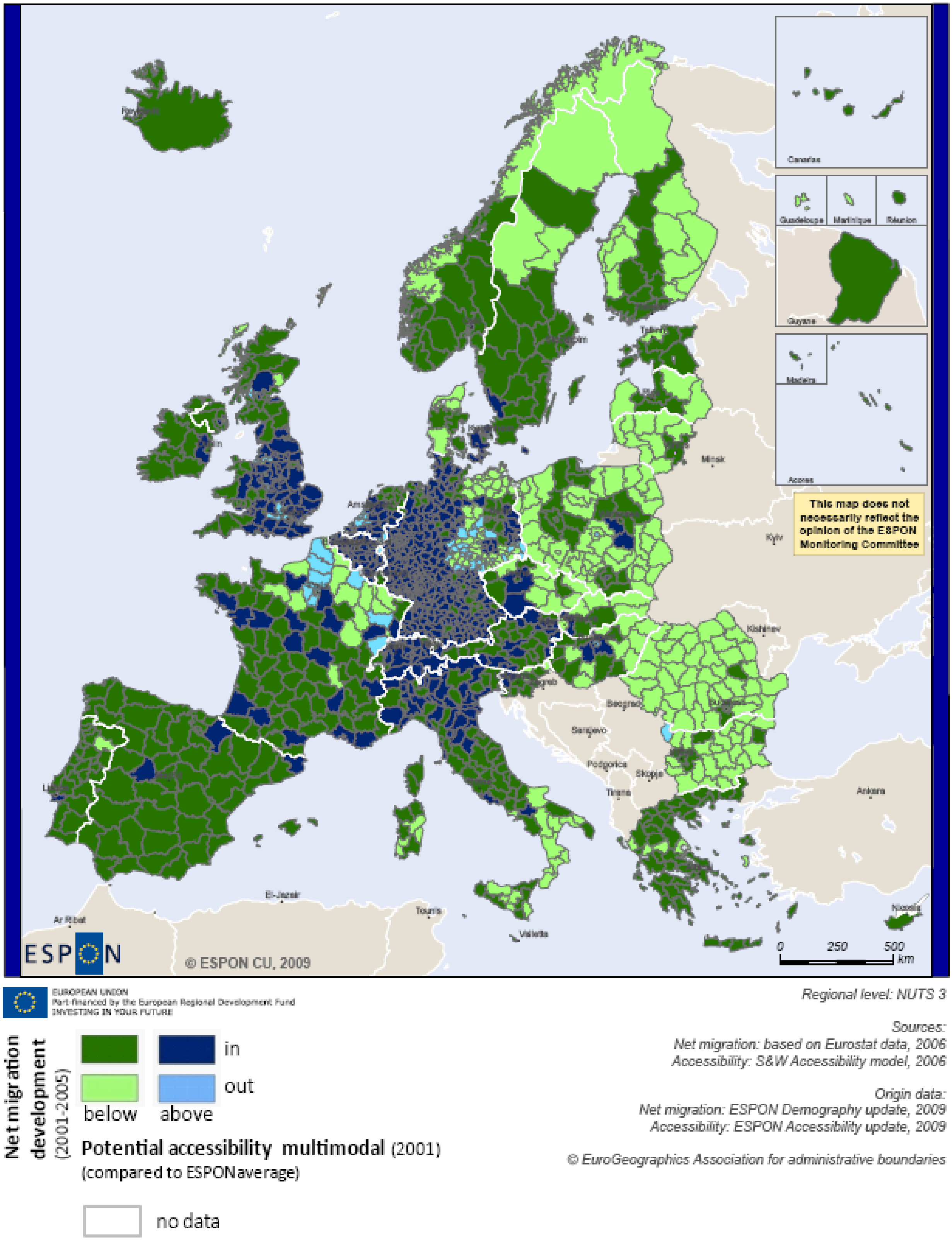

Figure A-2: Annual net migration development versus potential multimodal accessibility (ESPON, 2009: 22)