

Integration and labour markets in European border regions

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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 markets in border regions. Within the framework of different theoretical approaches, the effects of integration on location conditions and labour market disparities along national borders are analysed. Furthermore, we investigate empirically the degree of labour market integration in European border regions. Measures of spatial association are used as indicators of the intensity of integration among neighbouring labour markets. The results of an analysis of per capita income and unemployment for the period 1995–2000 point to a measurable spatial segmentation of labour markets along national borders even among highly integrated EU15 countries. On average, border regions in the EU are characterised by a 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.

Contents	3	Cross-border labour markets in the EU
1 Introduction		
2 Border regions and integration – implications of economic theories	3.1	Methodology
2.1 Location conditions in border regions	3.2	Cross-section and data
2.2 Cross-border interaction	3.3	Empirical results
2.3 Conclusions – integration and cross-border labour markets	4	Conclusions
		References

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1 Introduction

Whilst barriers to trade between EU15 and accession countries were completely abolished on May 1st 2004, there are still restrictions impeding labour mobility. Transitional arrangements regarding the free movement of labour between the old and the new member states in the enlarged EU 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 aggravate labour market problems in the old member states, leading to declining wages and rising unemployment rates. Corresponding concerns are widespread, especially in the EU 15 countries close to the new member states. 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 internal border regions. However, in the short run internal EU border regions might face significant adjustment pressure due to increased competition on 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 the accession of the 10 new member states, the share of border regions as a proportion of the total area of the EU increased from 22% in the EU15 to more than 35%. The corresponding percentage of the EU population rose from 15% to almost 25%.¹ This paper deals with the effects of integration on labour market conditions, i.e. on unemployment and per capita income, in internal EU border regions. Within the framework of different theoretical approaches, the effects of integration on location conditions and labour market disparities along national borders 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 have been analysed for selected border regions.² In contrast to these studies, 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 constitute a representative phenomenon in the EU and whether the spatial structure of per capita income and unemployment is marked by significant border effects. The empirical analysis is based on the assumption that the intensity of regional labour market integration is indicated by regional disparities in per capita income and unemployment rates. We presume that the differences between two regions as regards labour market conditions diminish as the intensity of labour market integration between these areas increases. Indicators of spatial association are used as measures of the degree of integration between adjacent 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. We compare the labour market integration of internal border regions with the results for a reference group that includes non-border regions and regions along the external EU border.

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.³ This section includes a description of methods, data and the cross-section. Methods of exploratory spatial data analysis are applied in order to investigate whether national frontiers hamper the convergence of labour market conditions between neighbouring border regions. We analyse regional disparities in per capita income and unemployment for the period 1995–2000 to determine structural breaks in space resulting from border impediments. Section 4 concludes the paper.

2 Border regions and integration – implications of economic theories

The reduction of border impediments between two countries gives way to an intensification of cross-

¹ Cf. Resmini (2003).

² The volumes by De Gijssel 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.

³ The EU15 comprises Belgium, the Netherlands, Luxembourg, France, Germany, Italy, Denmark, the UK, Ireland, Spain, Portugal, Greece, Austria, Sweden and Finland. The EU25 consists of the EU15 countries and the new member states of Hungary, Poland, Latvia, Lithuania, Estonia, the Czech Republic, Slovenia, Slovakia, Cyprus and Malta. The EU27 cross-section comprises the EU25 regions plus regions in the two accession countries Bulgaria and Romania.

border market integration. Advancing integration usually affects regional labour markets along three channels: trade, migration and foreign direct investment (FDI).⁴ Specific integration effects 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 geographical position of internal border regions in the centre of an integration area might give rise to 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 geographical distance. Moreover, closeness of the integration partners might permit 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 on labour demand, wages and unemployment. Furthermore, the 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 briefly outline the implications of different theoretical approaches regarding the labour market effects in border regions resulting from integration.⁵ The interdependence between integration, location conditions, trade and labour mobility is considered within the framework of location theory, NEG, trade theory and migration theory.

2.1 Location conditions in border regions

Location theories provide an adequate framework for analysing integration effects in border regions arising from changes in location conditions. Corresponding models emphasise the 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 diminish 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 and supply of production factors, such as labour. Firms are therefore discouraged from locating near borders. Border regions will have 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. Diminishing border impediments change immensely the relative geographical position of border regions. While internal border regions are peripheral areas on a national scale, they gain a more central position in the integration area, due to their location at the interface of domestic and foreign markets. Proximity to a national border will lose its relevance as a location disadvantage if border impediments decrease in the course of economic integration. It is a specific location advantage for firms located in border regions that they are close to foreign labour markets making it easier to employ workers from abroad. Liberalising labour mobility results in a pooling of workers from both sides of the border. If border impediments decrease significantly, the labour markets located on the two sides of the border might melt into a common labour market, allowing a more efficient allocation of labour. In fully integrated cross-border labour markets, we might expect no significant differences in per capita income and unemployment to prevail, owing to a high degree of labour mobility. However, traditional location theories do not investigate explicitly the development of labour market disparities along national borders.

Going beyond traditional location theories, more recent location models – which are often subsumed under the term *New Economic Geography* – have more explicit implications regarding the impact of integration on labour market disparities between two regions located on either side of a border. NEG models consider the spatial distribution of economic activities. They explain the emergence of agglomerations and pronounced regional income disparities in an otherwise homogeneous space by entirely endogenous location decisions. Based on market access considerations, NEG models suggest that reducing

⁴ Cf. Boeri/Brücker (2001).

⁵ For an overview of integration effects in border regions see Niebuhr/Stiller (2004).

border impediments could affect regional disparities due to labour migration and mobile firms.⁶ The reduction of border impediments has a positive effect on location conditions – and also on factor endowments – in border regions, thus stimulating the development of the labour market. This arises 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 grows with market access since access advantages raise wages. Moreover, firms also prefer locations that offer a large market. Therefore, integration might trigger a self-reinforcing process of industrial concentration in the course of which firms and workers relocate towards internal border regions. Employment and the wage level will rise in internal border regions due to the immigration of labour and the settlement of firms.⁷ However, the effect on wage disparities along national borders depends on the level of labour mobility and the reduction of interregional transport costs resulting from diminishing border impediments.

In an NEG model developed by Ludema/Wooton (1999), wage differences between regions might first increase due to decreasing cross-border transport costs and diminishing impediments for labour mobility. But disparities will start to decrease if transport costs continue to fall. If transportation costs are sufficiently low, spatial wage disparities will vanish entirely. The reason for the equalisation of wage disparities is the incentive for firms to locate in less-developed regions in order to take advantage of low labour costs.⁸ As a consequence, the local market in the former low-wage region grows and real wages start to increase. Changes in regional wage differences will also trigger labour mobility. The relocation of firms and workers proceeds until real wage differences vanish. The model implies that integration might promote convergence as well as divergence between regions located on the two sides of a border. It remains uncertain whether the reduction of border impediments, i.e. a reduction of transport costs, will decrease or increase labour market disparities along borders. It depends on the level of transport costs – the level of integration – and the willingness of workers to migrate whether proceeding integration efforts foster or work against cross-border wage disparities. However, the model implies

that wage disparities will disappear if border impediments vanish. Therefore, assuming that the level of economic integration is already quite high in the EU, we might expect disparities between EU border regions to decline as border impediments decrease and the mobility of workers and firms increases.

In general, no conclusions concerning regional unemployment disparities can be derived from NEG since most models assume that labour markets clear automatically. A rare exception is the NEG model by Peters/Garretsen (2000), which incorporates unemployment. According to this approach, integration might aggravate the labour market 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 are concentrated have lower unemployment rates than sparsely populated peripheral regions. Labour mobility will exacerbate regional disparities in income and unemployment rates. Therefore, free movement of labour established in the course of integration might reinforce regional labour market disparities.⁹ This differs from conventional approaches, which predict converging labour market conditions as a result of labour mobility. The study by Südekum implies that there should be pronounced differences between core regions and peripheral areas as regards unemployment rates and income. 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 arises mainly due to

⁶ Cf. Niebuhr/Stiller (2004).

⁷ Considerations based on Elizondo/Krugman (1996) and Fujita et al. (1999). In contrast to positive integration effects derived from market access considerations, Papapanagos/Vickerman (2000) argue that border regions might also experience a decline of economic activity due to a reduction of border impediments since they lose business associated with crossing the border.

⁸ Similar results can be found in Junius (1999) and Puga (1999).

⁹ This 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 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 stage of integration, when transportation costs become negligible, do unemployment disparities tend to disappear.

migration, FDI and trade, which tend to increase as border impediments diminish. Furthermore, in border regions cross-border commuting and the exchange of non-tradable goods might trigger additional integration effects. Integration has an impact on 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.

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.¹⁰ Under this presumption, border regions should *ceteris paribus* be more strongly involved in trade with neighbouring countries than non-border regions. Regional labour market effects resulting from trade liberalisation might therefore be relatively pronounced and emerge rapidly 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 have a positive impact on regions specialising in the production of goods belonging to the export sector after integration. Adjustment pressure will arise in regions which produce commodities that become import goods.¹¹ Therefore, the impact of trade crucially depends on comparative advantage and regional specialisation. In this respect, the labour market effects of integration will not differ systematically between border regions and other regions as long as border regions do not exhibit specific specialisation patterns.¹²

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.¹³ A wider variety of economic branches is affected by integration in border regions compared with areas located in the centre of a na-

tional economy. Various sectors are exposed to international competition and might also 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. Due to relatively intense trade relations between the regions located on the two sides of a border, adjustment pressure on labour markets resulting from trade and corresponding equilibrating forces might be particularly strong in border regions. We can therefore expect wage gaps between neighbouring border regions to close at a high pace.

Labour mobility

According to neoclassical models, wage and unemployment differentials are the driving forces for labour mobility. The liberalisation of labour mobility between regions will trigger 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 disparities exist between any regions of two countries. Thus integration will support the convergence of wage levels between regions – also between areas along both sides of a national frontier – if labour markets are liberalised and border impediments decrease.¹⁴ Border impediments hamper the convergence of cross-border labour markets. However, the reduction of cross-border wage disparities might be a long-term process even without significant border impediments if equilibrating forces work at a slow pace.¹⁵

Regarding the convergence of labour market conditions in an integration area, frictional effects of distance and transaction costs are highly relevant. Labour mobility – migration as well as commuting – is not free of costs and there is no perfect informa-

¹⁰ Corresponding analyses are empirically highly significant in explaining the volume of trade between two regions by their economic size and the distance between the regions. Cf. Deardorff (1998) and Fidrmuc/Fidrmuc (2003).

¹¹ Cf. Bittner (2002), P. 67.

¹² The same conclusions can be drawn from more recent trade theories, which highlight product cycles, economies of scale and product differentiation as determinants of international trade.

¹³ Cf. Dascher (2003).

¹⁴ Cf. Fischer/Straubhaar (1994), P. 75–100.

¹⁵ This is in accordance with Elhorst (2003), who differentiates between a disequilibrium and an equilibrium view regarding regional unemployment disparities. 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.

tion about labour market opportunities.¹⁶ 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 general costs and information costs which are both increasing with distance. Empirical studies imply that the probability of migrating between two regions declines the further apart they are, because migration costs rise and it becomes more difficult to assess potential migration gains.¹⁷ The dampening effect of distance indicates that workers living in border regions should have a relatively high incentive to migrate to their neighbouring country. The costs of migrating to neighbouring countries are comparatively low for individuals in border regions, who have advantages in gathering information about the foreign labour market, due to the spatial proximity. Moreover, social costs should be relatively low due to short travelling times for visiting families in the respective other country.¹⁸ However, significant border impediments might increase transaction costs and information deficits, reducing labour mobility between neighbouring regions along the two sides of national borders in relation to mobility among domestic labour markets.

If the costs of migration and commuting matter, interregional real wage disparities are compatible with a migration/commuting equilibrium. Migration between two regions will cease if the wage gap between these regions is equal to the mobility costs. Furthermore, workers will only have an incentive to commute across a border if the wage differential compensates for the commuting costs. In a model by Buettner/Rinke (2004), the existence of a border results in additional mobility costs. A reduction in the transaction costs of mobility resulting from integration will raise labour supply in the border regions of high-income countries. In these regions the wage rate falls, unemployment increases and participation declines. The authors also provide empirical evidence of the impact of integration on labour market conditions in border regions based on an analysis of the German reunification shock. According to the results, regions located along the western side of the former border experienced a decline in wages and an increase in unemployment in relation to other western German regions due to cross-border labour

mobility. Thus the reduction of transaction costs is particularly effective in border regions. Commuting, but not necessarily migration, expanded labour supply and led to 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 between neighbouring regions on either side of a national border compared with non-border regions of the two countries.¹⁹

Papapanagos/Vickerman (2000) point out that the effects of labour mobility in the receiving region crucially depend on the skill profile of the immigrants in relation to the domestic labour force. If the mobile employees cover 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, if 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 regard 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, it could be concluded that the potential for cross-border migration is above average in border regions – for both immigration and 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, the labour market effects of integration might be pronounced in only some border regions. The number of commuters and of immigrants from abroad will be the higher in border regions 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 the neighbouring regions across the border than rural border areas will.

¹⁶ Janssen (2000).

¹⁷ Cf. Tassinopoulos (1999).

¹⁸ Schwartz (1973).

¹⁹ 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.

2.3 Conclusions – integration and cross-border labour markets

Most probably labour market conditions will differ between neighbouring regions located along a national border as long as interaction between regions is hampered. Regional disparities in labour market and living conditions are incentives for cross-border migration and commuting, which might be realised increasingly as border impediments diminish. According to neoclassical theories, removing 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.

Traditional location theory and NEG models imply that labour might be attracted to border regions – from abroad as well as from domestic regions – if wages rise as a consequence of an increased access to purchasing power. However, NEG models do not allow clear-cut conclusions to be drawn regarding the development of wage disparities and differences in unemployment rates between the two regions located on either side of a border in the course of integration. Due to the existence of multiple equilibria in NEG models, it remains unclear what effect the reduction of border impediments resulting from proceeding integration has on cross-border disparities in labour market conditions.

On the whole, it can be concluded from the theories considered here that the segmentation of labour markets by a border is smaller, the lower interregional transport costs are and the more willing workers are to commute or migrate across a border. In this context, costs resulting from border impediments might constitute a major part of transport costs. In addition to physical transport costs, national frontiers usually give rise to various impediments which effectively segment regional labour markets along national borders. Border impediments might be based on institutional and cultural disparities as well as on language barriers and poorly developed cross-border infrastructure.

Results of NEG and migration theories also suggest that pronounced labour market disparities along national borders might represent a long-term spatial equilibrium within an integration area, such as the EU, if significant border impediments continue to exist even though tariffs and institutional impediments to labour mobility have been abolished. But there is no indication of above-average disparities between neighbouring border regions as compared with non-border regions unless there are significant border impediments. Thus regional disparities could

give some idea of the degree of cross-border labour market integration. A relatively low level of cross-border integration of labour markets might be put down to the fact that impediments to labour mobility still matter among EU countries. As the degree of labour market integration increases, regional income differentials and unemployment disparities should decline. The empirical analysis in section 3 deals with the issue of whether there are relatively pronounced differences in per capita income and unemployment along national borders, pointing to significant border impediments.

3 Cross-border labour markets in the EU

As mentioned above, the empirical analysis of European cross-border labour markets starts out from the idea that the degree of 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. 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. In principle, especially neighbouring regions will be characterised by similar unemployment rates and income levels if labour markets are highly integrated. But our investigation has to consider frictional effects of distance that hamper the interaction between regional labour markets. Costs of labour mobility and differences in regional amenities might result in persistent regional differences in labour market conditions. However, without border impediments, interaction between labour markets adjacent to national borders will be inhibited by distance, or more generally by transaction costs, to the same extent as between regions within one and 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 internal border regions and non-border regions.

We examine the intensity of labour market integration in the EU and the role of internal border regions as focal points of integration by means of spatial statistics. The most suitable approach for dealing empirically with the significance of spatial interaction between 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 is not available

at a suitable regional level. 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 at European level. This scarcity of data makes it necessary to apply a method that permits an analysis of the effects of spatial interaction without quantitative information on different linkages between labour markets. We therefore use methods of exploratory spatial data analysis that allow an indirect analysis of integration.

To sum up therefore, we expect disparities in regional labour market conditions, within member states too, 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

Both global and local measures of spatial association are used to analyse spatial dependence among regional labour markets and structural breaks in space. Moran's *I* statistic is used as a global measure; this indicates the extent of significant spatial clustering of regional unemployment and per capita income in the EU. Moran's *I* can be expressed as:

$$(1) \quad I = \frac{n \sum_i \sum_j x_i x_j w_{ij}}{S \sum_i x_i^2}$$

where x_i and x_j are the observations of the considered variable in region i and j (in deviations from the mean) and w_{ij} is an element of the spatial weights matrix \mathbf{W} . n is the number of regions and S the sum of all spatial weights. Via the matrix \mathbf{W} , the various directions of dependence in space are taken into account. For a set of n observations, the matrix \mathbf{W} is a $n \times n$ matrix whose diagonal elements are set at zero (Anselin/Bera 1998). We apply a binary spatial weights matrix such that $w_{ij} = 1$ if the regions i and j share a border and $w_{ij} = 0$ if they do not. In this analysis, the weights matrix is row-standardised. Therefore S equals n . The test statistic used to determine the significance of spatial autocorrelation is given by:

$$(2) \quad z_I = \frac{I - E(I)}{\sqrt{V(I)}}$$

where $E(I)$ is the mean and $V(I)$ is the variance of I . Moran's *I* is similar but not equivalent to a correlation coefficient. The theoretical mean is $-1/(n - 1)$. Thus, the expected value is negative and will move towards zero as the sample size increases. $V(I)$ depends on the stochastic assumptions.²⁰

Moran's *I* gives an indication of the overall degree of linear association between a vector of observed values \mathbf{x} and the weighted average of values in neighbouring regions $\mathbf{W}\mathbf{x}$. The Moran coefficient can be interpreted as the slope of a linear regression line of $\mathbf{W}\mathbf{x}$ on \mathbf{x} . The so-called Moran scatterplot provides a way to portray the association between \mathbf{x} and $\mathbf{W}\mathbf{x}$ in the form of a bivariate scatterplot. The Moran scatterplot makes it possible to identify clusters of similar high or low values as well as clusters of dissimilar values. The latter might indicate 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 to structural breaks, i.e. to non-stationarities 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 between neighbouring labour markets due to the existence of a national border.²¹

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

$$(3) \quad I_i = \frac{x_i}{\sum_i x_i^2} \sum_j w_{ij} w_j$$

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 internal border regions and the reference group comprising non-border and external border regions. In general, we interpret a high positive spatial autocorrelation as an indication of a high degree of labour market integration, whereas negative spatial autocorrelation or no significant spatial dependence points to a relatively low level of interaction between corresponding regional labour markets.

²⁰ See Anselin (1988). For a more detailed presentation of the moments under different assumptions see Cliff and Ord (1981).

²¹ Cf. O'Loughlin/Anselin (1996) for a corresponding analysis of international trade bloc formation.

Table 1

Descriptive statistics for the regional cross-section

	EU15			EU27		
	Internal border regions	Non-border and external border regions	Average	Internal border regions	Non-border and external border regions	Average
Population density, 2000 (inhabitants per km ²)	89.6	129.7	120.0	87.8	126.5	114.1
Unemployment rate, 2000	6.3	7.7	7.4	7.0	8.6	8.3
GDP per capita (PPS), 2000 as % of EU15 (EU27)	95.4	101.0	100	79.9	106.6	100
Annual average growth of GDP (PPS) 1995–2000, as %	4.8	5.3	5.2	5.0	5.4	5.5
Annual average growth of GDP per capita (PPS) 1995–2000, as %	4.5	5.0	4.9	4.9	5.3	5.2

Source: Eurostat, Regio database; own calculations.

3.2 Cross-section and data

Overall, the cross-section analysed includes 855 European regions, 668 EU15 regions and 187 regions in the new member states and the candidate countries of Bulgaria and Romania. We differentiate between a cross-section including only the EU15 regions and a larger group that comprises the EU27 regions. To ensure that border regions can be defined adequately, 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, the working population and Gross Domestic Product (GDP) per capita were taken from the Eurostat Regio database. We use GDP per capita as a proxy for the wage level since data on regional wages are not available for NUTS 3 regions. 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 number of unemployed as a proportion of the entire economically active population. The harmonised regional data on unemployment is based on estimates taken from the Community Labour Force Survey, which are combined with regional structures of registered unemployed persons or regionally representative results

of labour force surveys.²² GDP per capita is available 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 homogeneous group. They comprise both rural peripheral regions such as Orense (Galicia) and densely populated agglomerations like København. Nevertheless, border regions differ systematically from other regions in some respects. Table 1 shows that internal border regions are characterised by a relatively low population density and a below-average income level, somehow confirming in part Lösch's perception of border regions as wasteland. Moreover, in the second half of the 1990s, growth was slightly lower in internal border areas compared with other EU regions. However, as far as unemployment is concerned, labour market conditions tend to be more favourable in areas along national frontiers than in non-border and external border regions.

²² For more detailed information on the Eurostat Regio database see Eurostat (2001).

The differences between internal border regions and the reference group are negligible compared with the large and persistent unemployment differentials and income disparities that characterise the EU as a whole (see Figures 1 and 2). With enlargement, regional disparities in the EU are mainly characterised 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. Differences in labour market conditions within a country 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-specific effects. On the whole, the regional patterns of unemployment and income indicate that a spatial dimension exists, i.e. a clustering of similar labour market conditions in space. The results of several studies suggest that per capita income and unemployment are characterised by a significant spatial dependence, i.e. regions with similar conditions tend to be neighbours.²³

The impression derived from visual examination is supported by the evidence on spatial dependence (see Tables 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 that of income. For the EU27 corresponding differences are not detected. In order to control for national effects, relative income ($y_{i,t}/y_{c,t}$) and unemployment rates ($u_{i,2000}/u_{c,2000}$) are considered, i.e. the ratio of the regional unemployment rate (income) to the unemployment rate (income) for the country as a whole.²⁴ 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 by the differences between the coefficients for the absolute and relative variables. This applies in particu-

lar 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.

The local Moran statistics for internal border regions on the one hand and for the reference group on the other hand suggest that significant differences exist between these groups of regions at least with respect to unemployment in the EU (see Tables 2 and 3, columns 3 and 4). For unemployment and relative income in 1995 the strength of positive spatial association is higher for the reference group than for internal EU 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 than non-border regions. This can be interpreted as evidence of national borders that still constitute measurable disruptions in space and hamper interaction between regional labour markets and the convergence of labour market conditions. Differentiation of the EU27 results for spatial autocorrelation with respect to internal border regions in the EU15 and in the accession countries and new member states (see Figure 3) points at least in parts to a higher intensity of labour market integration in the EU15 since internal border regions in the old member states achieve a higher positive autocorrelation for unemployment than corresponding regions in the new EU countries plus Bulgaria and Romania. In contrast, spatial autocorrelation will be relatively low for internal border regions in the EU15 if we consider per capita income in 2000. This result might reflect to some extent the fact that all Eastern European regions together can be defined as one low income cluster within the enlarged EU.²⁵

However, results regarding GDP per capita differ significantly from the findings for unemployment. Though there is some evidence of border effects for regional income in 1995, differences between internal border regions and other EU regions tend to be insignificant or even wrongly signed. Examination of corresponding Moran scatterplots reveals that the

²³ Cf. Fingleton/McCombie (1998), Overman/Puga (2002), López-Bazo et al. (1999) and Niebuhr (2003) for corresponding evidence.

²⁴ Maps of the corresponding variables for 2000 are given in the appendix.

²⁵ Moreover, as shown below, empirical findings for per capita income in 2000 also suffer from outlying regions which cause biased estimates of Moran's I .

Figure 1
Regional GDP per capita 2000*

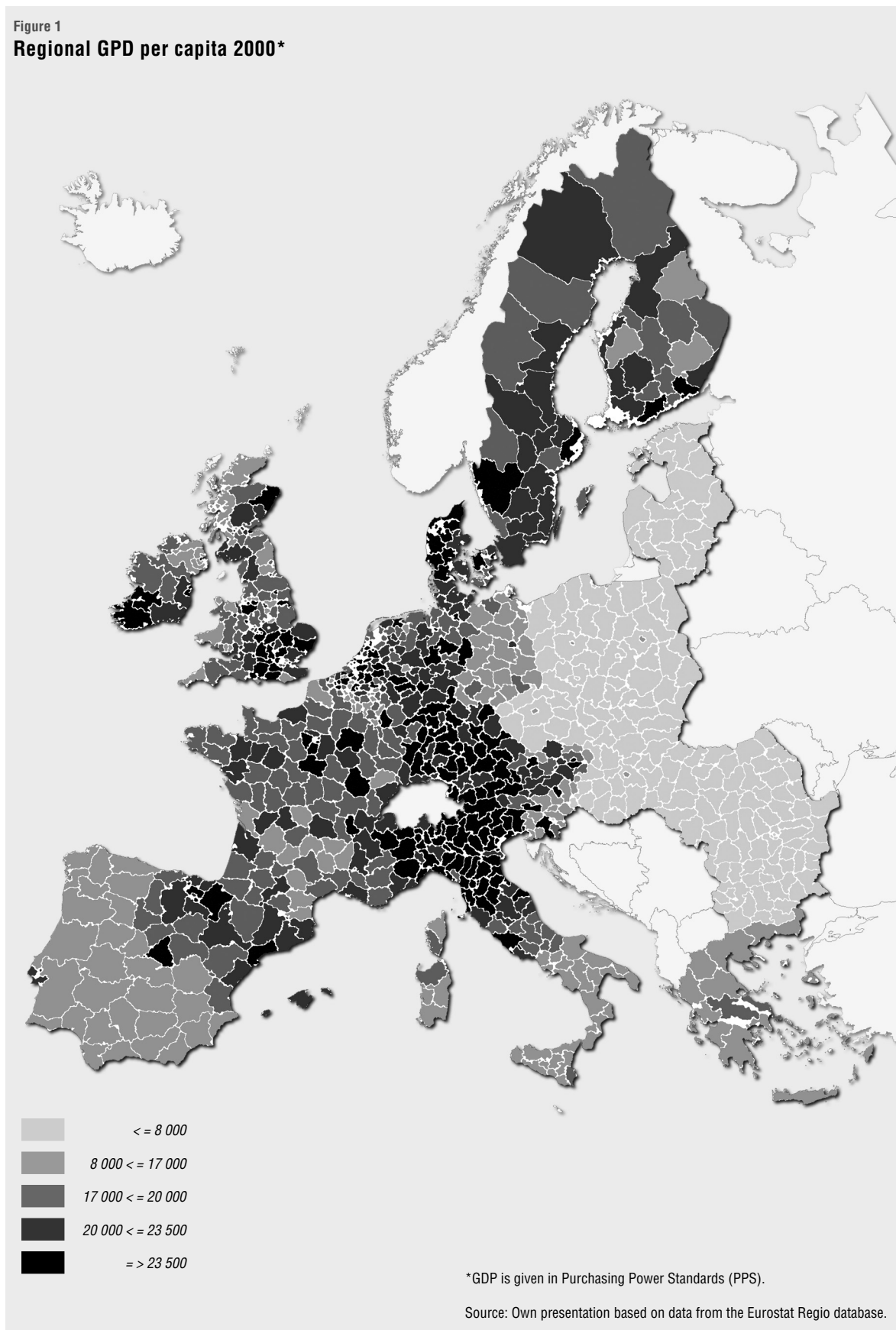


Figure 2
Regional unemployment rates 2000*

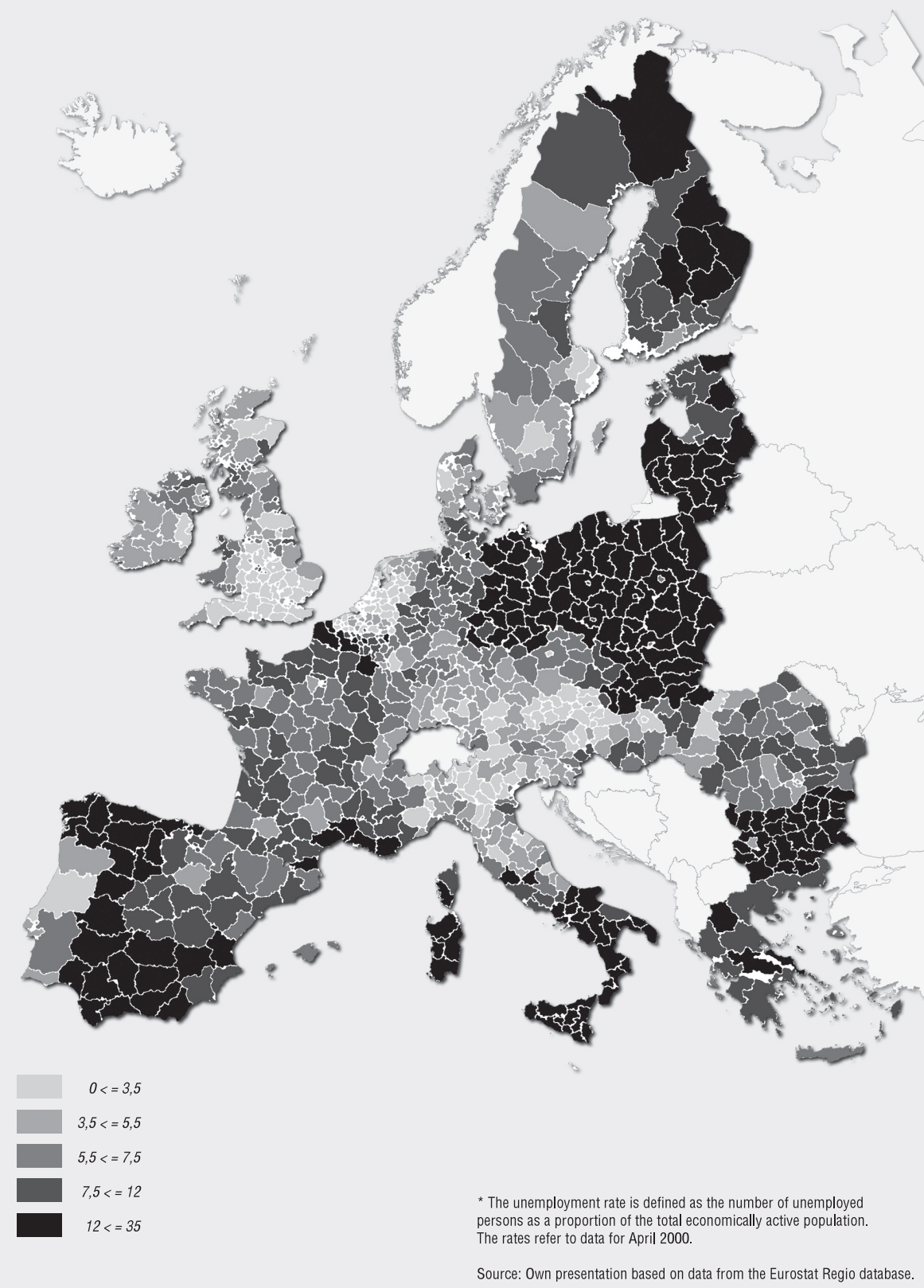


Table 2

Spatial autocorrelation of income and unemployment in the EU15

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

**significant at the 0.01 level, *significant at the 0.05 level.

Source: Eurostat, Regio database; own calculations.

Table 3

Spatial autocorrelation of income and unemployment in the EU27

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

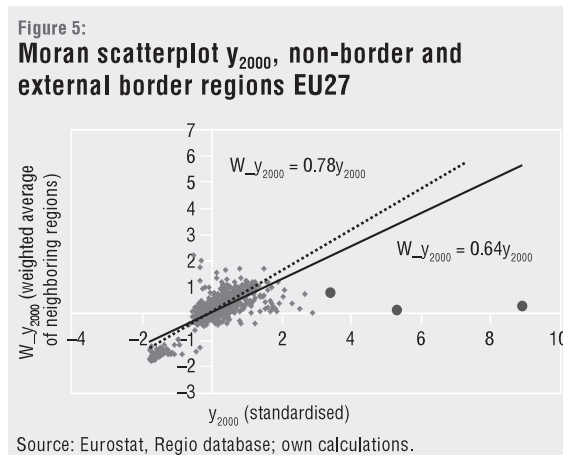
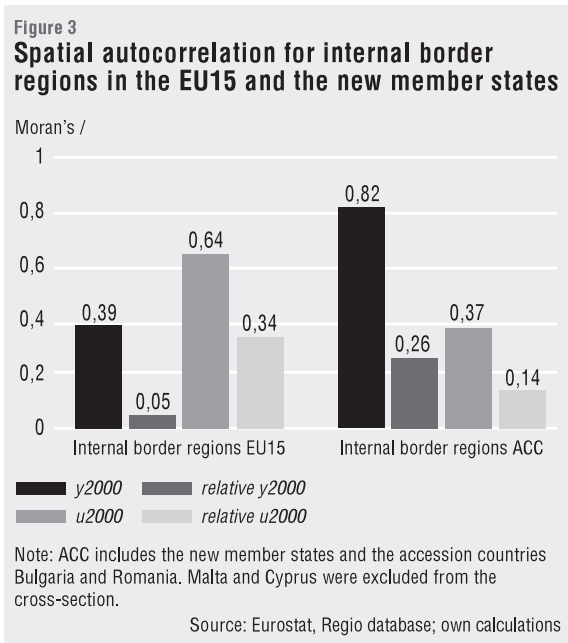
**significant at the 0.01 level, *significant at the 0.05 level.

Source: Eurostat, Regio database; own calculations.

estimates for the reference group are severely downwardly biased due to some outlying regions which constitute leverage points. As Figures 4 and 5 show for $y_{i,2000}$, the detected spatial autocorrelation will clearly increase if we control for the impact of the leverage points (marked by bold 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 reference group. This constellation also applies to the other income variables. Taking into account the effects of leverage points, there is some support for a higher spatial dependence for non-border regions plus external border regions compared

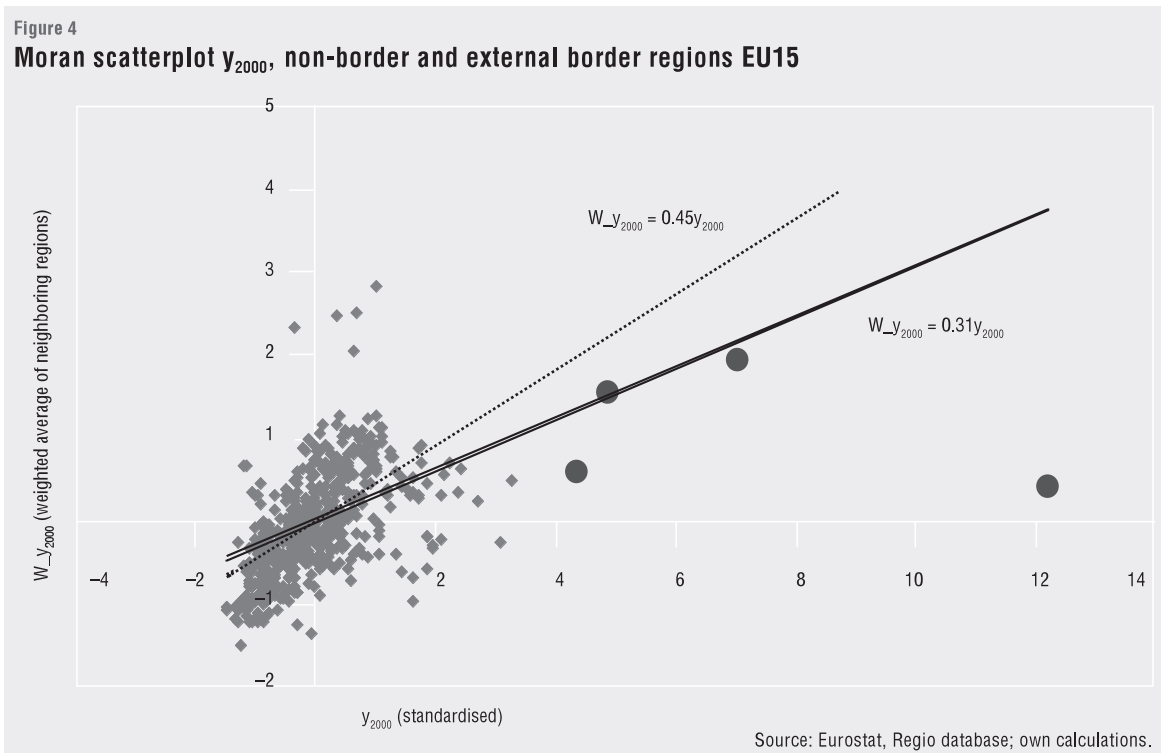
with internal border areas. Nevertheless, the findings point to a much stronger segmentation of cross-border labour markets with respect to unemployment than with respect to income.

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. At any rate, a significant spatial segmentation of labour markets is measurable even among highly integrated EU15 countries. However, regional labour markets in the EU are separated within member states, too, since equilibrating forces



across regions are small. The segmentation does not refer mainly to small regional units since this would be reflected in a negative spatial dependence in our analysis. In fact, segmentation consists mainly in differences between spatial clusters of high and low unemployment (income). Furthermore, we detect significant border effects in as far as internal border

regions show a higher degree of labour market segmentation (lower positive spatial dependence) on average than other EU regions. However, this mainly refers to unemployment. Corresponding empirical evidence for per capita income is less persuasive. The results differ from the findings of 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 NUTS 2 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 facilitated labour mobility in the EU to a considerable extent, migration, cross-border commuting and corresponding labour market effects are at a low level. There is also evidence of significant non-tariff impediments to trade in Europe that might hamper the convergence of regional labour market conditions.²⁶ In accordance with this, 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, labour market conditions differ more between adjacent foreign regions than between neighbouring regional labour markets in the same member state. However, we obtain robust results only for unemployment since analyses for per capita income are seriously affected by outlying observations. Our findings indicate that there is still a high potential for more labour market integration, especially for the new internal border regions in the EU27 because labour market integration among the EU15 countries seems to be more advanced compared with the enlarged EU.

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 are the result of deficits in cross-border infrastructure, institutional and administrative disparities, cultural and linguistic differences as well as social or psychological barriers (cf. de Gijssel 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 between regions where barriers to mobility should be quite small after decades of integration efforts. According to estimates by Hansen/Nahrstedt, full integration between Denmark and Germany would result in a tenfold increase in commuting across the border. The labour markets on the two sides of the border remain separated to a large extent even though free movement of labour has been 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 regard to the formation of cross-border labour markets in the enlarged EU based on this evidence from the EU15? The level of labour mobility, which establishes cross-border labour markets, is currently low in the EU. Previous experience regarding the introduction of the free movement of workers in the EU suggests that overall the migration potential within the EU27 is modest. However, future migration and commuting will probably vary considerably between EU regions and in particular among border regions. Therefore, labour markets in specific border regions might be affected by pronounced integration effects. At any rate, the long-term effects of labour mobility might also be fairly limited in the border areas affected most strongly. The Commission (2001) notes that adverse effects of immigration on indigenous unemployment and wages in the EU were relatively small in the past. Furthermore, transitional arrangements between new and old member states will at least delay corresponding effects.²⁷ One argument for a relatively high level of cross-border mobility in new internal border regions might be derived from the large income disparities and pronounced differences in unemployment rates between new and old member states.²⁸ In contrast, the low density of economic activity and population in many of the new internal border regions suggests that on the whole the intensity of labour market integration as measured by cross-border mobility is likely to remain low.

In order to achieve a high level of integration the EU Commission has already implemented various measures that are intended to reduce barriers to cross-border interaction. However, evidence of 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, which might especially concern the new internal border regions in the enlarged EU because of existing deficits and the relevance for cross-border commuting. Moreover, the harmonisation of national labour market regulations and social security systems is relevant in this respect. But labour market disparities will be resistant to usual measures of integration

²⁶ Cf. Tassinopoulos (1999), Bröcker (1998), Nitsch (2000).

²⁷ 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.

²⁸ Cf. Hönekoop/Werner (1999).

policy and EU harmonisation efforts 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.²⁹ 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 means that achieving a reasonable degree of cross-border labour market integration is a long-term task of EU policy.

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²⁹ Cf. Tassinopoulos (1999), Straubhaar (2000).

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Appendix: Description of the cross-section

EU15–668 regions (NUTS 2, NUTS 3, planning regions)

- Belgium: 43 NUTS 3 regions
- Denmark: 14 NUTS 3 regions (excluding Bornholms amt)
- Germany: 97 planning regions (functional regions comprising several NUTS 3 regions)
- Greece: 10 NUTS 2 regions (excluding Voreio Aigaio, Notio Aigaio, Kriti)
- Spain: 47 NUTS 3 regions (excluding Ceuta y Melilla, Canarias, Islas Baleares)
- France: 96 NUTS 3 regions (excluding Départements d’outre-mer)
- Ireland: 8 NUTS 3 regions
- Italy: 103 NUTS 3 regions
- Luxembourg: 1 region
- Netherlands: 40 NUTS 3 regions
- Austria: 35 NUTS 3 regions
- Portugal: 5 NUTS 2 regions (excluding Açores, Maeira)
- Finland: 19 NUTS 3 regions (excluding Åland)
- Sweden: 20 NUTS 3 regions (excluding Gotlands län)
- UK: 130 NUTS 3 regions (excluding Western Isles, Orkney Isles, Shetland Isles)

ACC10–187 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)

Slovakia: 8 NUTS 3 regions

Slovenia: 12 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

Figure A1

Regional GDP per capita (PPS) relative to the national average 2000 (national average = 100)*

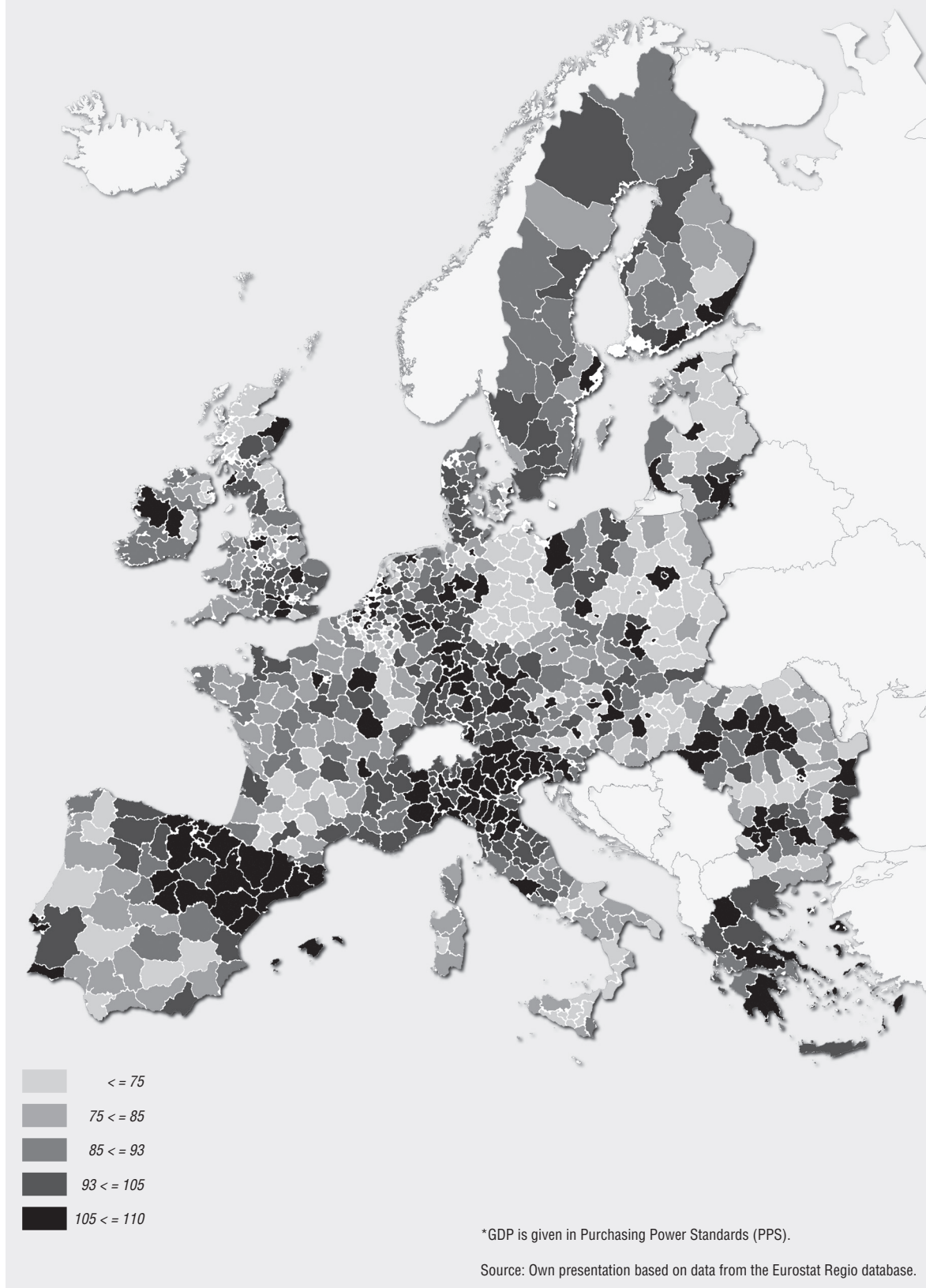


Figure A2

Regional unemployment rates relative to national average 2000 (national average = 100)*

