INTEGRATION AND LABOUR MARKETS IN EUROPEAN BORDER REGIONS

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Abstract
Border regions are likely to play a critical role within the spatial dynamics initiated by the enlargement of the EU. This paper deals with the effects of integration on labour market conditions in border regions. Within the framework of different theoretical approaches the effects of integration on location conditions and labour markets in border regions are analysed. Furthermore, we investigate empirically the degree of labour market integration in European border regions. Measures of spatial association are applied as indicators for the intensity of integration among neighbouring labour markets. The results of an analysis of per capita income and unemployment for the period 1995 to 2000 point at a measurable spatial segmentation of labour markets even among highly integrated EU15 countries. On average, border regions in the EU are characterised by lower degree of labour market integration than non-border areas due to significant border impediments that hamper equilibrating forces between labour markets on both sides of national frontiers.

JEL classification: F22, J61, R23
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1. Introduction

While barriers to trade between EU15 and accession countries have been completely abolished on May 1st 2004, there are still restrictions impeding labour mobility. Transitional arrangements regarding the free movement of labour in the EU25 between old and new member states mainly arose from the fear of mass immigration from Eastern European countries. In this context, it is argued that an increase in labour supply resulting from immigration could worsen labour market problems in the old member states, leading to declining wages and rising unemployment rates. Especially in EU countries close to new member states corresponding concerns are widespread. The Commission (2001) notes that in particular regions along the former external EU border might face very pronounced integration effects because of their proximity to the new member states. In principle, these regions are expected to benefit from EU enlargement in the medium and long term. Intensified cross-border interaction might give rise to a dynamic growth process in border regions. However, in the short run border regions might face significant adjustment pressures due to increased competition in product and labour markets.

Border regions are likely to play a critical role within the spatial dynamics initiated by the enlargement of the EU. With accession of the 10 new member states the share of border regions in total area of the EU increased from 22% in the EU15 to more than 35%. The corresponding percentage of EU population rose from 15% to almost 25%. This paper deals with the effects of integration on labour market conditions in border regions. Within the framework of different theoretical approaches the effects of integration on location conditions and labour markets in border regions are analysed. Furthermore, the study aims at investigating empirically the degree of labour market integration in European border regions. In various case studies specific aspects of labour market integration are analysed for selected border regions.[1] In contrast, we aim at providing some empirical evidence on the average effect of national frontiers in European cross-border labour markets. This implies that our analysis can not offer the same detailed insights as existing case studies. In fact, the objective of this investigation is to assess whether different border impediments which are described in case studies make up a representative phenomenon in the EU and whether the spatial structure of labour market conditions is marked by significant border effects. Indicators of spatial association are applied as measures for the intensity of integration among neighbouring labour markets. The analysis focuses on internal border regions, i.e. regions located along the borders of integrating countries which constitute the focal point of integration from a geographical perspective.

[1] The volumes by De Gijsel et al (1999) and Van der Velde/Van Houtum (2000) include several detailed and thorough studies dealing with labour market issues in different European border regions.

The rest of the paper is organised as follows. Section 2 explores specific characteristics of border regions and labour market integration along national borders within different theoretical frameworks. We consider traditional location theory, New Economic Geography (NEG), trade theory, and migration theory. In section 3, the results of an empirical analysis of spatial labour market segmentation in the EU15 and the EU27 are presented. The section comprises a description of methods, data and cross section. Methods for exploratory spatial data analysis are applied in order to investigate whether national frontiers hamper the convergence of labour conditions in border regions. We analyse regional disparities in per capita income and unemployment in the period 1995 to 2000 to determine structural breaks in space resulting from border impediments. Section 4 concludes.

2. Border Regions and Integration – Implications of Economic Theories

Integration affects regional labour markets usually along three channels: trade, migration and foreign direct investment (FDI).[2] Specific effects of integration might arise in border regions because of two aspects. Firstly, integration can affect the location conditions of border regions in a special way. The specific geographic position of internal border regions in the centre of an integration area might give rise particular integration effects. Secondly, the proximity to integration partners could result in an above average participation in the international division of labour since the intensity of trade relations and factor mobility is influenced by geographic distance. Moreover, closeness of the integration partner might allow for a more comprehensive integration in border regions because additional forms of cross-border interaction such as commuting and trade in usually non-tradable goods are viable. The two aspects are directly related to labour market development in border regions. Location conditions affect the number of firms located in a region and hence employment. Correspondingly, changes in location conditions in the course of integration might impact labour demand, wages and unemployment. Furthermore, labour market effects of integration will be relatively pronounced in internal border regions due to their proximity to integration partners if interaction between regional labour markets is significantly hampered by frictional effects of distance.

In the following sections, we will shortly outline implications of different theoretical approaches regarding labour market effects in border regions released by integration. The interdependency between integration, location conditions, trade and labour mobility is considered within the framework of location theory, NEG, trade theory and migration theory.

[2] Cf. Boeri/Brücker (2001).

2.1 Location Conditions in Border Regions

Location theories provide an adequate framework for an analysis of integration effects in border regions arising from changes in location conditions. Corresponding models emphasise the significance of access to inputs and purchasing power, the endowment with human capital, agglomeration economies and infrastructure as important location factors. Spatial proximity to a national border may derogate the quality of location factors and thus the attractiveness of border regions as production sites. This holds in particular for market access which is influenced by population density, regional per capita income and infrastructure endowment. Lösch (1944) shows that the economic landscape, a system of different spatial market areas, is affected by national borders. Borders are distortions in market networks and divide market areas because they reduce the accessibility of demand. Therefore firms are discouraged from locating near borders, i.e. within border regions. Furthermore, firms will be the more distant from national borders and the nearer to a nation's geographical centre the larger their required market areas are. Consequently, border regions will have only a few economic activities and only firms requiring small market areas. Lösch describes a border region as a desert, a wasteland in which many products can only be obtained from a distance or not at all. Border regions are generally regarded as marginal spaces disadvantaged by their peripheral location and divided market areas resulting in limited possibilities for economies of scale.

Declining border impediments immensely change the relative geographical position of border regions. While internal border regions are peripheral areas on a national scale they gain – located at the interface of domestic and foreign markets - a more central position in the integration area. Proximity to a border will lose its relevance as a location disadvantage if border impediments decline in the course of economic integration. Traditional location models, developed by Lösch (1944), as well as NEG suggest that a reduction of border impediments positively affects location conditions and factor endowments in border regions. NEG models imply that intensified international trade might change the spatial distribution of economic activities within countries.[3] In the course of integration the geographical orientation of firms changes from an inward bias towards input and output markets abroad. Therefore, new economic centres might arise in the middle of the integration area while traditional production sites may lose importance.

Based on market access considerations, NEG models suggest that reducing border impediments could attract consumers and firms to internal border regions.[4] This originates from the fact that integration leads to above average increases in market access in internal border regions. In NEG models, a region's attractiveness for labour rises with market access since access advantages raise wages. Moreover, firms also prefer locations that offer a large market. Therefore, integration might release a self-reinforcing process of industrial concentration in

[3] Cf. Elizondo/Krugman (1996) and Fujita et al. (1999).
[4] Cf. Niebuhr/Stiller (2004).

the course of which firms and workers relocate towards internal border regions. Due to immigration of labour and settlement of firms, employment and the wage level will rise in border regions.[5]

In general, no conclusions concerning regional unemployment disparities can be derived from NEG since most models assume that labour markets automatically clear. A rare exception is the NEG model by Peters/Garretsen (2000) that incorporates unemployment. According to this approach integration might worsen labour markets conditions of peripheral regions. Südekum (2004) combines the wage curve approach with a product market that exhibits the basic features of NEG. He shows that regions with high income levels have low unemployment rates and vice versa. Large core regions where workers and production concentrate have lower unemployment rates than sparsely populated peripheral regions. Labour mobility will exacerbate regional disparities in income and unemployment rates. Hence, free movement of labour established in the course of integration might reinforce regional labour market disparities.[6] This is in contrast to conventional approaches that predict converging labour market conditions as a result of labour mobility. The study by Südekum implies that differences in unemployment rates and income should be pronounced among core regions and peripheral areas. However, labour market disparities between neighbouring regions can be expected to be rather small at a low level of regional aggregation because of their similar geographical location within the economic landscape.

2.2 Cross-Border Interaction

Borders affect economic activity in border regions since they generate barriers that raise the costs of cross-border interaction and reduce the transfer of information and knowledge. In general, the internationalisation of labour markets mainly arises due to migration, FDI and trade which tend to increase as border impediments decline. Furthermore, in border regions cross-border commuting and the exchange of non-tradable goods might release additional integration effects. Integration impacts regional labour markets – labour supply, labour demand and wages – via several transmission mechanisms. In this section, we focus on effects resulting from increasing trade and labour mobility.

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5 In contrast to positive integration effects derived from market access consideration, Papapanagos/Vickerman (2000) argue that border regions might also realise a decline of economic activity due to a reduction of border impediments since they lose business associated with crossing the border.

6 The result arises since unemployment disparities are mainly driven by an increasing returns technology and economic agglomeration of labour demand. This outcome is confirmed by Epifani/Gancia (2001). They have formulated a core-periphery model with unemployment in which search costs generate a positive externality of agglomeration on the labour market. Within this framework, labour mobility temporarily alleviates regional unemployment disparities but increases differences in unemployment rates in the long run. Only at a well advanced stages of integration when transportation costs become negligible, unemployment disparities tend to disappear.

Trade

From a certain string of trade models one might conclude that proximity matters for trade. The assessment that trade intensity depends on distance is supported by empirical tests of gravity models.[7] Under this presumption, border regions should be ceteris paribus more strongly involved in trade with neighbouring countries than non-border regions. Regional labour market effects caused by trade liberalisation might therefore be relatively pronounced in regions close to integration partners. Concerning the impact of trade on labour markets one has to differentiate between regions and sectors. The reduction of border impediments will positively impact regions specialised in production of goods belonging to the export sector after integration. Adjustment pressure will arise in regions which used to produce commodities that become import goods.[8] Therefore, the impact of trade crucially depends on comparative advantage and regional specialisation. In this respect, labour market effects of integration will not systematically differ between border regions and other regions as long as border regions do not exhibit specific specialisation patterns.[9]

However, as regards trade liberalisation specific effects for border regions are related to the fact that goods and services which are in principle non-tradables between countries (e.g. consumer services, local public transport and housing) might become tradable goods in border regions due to the proximity to foreign markets.[10] A wider variety of economic branches is affected by integration in border regions compared to areas located in the centre of the national economy. Various sectors are exposed to international competition and might as well benefit from the proximity to foreign markets. The interaction of intensified competition and increasing foreign demand might affect labour market outcomes in border regions positively or negatively. Concerning the impact on wages, classical trade theory implies that trade is sufficient for realising factor price equalisation in an integration area even without interregional mobility of production factors. Thus, there are close links between trade and labour mobility with respect to cross-border labour market integration. In principle, migration and commuting might act as substitutes for trade.

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7 Corresponding analyses are empirically highly significant in explaining the volume of trade between two regions by their economic size and the interregional distance. Cf. Deardorff (1998) and Fidrmuc/Fidrmuc (2003).

8 Cf. Bittner (2002), p. 67.

9 The same conclusions can be drawn from newer trade theories which highlight product cycles, economies of scale and product differentiation as determinants of international trade.

10 Cf. Dascher (2003).

Labour Mobility

According to neoclassical models, wage and unemployment differentials are the driving forces for labour mobility. The liberalisation of labour mobility among regions will release a reallocation of production factors among regions marked by disparities in labour market conditions. Labour will move from low wage regions to high wage areas. The relocation of production factors leads to declining disparities in factor remuneration. According to traditional neoclassical approaches, there will be a migration equilibrium if no more wage (w) disparities between two regions A and B will exist (see equation 1). Thus integration will support the convergence of wage levels between regions - also among areas along both sides of a national frontier - if labour markets are liberalised and border impediments decline.

(1) Interregional migration equilibrium: $w_A = w_B$

More advanced migration theories go beyond considering wage disparities as the only determinant of labour migration. Migration models originally developed by Sjastaad (1969) and Todaro (1970) gave rise to the human capital approach for explaining migration. In this model, migration is considered as an investment decision depending on wage level in the potential destination, qualification, age of the worker and migration costs including direct migration costs (information, search cost and travel costs) as well as indirect migration costs (social and physical costs). Harris/Todaro (1970) developed a two sector model of rural-urban migration with urban unemployment going back to an institutionally determined minimum wage. Rural-urban migration proceeds in response to expected earnings. Labour will migrate from region B (rural) to region A (urban) as long as the wage level in region A - weighted by $(1-\theta)$ which can be interpreted as the probability of finding a job in A - surpasses the wage level in B. In this model the urban unemployment rate acts as an equilibrating force on migration since urban unemployment rises in the course of immigration making it less attractive to migrate from rural to urban regions.

(2) Interregional migration equilibrium: $w_A \cdot (1-\theta) = w_B$, θ = unemployment rate.

Furthermore, newer migration theories point to the relevance of personal networks in explaining the migration decision. Key elements of migration networks are intense relationships among persons in regions of origin and destination which reduce information and search costs for potential migrants (Straubhaar 2000). Some migration theories subsume migration determinants in push factors in the region of origin (e.g. low standard of living, high unemployment, insufficient social security system, high taxes, bad environmental conditions, bad infrastructure) and pull factors at work in the region of destination (e.g. high standard of living,

low unemployment, good social security system, low taxes, good environmental conditions, good infrastructure, networks).[11]

Regarding implications for labour markets in border regions, frictional effects of distance and transaction costs are highly relevant. Labour mobility is not free of costs and there is no perfect information on labour market opportunities.[12] Ravenstein (1889) formulated in his laws on migration that migration predominantly takes place over short distances. Schwartz (1973) discusses economic and other factors that form the underlying adverse effects of distance on migration as implied by the negative distance elasticity of migration flows. Corresponding migration determinants are sorted into two groups: (1) increasing (with distance) costs and (2) diminishing (with distance) information. Empirical studies imply that the probability to migrate between two regions declines as distance between them increases because migration costs rise and assessing potential migration gains becomes more difficult.[13] The dampening effect of distance indicates that workers located in border regions should have a relatively high incentive to migrate to neighbouring countries. Costs of migrating to neighbouring countries are comparatively low for individuals in border regions which have, due to spatial proximity, advantages in gathering information on the foreign labour market. Moreover, social costs should be relatively low due to short travel times for visiting families abroad.[14] However, significant border impediments might increase transaction costs and information deficits, reducing labour mobility between neighbouring regions along national borders relative to mobility among domestic labour markets.

In case migration costs and commuting costs matter, interregional real wage disparities are compatible with a migration/commuting equilibrium. Among two regions any migration will cease, if the wage gap between these regions equals migration costs (see equation 3). Furthermore, workers will only have an incentive to commute from A to B if the wage differential compensates for commuting costs.

(3) Interregional labour market equilibrium: $w_A - w_B = mc$,

mc = migration (commuting) costs.

In a model by Buettner/Rincke (2004), the existence of a border results in additional mobility costs. A reduction of transaction costs of mobility caused by integration will raise labour supply in border regions of high income countries. In these regions, the wage rate is reduced, employment increased and participation declines. The authors also provide empirical evidence on the impact of integration on labour market conditions in border regions based on an analy-

11 Cf. Fischer/Straubhaar (1994). pp 75-100.
12 Janssen (2000).
13 Cf. Tassinopoulos (1999).
14 Schwartz (1973).

sis of German re-unification shock. According to the results, regions located along the former border experienced a decline of wages and an increase in unemployment relative to other West German regions due to cross-border labour mobility. Thus the decline in transaction costs is particularly effective in border regions. Commuting but not necessarily migration expanded labour supply and caused adverse effects for the resident workers in the high income border regions. The findings suggest that the convergence of labour market conditions in the course of an integration process might be more pronounced among neighbouring regions at both sides of national border compared with foreign non-border regions.[15]

Papapanagos/Vickerman (2000) point out that the effects of labour mobility in the receiving region crucially depend on the skill profile of immigrants relative to the domestic labour force. If the mobile employees meet shortages of specific skills, the region of destination will benefit and the domestic labour force will not incur any adverse effects due to the increase in labour supply. However, in case the receiving region is marked by unemployment and no specific skill shortages prevail, immigration might result in a deterioration of labour market conditions in the receiving regions. The increase in labour supply might lead to rising unemployment and could exert a downward pressure on the wage level. With respect to labour market effects in the region of origin it is important whether emigration reduces an excess labour supply thus leading to declining unemployment and rising wages.

Summarising the above-mentioned considerations, one could conclude that the potential for cross-border migration is above average in border regions - for immigration as well as for emigration. Labour market integration between border regions might also be promoted by cross-border commuting which depends on distance by nature. However, since the amount of commuting is affected by population density, unemployment and income as well, labour market effects of integration might only be pronounced in some border regions. The number of potential in-commuters and immigrants in border regions will be the higher the better the opportunities for finding a job and the higher wage rates are. Therefore, densely populated border regions offering good labour market opportunities will attract more labour from abroad than rural border areas.

2.3 Conclusions - Integration and Cross-Border Labour Markets

Traditional location theory and NEG imply that the reduction of border impediments might have positive effects on location factors and labour market conditions in border regions, especially due to an improved market access.[16] Most NEG models also suggest that labour will be

[15] Hansen/Nahrstedt (2000) note that national differences in taxation or social security systems which usually represent obstacles to commuting might also create incentives for commuting. Therefore integration might give rise to opposing effects regarding the amount of cross border commuting since integration can reduce border-specific motives for commuting.

[16] Cf. Niebuhr/Stiller (2004).

attracted to border regions – from abroad as well as from domestic regions – if wages rise in consequence of an increased access to purchasing power. However, one should keep clearly in mind that NEG does not allow to draw clear-cut conclusions with respect to effects of declining border impediments in border regions. Due to the existence of multiple equilibria, it remains ambiguous how integration affects the spatial distribution of production factors and whether border regions can realise above average integration benefits. Some approaches actually indicate that integration will even worsen economic situation and labour market conditions in border regions if they are disadvantaged by a peripheral position before integration.

The potential for high cross-border labour market interaction is certainly above average in border regions. Cross-border commuting and trade in usually non-tradable goods are aspects of integration specific to border regions. The removal of remaining barriers to trade and the free movement of labour might impact more strongly on labour markets in border regions because of commuting possibilities and the limited tradability of services. Border regions are potentially most affected by integration. However, effects are probably diverse. Competitive firms and areas will benefit from the proximity to foreign markets, whereas less competitive ones will suffer from increased competition. The precise implications depends on comparative advantage and regional specialisation and no specific effects are due for border regions as long as they do not exhibit particular specialisation patterns.

Most probably, labour market conditions will differ among neighbouring regions as long as interregional interaction is hampered. National frontiers usually give rise to various impediments which effectively segment regional labour markets along national borders. Regional disparities in labour market and living conditions are incentives for cross-border migration and commuting that might be increasingly realised as border impediments decline. According to neoclassical theories, the removal of barriers to trade and factor mobility promotes income convergence. If no barriers to trade and no mobility costs exist, factor price equalisation will result from the liberalisation of trade and factor markets. Regarding regional unemployment disparities, Elhorst (2003) differentiates between a disequilibrium and an equilibrium view. The disequilibrium view states that persistent disparities are caused by the slow operation of equilibrating forces due to economic and social barriers. In the equilibrium view unemployment differences reflect regional amenities and disamenities. Economic and social barriers might separate regional labour markets and restrict labour mobility even among domestic regions. Results of NEG and migration theories also suggest that pronounced labour market disparities might characterise the long-term spatial equilibrium. But there is no indication for above average disparities among regions along national borders unless there are significant border impediments. One might even expect that on an international scale, disparities among regions along national borders are comparatively low as long as border impediments are negligible due to modest migration and commuting costs. Thus regional disparities could hint at the degree of cross-border labour market integration. Relatively low cross-border integration of labour markets might go back to the fact that impediments for labour mobility still matter

among EU regions. With increasing degree of labour market integration regional income differentials and unemployment disparities should decline.

3. Cross-border labour markets in the EU

The empirical analysis of European cross-border labour markets departs from the idea that the degree of cross-border labour market integration might be reflected in the spatial structure of disparities. We focus on the issue of borders as obstacles to equilibrating forces that impede the reduction of regional labour market disparities. If labour markets are highly integrated, especially neighbouring regions will be marked by similar unemployment rates and income levels. However, experience in the EU indicates that persistent border impediments, resulting from differences in languages, culture and institutional systems, might obstruct deep labour market integration in regions along national borders.

We investigate the intensity of labour market integration in the EU by means of spatial statistics. The first best approach to deal empirically with the significance of spatial interaction among regional labour markets in Europe would be a direct analysis of commuting, migration and interregional trade. However, comparable data on the various forms of interaction on an adequate regional level is not available. Data on interregional migration in Europe is restricted to rather large regions and intranational flows. Consistent data on interregional trade and commuting does not exist on the European level. This scarcity of data requires to apply a method that allows to analyse the effects of spatial interaction without quantitative information on different linkages between labour markets.

In order to investigate the degree of labour market integration and, in particular, the role of border regions as focal points of European integration, we apply methods for exploratory spatial data analysis. The analysis departs from the hypothesis that among perfectly integrated regional labour markets no income differences or disparities in unemployment should persist. But empirical findings suggest that frictional effects of distance hamper the interaction between regional labour markets. Costs of labour mobility and differences in regional amenities might result persistent regional differences in labour market conditions. However, with perfect integration, interaction among labour markets on both sides of national borders will be inhibited by distance, or more generally transaction costs, to the same extent as between regions within the same country. There should be no additional effects arising from the existence of a national border. The intensity of spatial labour market segmentation should not differ between border regions and non-border regions.

Thus to sum up, we expect disparities in regional labour market conditions, also within member states, due to transaction costs and differences in regional amenities that impede equalising interaction and convergence towards a common income level and unemployment rate. Moreover, we suggest that differences in labour market conditions are relatively pronounced

along national borders, since spatial interaction is hampered by additional transaction costs associated with the crossing of a national frontier.

3.1 Methodology

We apply spatial statistics to investigate labour market integration and the specifics of border regions in this respect. Both global and local measures of spatial association are used to analyse spatial dependence among regional labour markets and structural breaks in space. As global measure Moran's *I* statistic is applied that indicates the extent of significant spatial clustering of regional unemployment and per capita income in the EU. Moran's *I* can be expressed as:

$$(4) \qquad I = \frac{n \sum_j \sum_i x_i x_j w_{ij}}{S \sum_i x_i^2}$$

where x_i and x_j are the observations of the considered variable in region *i* and *j* (in deviations from the mean). *n* is the number of regions and *S* the sum of all spatial weights. w_{ij} is an element of the spatial weights matrix **W**. Via this matrix the various directions of dependence in space are taken into account. For a set of *n* observations, the matrix **W** is a $n \times n$ matrix whose diagonal elements are set to zero (Anselin/Bera 1998). We apply a binary spatial weight matrix such that $w_{ij} = 1$ if the regions *i* and *j* share a border and $w_{ij} = 0$ otherwise. In this analysis, the weights matrix is row-standardised. Therefore *S* equals *n*.

Moran's *I* gives an indication of the overall degree of linear association between a vector of observed values **x** and the a weighted average of neighbouring values **Wx**. The Moran coefficient can be interpreted as the slope of a linear regression line of **Wx** on **x**. The so-called Moran scatterplot provides a way to visualise the association between **x** and **Wx** in the form of a bivariate scatterplot. The Moran scatterplot allows to identify clusters of similar high or low values as well as clusters of dissimilar values. The latter might point to outliers with respect to the central tendency reflected by Moran's *I*, i.e. regions that deviate from the spatial pattern formed by the bulk of observations. These regions could refer structural breaks, i.e. to nonstationarities in space (with respect to the global spatial process at hand), especially if they are spatially contiguous locations. Corresponding anomalies could be interpreted as impediments to interaction among neighbouring labour markets due to the existence of a national border.[17]

In order to investigate whether the spatial clustering of unemployment and income significantly differs between border regions and non-border regions, we also compute a local indicator of spatial association, the local Moran statistic:

[17] Cf. O'Loughlin/Anselin (1996) for a corresponding analysis on international trade bloc formation.

(5) $$I_i = \frac{x_i}{\sum_i x_i^2} \sum_j w_{ij} x_j$$

A positive (negative) statistic points to the existence of a cluster of regions characterised by similar (dissimilar) unemployment rates and income levels surrounding region *i*. We compare average local Moran statistics for border regions and non-border regions. In general, we interpret a high positive spatial autocorrelation as indication of a high degree of labour market integration, whereas negative spatial autocorrelation points to relatively low interaction among corresponding regional labour markets.

3.2 Cross Section and Data

Overall, the analysed cross-section includes 855 European regions, 668 EU15 regions and 187 regions in the new member states and the candidate countries Bulgaria and Romania. We differentiate between a cross-section including only EU15 regions and a larger group that comprises the EU27 regions. To ensure that border regions can be adequately defined, fairly small observational units are chosen. The sample contains NUTS 3 and NUTS 2 regions as well as functional regions consisting of several NUTS 3 units. Internal border regions are defined as regions that share a common border with a foreign EU region. A detailed description of the sample is given in the appendix.

Regional data on unemployment, working population and Gross Domestic Product (GDP) per capita were taken from the Eurostat Regio database. GDP is measured in Purchasing Power Standards (PPS). The Eurostat definition of unemployment is in line with the recommendations of the International Labour Office (ILO). The unemployment rate is defined as the percentage of unemployed persons in the total economically active population. The harmonised regional data on unemployment is based on estimates taken from the Community Labour Force Survey that are combined with regional structures of registered unemployed persons or regionally representative results of labour force surveys.[18] GDP per capita is on hand for the period 1995 to 2000, whereas data availability restricts the analysis of unemployment to the year 2000. Finally, the spatial weights matrix is based on information on simple contiguity, i.e. regions will be regarded as neighbouring, if they have a border in common.

3.3 Empirical Results

European border regions are far from being a homogenous group. They comprise both rural peripheral regions such as Orense (Galicia) and densely populated agglomerations like København. Nevertheless, border regions differ systematically in some respects from other

[18] For more detailed information on the Eurostat Regio database see Eurostat (2001).

regions. Table 1 shows that border regions are characterised by a relatively low population density and a below average income level, confirming somehow partly Lösch's perception of border regions as wasteland. Moreover, growth was slightly lower in internal border areas in the second half of the 1990s compared with other EU regions. However, in terms of unemployment labour market conditions tend to be more favourable in areas along national frontiers than in non-border regions.

[Table 1 around here]

The differences between border and non-border regions are negligible compared with the large and persistent unemployment differentials and income disparities that mark the EU altogether (see Figure 1 and 2). With enlargement regional disparities in the EU are mainly earmarked by the backwardness of Eastern European countries. This refers especially to GDP per capita. However, considerable differences are also apparent among the member states of the EU15 as well as within countries. Intranational differences in labour market conditions are evident in particular in Germany, Spain and Italy. Some national borders can be identified as separation lines between regional labour markets, but the spatial structures of income and unemployment are not predominantly characterised by country effects. Altogether, the regional patterns of unemployment and income indicate that there exists a spatial dimension, i.e. a clustering of similar labour market conditions in space. The results of several studies suggest that regional labour market conditions are characterised by a significant spatial dependence, i.e. regions with similar labour market conditions tend to be neighbours.[19]

[Figure 1 around here]
[Figure 2 around here]

The impression derived from visual examination is supported by the evidence on spatial dependence (see Table 2 and 3, column 1). The analysis points to a significant positive autocorrelation of both the regional unemployment rate ($u_{i,2000}$) and GDP per capita ($y_{i,2000}$; $y_{i,1995}$). Thus, neighbouring regions that form clusters of high and low unemployment and groups of high (low) income areas are a central feature of disparities in Europe. In the EU15, the spatial dependence of unemployment is more pronounced than for income. For the EU27 corresponding differences are not detected. In order to control for national effects relative income ($y_{i,t} / y_{n,t}$) and unemployment rates ($u_{i,2000} / u_{n,2000}$) are considered, i.e. the ratio of the regional unemployment rate (income) to the nation-wide unemployment rate (income). The results imply that spatial clusters do not correspond with national clusters, since a significant autocorrelation also characterises the relative variables. Intranational disparities and cross-border clusters add to the overall spatial dependence of labour market conditions. However, a significant part of the spatial association is obviously caused by country effects as indicated

[19] Cf. Fingleton/McCombie (1998), Overman/Puga (2002), López-Bazo et al. (1999) and Niebuhr (2003) for corresponding evidence.

by the differences between the coefficients for the absolute and relative variables. This applies in particular to the EU27 – in the enlarged EU national effects seem to matter more than among the old member states. Moreover, for unemployment Moran's *I* is higher for the EU15 than for the EU27. This difference regarding the intensity of spatial dependence is in line with deeper labour market integration among the old member states as compared with the EU27.

[Table 2 around here]
[Table 3 around here]

The local Moran statistics for border and non-border regions in the EU suggest that significant differences exist between these groups of regions at least with respect to unemployment (see Table 2 and 3, columns 3 and 4). For unemployment and relative income in 1995 the strength of positive spatial association is higher for non-border regions than for regions along national frontiers as indicated by the corresponding means and t-tests for equality of means. These findings are in line with our expectations regarding the impact of national borders on labour market integration. Internal border regions in the EU tend to be less frequently surrounded by areas with similar labour market conditions. This can be interpreted as evidence on national borders that still constitute measurable disruptions in space and hamper interaction among regional labour markets and the convergence of labour market conditions.

However, results with respect to GDP per capita differ significantly from the findings for unemployment. Though there is some evidence on border effects for regional income in 1995, differences between border and non-border regions tend to be insignificant or even wrongly signed. Investigation of corresponding Moran scatterplotts reveals that the estimates for the non-border regions are severely downward biased due to some outlying regions which constitute leverage points. As the Figures 3 and 4 show for $y_{i,2000}$, the detected spatial autocorrelation will clearly increase, if we control for the impact of the leverage points (marked by red dots). The slope of the dashed line corresponds with the estimate for Moran's *I* excluding leverage points, whereas the solid line indicates the measured autocorrelation for the entire group of non-border regions. This constellation also applies to the other income variables. Taking into account the effects of leverage points, there is more support for a higher spatial dependence for non-border regions compared with border areas. Nevertheless, the findings point to a stronger segmentation of cross-border labour markets with respect to unemployment relative to income.

[Figure 3 around here]
[Figure 4 around here]

To sum up, the results point to a significant spatial dependence, i.e. both regions marked by favourable labour market conditions and areas characterised by low income and high unemployment tend to cluster in space. Anyhow, a significant spatial segmentation of labour markets is measurable even among highly integrated EU15 countries. However, regional labour

markets in the EU are separated also within member states since equilibrating forces across regions are small. The segmentation does not mainly refer to small regional units since this would be reflected in a negative spatial dependence in our analysis. In fact, segmentation consist mainly in differences between spatial clusters of high and low unemployment (income). Furthermore, we detect significant border effects in that border regions show on average a higher degree of labour market segmentation (lower positive spatial dependence) than non-border regions. The results are in contrast to the findings by Overman/Puga (2002) and Südekum (2004). Südekum (2004) notes that national borders are not extremely noticeable as separation lines between regions with high and low unemployment rates. Since the above mentioned studies analyse NUTS2 regions, the level of regional aggregation might be relevant in this context because aggregation tends to cover up disparities.

4. Conclusions

Although the process of European integration has considerably facilitated labour mobility in the EU, migration, cross-border commuting and corresponding labour market effects are low. In accordance with that, our findings point to significant border impediments despite the removal of formal barriers to cross border interaction. The spatial dependence between neighbouring labour markets in Europe is relatively low along national borders. Thus, borders still exert adverse effects regarding the convergence of labour market conditions in the EU. On average unemployment and income differ more among adjacent foreign regions than between neighbouring regional labour markets in same member state.

The results confirm evidence provided by various case studies that deal with different aspects of integration in selected European border regions. These analyses show that although legal and physical border impediments have been reduced in the course of ongoing European integration, significant barriers still remain. These border effects base on deficits in cross-border infrastructure, institutional and administrative disparities, cultural and linguistic differences as well as on social or psychological barriers (cf. de Gijsel et al. 2000, Van der Velde/Van Houtum 2000). Evidence provided by Hansen/Nahrstedt (2000), Janssen (2000) and Van der Velde (1999) reveals that cross-border labour mobility is relatively low even among regions where barriers to mobility should be rather small after decades of integration efforts. According to estimates by Hansen/Nahrstedt, complete integration between Denmark and Germany would result in a tenfold increase of commuting across the border. Labour markets on both sides of the border remain separate to a large extent even though free movement of labour was formally established. As a result, unemployment and wages on one side of the border are hardly affected by labour market conditions on the other side.

What can we expect with respect to the formation of cross-border labour markets in the enlarged EU based on this evidence on the EU15? Labour mobility that establishes cross-border labour markets is currently low in the EU. Previous experience regarding the introduction of free movement of workers in the EU suggests that overall the migration potential within the

EU25 is modest. However, migration will vary considerably between EU regions and in particular among border regions. Therefore, labour markets in specific border regions might be affected by pronounced effects. Moreover, cross-border commuting will probably have a stronger impact on labour supply in specific border regions. The findings of several studies indicate that effects of labour mobility might centre in densely populated border regions marked by large agglomerations and a dynamic development. According to Alecke/Untiedt (2001), significant cross-border commuting will primarily develop among regions which possess sufficient mass in terms of population and economic activity. Therefore potential commuting will probably be modest among sparsely populated rural border regions. Anyhow, the long term effects of labour mobility might be fairly limited also in the most affected border areas. The Commission (2001) notes that adverse effects of immigration on indigenous unemployment and wages in the EU have been relatively small in the past. Furthermore, transitional arrangements between new and old member states will at least delay corresponding effects.[20] An argument for relatively high cross-border mobility in new internal border regions might be derived from the large income disparities and pronounced differences in unemployment rates among new and old member states.[21] In contrast, the low density of economic activity and population in many of the new internal border regions suggests that altogether the intensity of labour market integration as measured by cross-border mobility will probably remain low.

In order to achieve a high level of integration the EU has already implemented various measures that are supposed to reduce barriers to cross-border interaction. However, evidence on persistent border impediments indicates that it might not be possible to achieve a high level of labour market integration in border regions by removing physical, administrative and legal obstacles alone. Some border effects can be influenced by integration policy, e.g. a poor cross-border infrastructure that might especially concern the new internal border regions in the EU25 because of existing deficits and the relevance for cross-border commuting. However, labour market disparities will be resistant to usual measures of integration policy if they are caused by weak spatial interaction due to cultural differences and mental barriers. Moreover, there might be good reasons for immobility because some skills and abilities are region- or country-specific.[22] The relevance of cultural differences, mental barriers and country-specific skills as well as the previous evidence on labour market integration among the old member states denotes that achieving a reasonable degree of cross-border labour market integration is a long-term task of EU policy.

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[20] The introduction of transitional arrangements regarding the free movement of labour is somehow inconsistent with the previously dominating view that low labour mobility in the EU15 constitutes a problem with respect to the integration goal.

[21] Cf. Hönekoop/Werner (1999).

[22] Cf. Tassinopoulos (1999), Straubhaar (2000).

Table 1: Descriptive Statistics for the Regional Cross Section

	EU15			EU27		
	Border Regions	**Non-border regions**	**Average**	**Border Regions**	**Non-border regions**	**Average**
Population density, 2000 (inhabitants per km^2)	89.6	129.7	120.0	87.8	126.50	114.1
Unemployment rate, 2000	6.3	7.7	7.4	7.0	8.6	8.3
GDP per capita (PPS), 2000 in % of EU15	95.4	101.0	100	79.9	106.6	100
Annual average growth of GDP (PPS) 1995–2000, in %	4.8	5.3	5.2	5.0	5.4	5.5
Annual average growth of GDP per capita (PPS) 1995–2000, in %	4.5	5.0	4.9	4.9	5.3	5.2

Source: Eurostat, Regiodatabase; own calculations.

Table 2: Spatial Autocorrelation of Income and Unemployment in the EU15

Variable	**Moran's I_t (standardised z-value)**	**Local Moran**		
		Mean		**t-Test for equality of means**
		Non-Border Regions	**Border Regions**	
$y_{i,2000}$	0.32 (12.3)**	0.32	0.33	0.05
$y_{i,2000} / y_{n,2000}$	0.29 (11.0)**	0.30	0.21	1.85
$y_{i,1995}$	0.35 (13.4)**	0.35	0.35	0.07
$y_{i,1995} / y_{n,1995}$	0.28 (10.9)**	0.30	0.20	2.03*
$u_{i,2000}$	0.79 (30.2)**	0.86	0.48	3.08**
$u_{i,2000} / u_{n,2000}$	0.62 (23.6)**	0.68	0.36	4.13**

Notes: ** significant at the 0.01 level, * significant at the 0.05 level.
Source: Eurostat, Regiodatabase; own calculations.

Table 3: Spatial Autocorrelation of Income and Unemployment in the EU27

Variable	Moran's I_t (standardised z-value)	Local Moran		
		Mean		t-Test for equality of means
		Non-Border Regions	Border Regions	
$y_{i,2000}$	0.65 (28.5)**	0.61	0.78	2.31*
$y_{i,2000} / y_{n,2000}$	0.25 (11.0)**	0.62	0.82	0.30
$y_{i,1995}$	0.68 (29.5)**	0.26	0.23	2.60**
$y_{i,1995} / y_{n,1995}$	0.39 (12.9)**	0.29	0.31	0.13
$u_{i,2000}$	0.61 (26.5)**	0.64	0.52	1.44
$u_{i,2000} / u_{n,2000}$	0.44 (19.3)**	0.52	0.23	5.01**

Notes: ** significant at the 0.01 level, * significant at the 0.05 level.
Source: Eurostat, Regiodatabase; own calculations.

Figure 1: Regional GDP per Capita (PPS) 2000

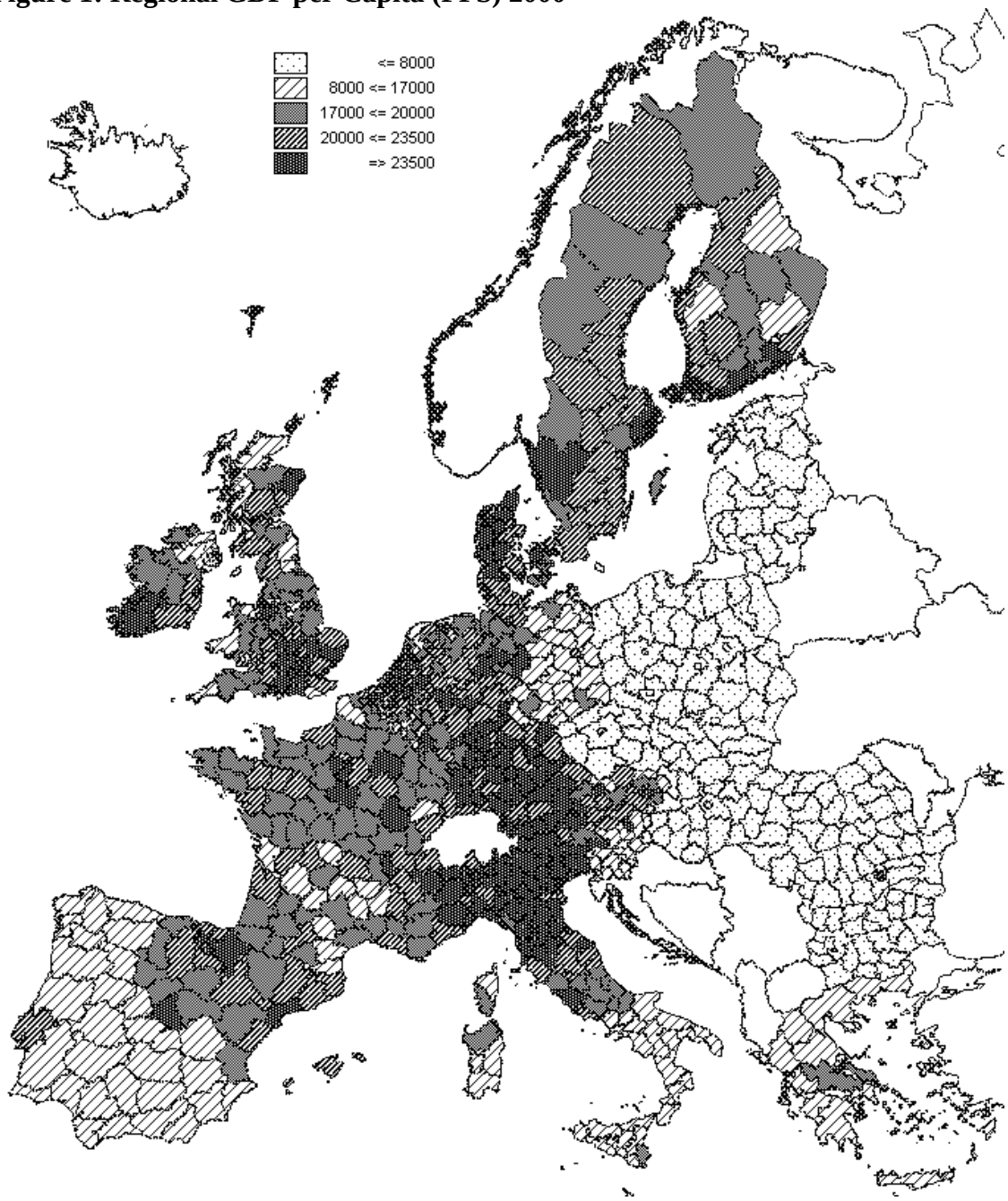


Figure 2: Regional Unemployment Rates 2000

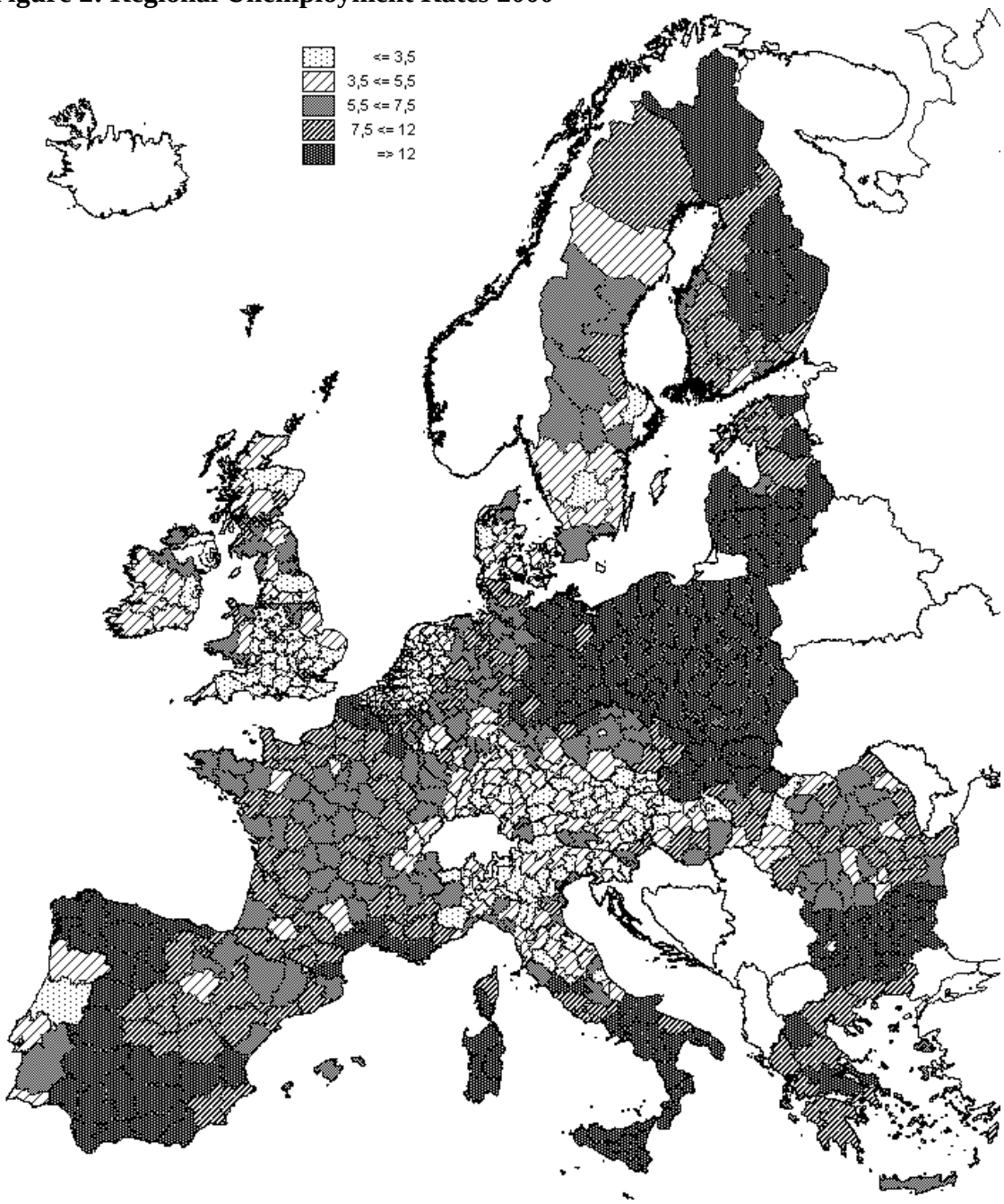
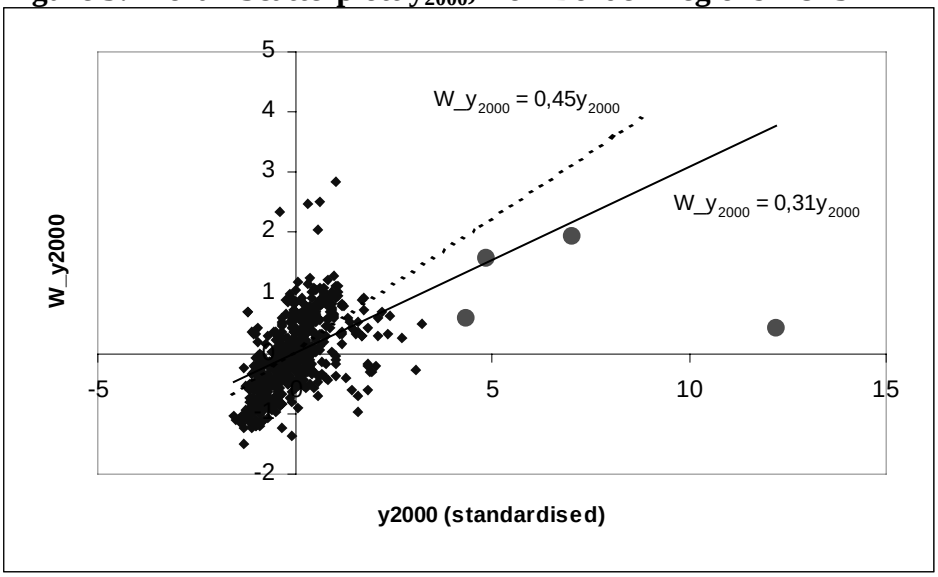
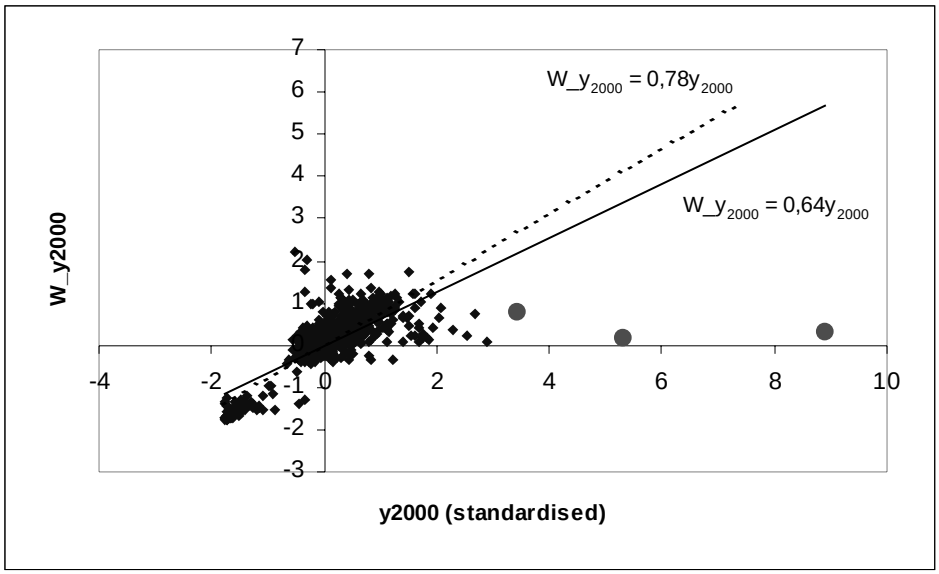


Figure 3: Moran Scatterplott y_{2000}, Non-Border Regions EU15



Source: Eurostat, Regiodatabase; own calculations.

Figure 4: Moran Scatterplott y_{2000}, Non-Border Regions EU27



Source: Eurostat, Regiodatabase; own calculations.

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Appendix: Description of Cross Section

EU15 – 668 regions (NUTS 2, NUTS 3, planning regions)
Belgium: 43 NUTS 3 regions
Dänemark: 14 NUTS 3 regions (excluding Bornholms amt)
Deutschland: 97 planning regions (functional regions comprising several NUTS 3 regions)
Griechenland: 10 NUTS 2 regions (excluding Voreio Aigaio, Notio Aigaio, Kriti)
Spanien: 47 NUTS 3 regions (excluding Ceuta y Melilla, Canarias, Islas Baleares)
Frankreich: 96 NUTS 3 regions (excluding Départements d'outre-mer)
Ireland: 8 NUTS 3 regions
Italien: 103 NUTS 3 regions
Luxemburg: 1 region
Niederlande: 40 NUTS 3 regions
Österreich: 35 NUTS 3 regions
Portugal: 5 NUTS 2 regions (excluding Açores, Maeira)
Finnland: 19 NUTS 3 regions (excluding Åland)
Schweden: 20 NUTS 3 regions (excluding Gotlands län)
UK: 130 NUTS 3 regions (excluding Western Isles, Orkney Isles, Shetland Isles)

ACC12 – 187 NUTS 3 regions
Bulgaria: 28 NUTS 3 regions
Czech Republic: 14 NUTS 3 regions
Estonia: 5 NUTS 3 regions
Hungary: 20 NUTS 3 regions
Lithuania: 10 NUTS 3 regions
Latvia: 5 NUTS 3 regions
Poland: 44 NUTS 3 regions
Romania: 40 NUTS 3 regions and 1 NUTS 2 region (Bucuresti)
Slovenia: 12 NUTS 3 regions
Slovakia: 8 NUTS 3 regions

Excluding Cyprus, Malta and all islands that comprise only one NUTS 3 region.
The cross section includes 123 internal border regions in the EU15 and 231 internal border regions in the EU27