43rd Congress of the European Regional Science Association
"Peripheries, Centres and Spatial Development in the New Europe"
August 27th – 30th, 2003, Jyväskyla, Finland

Market Potential and Regional Disparities in Europe *

Annekatrin Niebuhr

July 2003
Preliminary version, not for citation

Abstract
A basic result of new economic geography models is that the proximity to consumer markets impacts wages and employment within regions. While there is a bulk of theoretical literature on new economic geography related empirical tests are still scarce. The present paper aims at providing some evidence on the validity of the forces emphasised by new economic geography models. The empirical analysis focuses on the relationship between market potential and regional wages in Europe. Consumers and purchasing power are unevenly distributed across space. The paper analyses the significance of the market potential for regional disparities in a cross section of European regions taking into account the effects of national borders as well. In the course of integration the significance of borders as impediments to trade and factor mobility declines presumably affecting the market potential especially in border regions. The regression analysis covers the period between 1985 and 2000.

JEL classification: C21, F15, R12
Keywords: New economic geography, market potential, European integration

Hamburg Institute of International Economics
Department of European Integration
Neuer Jungfernstieg 21
D 20347 Hamburg
Germany
e-mail: niebuhr@hwwa.de,

* I would like to thank Johannes Bröcker for the provision of travel time data and Wolfgang Henne for his support.

1. Introduction

Spatial effects of economic integration have been a central topic of regional science for decades now. Against the background of upcoming EU accession of 10 European countries in 2004 spatial integration effects are still a highly relevant subject. In this context, most analyses focus on the question whether integration will involve increasing regional disparities. The EU Commission is concerned about the development of lagging peripheral areas and border regions in an enlarged EU. New economic geography models allow to deal with these issues. Based on corresponding approaches *Krugman/Venables* (1990) and *Krugman* (1993) explicitly investigated the implication of integration for the spatial structure of economic activity in Europe. But theoretical analyses alone do not provide clear cut answers with respect to the question whether the economic core of the EU will benefit from integration at the expense of the periphery. Unfortunately, empirical research on the relevance of new economic geography and empirical applications regarding spatial effects of European integration are still scarce. Some studies investigate the impact of European integration on the spatial structure of economic activity in the EU without a firm theoretical framework. Frequently, market access considerations and calculations of market potentials constitute the starting point of such investigations. However, the specific meaning of market access for regional development remains vague in most of these studies since a theoretical fundament is missing. New economic geography models can offer this base because they establish the missing economic link between market access and regional development.

The present paper aims at analysing the significance of the market potential for regional disparities in Europe. New economic geography models provide arguments why especially market access respectively changes in the market potential due to integration might be decisive factors with respect to spatial integration effects. In contrast to earlier studies on market potential of European regions (e.g. *Clark* et al. 1969, *Keeble* et al. 1982), the present analysis bases on a theoretical fundament linking market access, economic integration and regional development. The applied regression model is directly related to new economic geography models. Therefore, the analysis represents also a test of mechanisms of regional development emphasised in corresponding models. To our knowledge up to now such tests have only been conducted for US and German regions by *Hanson* (2000), *Roos* (2001) and *Brakman* et al. (2002a, b). Here we apply the approach to a cross section of European regions and investigate the existence of a spatial wage structure in the EU. The empirical analysis aims at investigating whether nominal wages in the EU depend positively on the proximity to large markets. The period under consideration ranges from 1985 to 2000.

The rest of the paper is organised as follows. Section 2 comprises a short description of new and traditional location theory constituting the theoretical framework of the empirical analysis. The regression models are derived and the empirical implementation is illustrated. In section 3 previous empirical evidence on the market potential is summarised. Data and regional system are described in section 4. The results of the regression analysis are presented in section 5. Section 6 concludes.

2. Theoretical background – traditional location theory and new economic geography

Traditional location theory as well as new economic geography provide arguments regarding integration effects that base on changes in regional market potential emerging in the course of integration processes.[1] Several elements of new economic geography models dealing with spatial integration effects are already discussed by *Lösch* (1944). He develops a system of spatial market areas which are affected by national borders. Borders divide the market area and negatively affect a firm's market potential. Especially regions close to border have comparatively small market areas discouraging firms from locating in these areas. In general, regions with a small market potential should be marked by a relatively low density of economic activities.

Reversing this reasoning suggests that integration, i.e. the opening of a border for trade may significantly change the spatial structure of economic activity. The reduction of barriers to international trade entails low-cost access to foreign markets in some regions. In the course of integration the accessible market area, i.e. the market potential of regions in the geographical centre of the integrating area rises. An above average increase in the market potential should raise the attractiveness of corresponding locations as productions sites and foster the development of the regional economy. *Giersch* (1949/50) explicitly deals with the spatial impact of an economic union in Europe and expects a favourable evolution of regions in the centre of the European Community.

New economic geography deals with the distribution of economic activities across space as well. The distribution of workers and firms across space depends on the relative strength of centripetal forces and centrifugal forces. If centripetal forces dominate the economic landscape will be differentiated, marked by agglomerations with a high density of economic activities and regions which have only a few firms or no industry at all. In new economic geography models centripetal forces arise from the fact that a relatively large home market has a positive impact on a firm's profit and a consumer's utility. Scale economies and transport costs generate demand linkages between and within regions. These demand linkages contribute to agglomeration of economic activity and population. Locations that allow to supply a large local market at low transport costs are attractive for firms.

Integration via its impact on interregional transport costs affects the balance of centripetal and centrifugal forces and thus might alter the spatial distribution of economic activities. In the

[1] For a more detailed presentation of different models of location theory and their implication with respect to spatial integration effects see *Niebuhr*/*Stiller* (2002).

course of integration the location of economic activities changes from a strongly inward-oriented one to a more outward orientated economy. The domestic market becomes less important, possibly resulting in a reallocation of resources from previous centres to new locations. Market size considerations based on new economic geography models suggest that central regions, i.e. regions along the common border of integrating countries might realise above average integration benefits since they achieve above average increases of their market potential. The relative geographical position of these regions and their market access is altered dramatically by integration. The geographical position changes from a peripheral one on a national scale to a central one in the common market. Altogether, the new economic geography suggests that a favourable economic development of central regions could be initiated by integration due to an increase in their market potential. However, in the end it is not possible to draw precise conclusions on spatial integration effects from new economic geography. Increased integration might not be sufficient to destabilise the existing spatial distribution of economic activity. Moreover, in case of significant spatial effects, integration might work to the advantage of central locations or peripheral areas. The specific outcome depends on the magnitude of trade cost reduction respectively the level of international trade costs.[2]

The present paper analyses the relevance of mechanisms described in new economic geography models with respect to the spatial structure of the EU. The investigations depart from an approach first applied by *Hanson* (1998, 2000) to investigate the significance of a spatial wage structure in the US. The regression analysis is based on *Helpman's* (1998) version of the core-periphery-model by *Krugman* (1991b).[3] In order to derive an estimable equation from the model, Hanson has to assume real wage equalization. This implies that the spatial economy under consideration is in long-run equilibrium which necessitates a sufficient degree of labour mobility and wage flexibility. In the present analysis we instead apply a second approach by *Hanson* (1998), the so called market potential equation that avoids the unrealistic assumption of a spatial wage structure representing a long-run equilibrium. The market potential equation is an approximation of the nominal wage equation in the *Krugman* (1991) model.[4] The concept, introduced by *Harris* (1954), defines the market potential of region i as the weighted sum of purchasing power in all accessible regions j whereby the weighting scheme is a function declining with increasing distance between locations i and j. According to the Krugman model in equilibrium w_i, the nominal wage in region i, is a function of the market potential:

(1) $$w_i = \left[\sum_{j=1}^{J} Y_j e^{-\tau(\sigma-1)d_{ij}} T_j^{\sigma-1} \right]^{1/\sigma},$$

---

2 See *Krugman/Venables* (1993) or *Krugman/Venables* (1990).

3 The corresponding model is well documented in the literature. Therefore we forego a detailed presentation of the approach. For a derivation of the regression model see e.g. *Hanson* (1998) or *Roos* (2001).

4 See *Hanson* (2000) and *Brakman* et al. (2000a)

where Y_j is income in region j, d_{ij} is distance between i and j, σ is the elasticity of substitution between any pairs of goods produced in the monopolistically-competitive manufacturing sector, τ is the unit transport costs and T_j is the price index for traded goods in region j. Equation (1) relates the wage level to the attractiveness of a specific location. A region's attractiveness for firms is positively affected by good access to a large market. As *Hanson* (2000) notes, equation (1) can be thought of as a spatial labour-demand function in an economy with perfect labour mobility. Labour demand and wages are relatively high in locations close to high consumer demand. Regional wages increase with income of neighbouring regions and decline with rising transport costs to these surrounding locations. The market potential function can be regarded as a reduced form of the nominal wage equation from the core-periphery-model.

Equation (1) cannot be estimated directly since data for regional price indices T_j are not available. *Roos* (2001) solves this data problem by assuming that T_j is identical in all locations.[5] In this case, the basic wage equation to be estimated is given by:

$$(2) \qquad \log(w_i) = \alpha_0 + \alpha_1 \log\left(\sum_{j=1}^{J} Y_j e^{-\alpha_2 d_{ij}}\right) + \varepsilon_i ,$$

where ε_i is an error term. The coefficient α_1 is the reciprocal of the elasticity of substitution ($\alpha_1 = 1/\sigma$) and $\alpha_2 = \tau(\sigma - 1)$. Equation (2) states that wages in a given region are determined by the proximity to consumer markets. The equation is not derived from an explicit model and can be regarded as reduced form of several economic geography models.

However, there are probably a number of additional factors determining the regional wage level such as sectoral composition of the regional economy or education and age of the work force. In order to deal with these issues, as far as possible with available data, control variables are included in the regression analysis[6]:

$$(3) \qquad \log(w_i) = \alpha_0 + \alpha_1 \log\left(\sum_{j=1}^{J} Y_j e^{-(\alpha_2 d_{ij})}\right) + \sum_{n=1}^{N} \gamma_n X_{in} + \varepsilon_i ,$$

where X_{in} is a control variable and γ_n is the corresponding coefficient. In order to control for effects of local agglomeration, we include the population density as an additional explanatory

5 As *Roos* (2001) states, assuming a constant price indices across all regions implies that there is only a backward linkage as centripetal force (firm locate near large markets). The forward linkage related to differentiated regional costs of living is lost by the assumption (agglomeration allows to buy a given product diversity for lower prices).

6 *Hanson* (2000) includes shares of the working age population in a region by gender, age, and education as well as indicators of exogenous amenities (e.g. climate measures) which might be relevant in this context.

variable. Furthermore, control variables comprise indicators for sectoral composition of regional economies and country dummies.

The empirical analysis investigates the existence of a spatial wage structure for a cross section of more than 150 European regions. Therefore investigating the relevance of the market potential has to consider trade across national border, i.e. foreign markets. However, the results of several studies point to significant border impediments even between highly integrated EU member states (see e.g. *Bröcker* 1998 or *Nitsch* 2000). The regression model should therefore take into account border effects that reduce the accessibility of foreign markets:

$$\text{(4)} \qquad \log(w_i) = \alpha_0 + \alpha_1 \log\left(\sum_{j=1}^{J} Y_j e^{-(\alpha_2 d_{ij} + \alpha_3 B_{ij})}\right) + \sum_{n=1}^{N} \gamma_n X_{in} + \varepsilon_i$$

with B_{ij} as border variable. In the regression analysis border effects are either approximated by a dummy variable or by estimated border effects. In the former case $B_{ij} = 0$, if the regions i and j are located in the same country and $B_{ij} = 1$, if the regions are in different countries. In the latter case again $B_{ij} = 0$, if i and j are located in the same country. However, in contrast to the dummy specification of border effects, B_{ij} will be approximated by estimated border impediments now if the regions i and j are in two different EU member states.[7] A significant and positive coefficient would indicate that the impact of purchasing power on the wage in a given region is significantly reduced by crossing a national border.

Another estimation issue concerns unobserved, time-invariant characteristics of regions. There are no region-specific endowments included as explanatory variables in the basic regression model. Time-invariant characteristics such as access to the sea, pre-existing infrastructure or other natural features of regions are not considered. This problem can be solved by controlling for fixed location effects via estimating a specification in time differences (see *Hanson* 2000). Equation (2) becomes then:

$$\text{(5)} \qquad \Delta \log(w_{it}) = \alpha_1 \left[\log\left(\sum_{j=1}^{J} Y_{jt} e^{-\alpha_2 d_{ij}}\right) - \log\left(\sum_{j=1}^{J} Y_{jt-k} e^{-\alpha_2 d_{ij}}\right)\right] + \Delta\varepsilon_{it},$$

with Δ as difference operator and t as time index. The errors $\Delta\varepsilon_{it}$ are assumed to be *i.i.d.*, uncorrelated with the regressors as well as across regions. Changes in market potential of regions should reflect long term structural changes of the spatial distribution of economic activity. Therefore they should be uncorrelated with time- and region-specific shocks.

7 For a detailed description of data on border impediments and data sources see section 4.

The original regression model assumes that the analysed regional system is a closed economy, i.e. only national income and demand matter for regional wages and the spatial distribution of economic activity. In the present analysis all western European countries are included as sources of demand for products of a specific location. In other words, the main trading partner of the countries and regions investigated in the analysis are taken into account. However, we cannot consider demand from middle and eastern European countries because of data restrictions with respect to the period under consideration.

Finally, we have to consider the endogeneity problem, i.e. right hand side variables, such as regional income are not exogenous, possibly causing inconsistent estimates. So far, this problem is addressed by using time lags instead of contemporary income. In the present analysis the applied income measure Gross Value Added is lagged by 10 years.

3. Previous empirical evidence on the market potential

There are some early studies that apply market potential arguments in order to analyse spatial integration effects. *Clark* et al. (1969) and *Keeble* et al. (1982) investigate effects of European integration by analysing changes in regional accessibility and market potential induced by a reduction of tariff barriers. They apply the concept of the market potential as proposed by *Harris* (1954). The analyses assume that accessibility is important for investment decisions and, therefore, regional growth. A high market potential is rated as a locational advantage. Thus, the most densely populated areas and central locations in Europe should realise the highest integration benefits. According to the results of *Keeble* et al. (1982), the most inaccessible regions, marked by extremely low market potentials, are located in the geographical periphery. In contrast, high accessibilities and market potentials are estimated for regions in the north-east of Europe, covering large parts of the Netherlands, Belgium and West Germany. Moreover, the results point to a widening of regional disparities in accessibility and market potential: Enlargement as well as faster growth of more accessible regions tended to favour the central areas in Europe in the 1960s and 1970s.

As *Keeble* et al. (1982) point out, the basic pattern of the market potential reflects historic processes, e.g. industrialisation and urbanisation. The effects of integration induce only slight changes in the market potential of European regions. However, the positive effect ascribed to the change of the market potential is not based on a well defined theoretical approach. The significance of the market potential for regional development remains an unclear matter – from a theoretical as well as from an empirical point of view. *Clark* et al. (1969) and *Keeble* et al. (1982) do not investigate the growth effects of the market potential and of its change in the course of integration. Whereas there is clearly a positive correlation between level of development (e.g. measured by income per capita) and market potential, there is no such evidence concerning the relationship between change in market potential and change in income per capita (see *Bröcker* 1990).

With the development of the new economic geography theoretical deficiencies concerning the market potential have been remedied. Some recent studies investigate the empirical significance of the market potential, based on tests of corresponding theoretical approaches. *Hanson* (1998, 2000) conducted the initial analyses of this kind for US counties. The findings of the regression analyses point to strong but highly localised demand linkages between regions. A higher effective consumer demand, determined by income and transport costs, tends to raise wages in a given location. Regional wages decline with increasing distance to consumer markets. According to the results, purchasing power in regions more than 1,000 kilometres away from a location does not affect demand for goods of that location and has therefore no impact on local wages. Moreover, Hanson ascertains that the market potential is positively correlated with education and experience of the work force which are also associated with higher regional wages. Highly skilled labour seems to be attracted to locations with high consumer demand.

Brakman et al. (2000b) estimate the level specification of the market potential function for German districts with data for the years 1995. They find strong confirmation of the significance of a spatial wage structure in Germany. Regional wages are affected by economic activity and corresponding demand in neighbouring regions. The effect of demand is fairly localized, i.e. distance matters for interregional demand linkages. Adding market access to Germany's main trading partners has no significant effect on the regression results. The authors therefore conclude that economic activity beyond national borders seems not to affect the spatial wage structure in Germany. These findings are confirmed by results of additional analyses by *Brakman* et al. (2000a). The analysis of *Roos* (2001) affirms the empirical evidence provided by *Hanson* (2000) and *Brakman* et al (2000a, b). A positive relationship between regional wage and purchasing power in neighbouring locations marks the analysed cross section of West German regions. However, the findings of Roos imply that explanatory power of the market potential as well as spatial scope of demand linkages are rather limited. Moreover, the market potential only seems to affect the wages of skilled workers, whereas there is no significant effect on the wages of unskilled workers.

4. Data and regional system

4.1 Data

The dependent variable in the following regression analysis of European regions is the log compensation per employee respectively the log change in compensation per employee. In the level specifications of the market potential function data on regional compensation per employee in 1985, 1990, 1995 and 2000 are included. For the time-difference specifications data for the period 1985-2000 is used. The dependent variable is given for 158 European regions. Regional income, i.e. purchasing power is approximated by Gross Value Added (GVA) in 1975, 1980 1985 and 1990 in 205 European regions. Indicators for the sectoral composition of regional economies base on employment data by NACE-CLIO R6 classification (B01: Agricultural, forestry and fishery products, B30: Manufactured products, B53: Building and construction, B68: Market services, B86: Non-market services). The corresponding employment shares, i.e. the percentages of regional employment in agriculture, manufacturing, et cetera, are used as control variables. All data were taken from Cambridge Econometrics' European regional databank.

4.2 Distances and border impediments[8]

Distance is measured by travel time in minutes between the centres of regions. With respect to internal distances of the European regions we use an approach frequently applied in the corresponding literature, i.e. internal distance is modelled as proportional to the square root of the region's area.[9] The area of each region is approximated with a disk in which all production activity is concentrated in the centre and the consumers are distributed evenly across the area. Under these assumptions, the average distance between consumers and producers in the region can be estimated as a function of the square root of the area. Following *Bröcker* (1999), we determine the internal distance of region i in minutes of travel time as:

(5) $$d_{ii} = 0.75 \cdot \sqrt{A_i}\ ,$$

where A_i denotes the area of region i. *Crozet* (2000) notes that this kind of determination might not be as precise as other specifications applied for interregional distances. In particular, two biases are relevant in this context. Firstly, both consumers and firms tend to be located in or around cities. Thus actual distances between consumers and producers should be smaller than those implied by the disk approximation. Secondly, the approximation is simultaneously affected by downward bias since internal distance is measured "as the crow flies". The biases work in opposite directions and the effects might just level out each other (see *Crozet* 2000).

In order to generate data on bilateral border impediments for the EU different sources are used. *Bröcker* (1998) estimates bilateral trade impediments for several European countries for the year 1994. The factors by which international trade is reduced compared with intranational trade range between 7 and 117. On average trade is reduced by a factor of 20 due to crossing a border. These results are in line with the empirical evidence provided by *Mc Callum* (1995). However, they are rather high compared to the estimates of *Nitsch* (2000) or *Wei* (1996) for the EU. By applying a gravity model to EU-trade *Nitsch* (2000) estimates border effects between 6 and 16. The findings of *Wei* (1996) suggest border impediments around a factor of 10. Moreover, Wei's results imply that border effects in the EU declined by 50% between 1982 and 1994. Estimates of *Head/Mayer* (2000) range between 12 and 20.

---

8 I would like to thank Johannes *Bröcker* for the provision of interregional distances.
9 See e.g. *Head/Mayer* (2000), *Nitsch* (2000) or *Crozet* (2000).

The analysis by *Nitsch* (2000) provides more information on the development of border impediments in the EU between 1979 and 1990. According to the results, there has been a pronounced decline of border effects between 1979 and 1982 and since then the impediments gradually declined from factor 12 to factor 10. *Head*/*Mayer* (2000) analyse the change of border impediments in the EU as well. Their empirical evidence suggests that the border effects have decreased from a factor of 20 in the late 1970s to roughly 13 in 1993/1995 after the completion of the Single European Act. *Head*/*Mayer* report a rapid decline until 1985 and only small change thereafter.

The estimates on bilateral trade impediments in 1994 and on the development of average border impediments in the EU since the end of the 1970s are combined in order to generate data on bilateral border effects for the period under consideration.

4.3 Regional system

Two cross sections have to be distinguished in the present analysis. One cross section concerns the dependent variable and comprises 158 EU regions. The second cross section consists of all regions whose income is included in the market potential, in total 205 European regions. The regional system largely corresponds with the Nuts II level. Exceptions concern in particular Denmark (3 former Nuts regions) Belgium, Germany (Nuts I level) and Sweden (Nuts III level). The following regions are not considered because of data restrictions: Berlin and all Nuts II regions in East Germany, Départements d'outre-Mer (France), Açores, Madeira (Portugal), Ceuta y Melilla, Canarias (Spain). Norway (19 Fylke) and the Switzerland (7 Grossregionen) are included in the larger cross section for estimation of the market potential. With respect to the left hand side of the regression model, Sweden, Norway and the Switzerland could not be considered because of data restrictions. A more detailed description of the cross section is given in the appendix.

5. Regression analysis

A number of different specifications, as described in section 2, are estimated. The equations (2) to (5) are estimated applying nonlinear least squares. Data for the level specifications is not pooled, i.e. cross sections for different dates are analysed. The time difference specification is estimated in order to deal with the problem of time-invariant, unobserved determinants of regional wages, as in *Hanson* (2000) or *Roos* (2001). Moreover, the model allows to address the deficiency identified by *Bröcker* (1990). In order to draw conclusions with respect to the question whether in the course of integration those regions with highest increases of the market potential also realise highest wages growth, a test based on first difference is necessary.

Table 1 summarises estimates of the models given by equation (2) and (3) for the log compensation per employee in 2000. GVA, applied as income measure, refers to 1990, population density and sectoral composition to 2000. In column (1) the estimates for the basic market potential equation are presented. The coefficients are highly significant with signs in accordance with theoretical fundamentals. Almost 50% of the variation in regional wages is explained by market access. Coefficients of market potential and distance slightly decrease if additional control variables are included in the regression model (see column 2). However, the model given in column 2 is marked by a number of outlying observations. The outlying regions do not correspond with the market potential function determined by the majority of observations. Outliers will seriously affect the coefficient estimates if they are influential leverage points, i.e. outlying observations with regard to the market potential. We identified outliers as those regions whose standardised residuals exceed the critical value $|2.5|$. In order to control for effects of outlying observations, dummy variables for the outliers are introduced. The most significant outlier is the region Brussels. Moreover, most Portuguese regions are outliers as well. To control for these observations a country dummy was included. Another country dummy was included for Finland since the residuals point to a systematic upward bias for finish regions.[10] Considering the dummy variables further reduces the coefficients of market potential and distance but both estimates remain significant at the 0.01 and 0.05 level, respectively (see column 3).

[Table 1 around here]

Eliminating insignificant explanatory variables gives rise to the model shown in column 4. Market access has a strong positive effect on the wage level. Control variables and dummy variables improve the fit of the regression considerably. The model presented in column 4 explains more than 70% of the variation in regional wage level. Apart from market access the wage level is also influenced by settlement structure and sectoral composition of the regional economy. The results suggest that, controlling market access and sectoral composition of the economy, highly agglomerated regions are not characterised by an above average wage level. Thus, high wages in the densely populated regions in the geographical centre of the European Union can be traced back to their favourable market access and their specialisation. Settlement structure affects the wage level as well, but regional wages tend to decline with increasing agglomeration. A high percentage of employment in agriculture has a depressant impact on the wage level, as one would expect. The same negative wage effect applies to a regional specialisation in construction. In contrast, a comparatively high share of employment in market services tends to exert positive influence on the regional wage level.

According to the estimates for α_1, the elasticity of substitution σ is 7.7, i.e. consistent with theory greater than 1.[11] The coefficient α_1 also points to increasing returns to scale since $\sigma/(\sigma-1)=1.15$. These results confirm the evidence provided by *Roos* (2001), *Brakman* et al. (2000a,

---

[10] All finish region apart from Åland are characterised by relatively high positive residuals whereas the Portuguese regions have highly negative errors.

[11] Estimates of σ range between 3.2 and 9.1 which is roughly in accordance with recent estimates in the empirical literature. See also *Hanson* (2000) for a comparison.

b) and *Hanson* (2000). The coefficient α_2 can be interpreted as a spatial discount factor that determines changes in the weight of purchasing power with increasing distance. The estimated distance decay coefficient implies that the intensity of demand linkages declines by 50% over a range of almost 250 minutes of travel time. Figure 1 displays the evolution of the distance decay with increasing travel time. Assuming an average speed of 80 km/h gives a half-life distance of approximately 330 km. Compared with the findings of *Roos* (2001) and *Brakman* et al. (2000a, b), the estimated geographical scope of demand linkages is rather large. The regression results in *Roos* (2001) imply that the intensity of spatial effects halves after 5 to 30 minutes of travel time, depending on the specification. The half-life distance derived from the estimates of *Brakman* et al (2002) ranges between 2 km and 8 km.[12]

[Figure 1 around here]

The estimated distance decay parameter combined with regional data on GVA allows to calculate the market potential. Figure 2 shows the results for the year 1990 and a distance decay α_2=0.0028. The spatial pattern of the market potential resembles accessibility measures and peripherality indices calculated by *Keeble* et al. (1982) or *Schürmann*/*Talaat* (2000). Regions marked by low market potentials are located in the geographical periphery, comprising in particular Finland, Greece, Portugal and the south of Spain and Italy. In contrast, high accessibility and market potentials are estimated for regions in the north-east of Europe, covering large parts of the Netherlands, Belgium, Germany and the north of France.

[Figure 2 around here]

Table 2 summarises results of a sensitivity analysis with respect to changes over time. Altogether, the specification including the market potential, control variables and dummies generates fairly robust estimates for different dates. Estimates are given for the log compensation per employee in 1985, 1990, 1995 and 2000. Again, regional income is lagged by 10 years in each case. The explanatory power of the approach slightly decreases for spatial wages structures between the mid of the 1980s and 2000. Moreover, the regression results indicate that the market potential has become less important for the regional wage level. At the same time, the negative effect of distance declined somewhat as well. In other words, the geographic scope of demand linkages seems to rise a little. These findings are in line with an economy marked by a declining importance of distance due falling communications and transport costs.

[Table 2 around here]

12 In the present analysis half-life distance ranges between 80 km and 330 km (60 to 250 minutes of travel time).

Finally, in Table 3 the findings with respect to border impediments and specifications in time differences are summarised. The corresponding results, so far, are rather disappointing. The inclusion of border effects in the basic market potential function presented in column 1 does not yield significant border impediments that hamper demand linkages between domestic and foreign regions. Moreover, the coefficient is negative, which contradicts empirical evidence on trade reducing effects of national borders. In the extended specification including control variables and dummies the implausible effect of borders even becomes significant at the 0.01 level. The negative coefficient implies that crossing a national border increases the weight of demand, i.e. the importance of purchasing power in foreign region is c.p. higher than importance of domestic demand. Furthermore, the simple difference specification shown in column 3 achieves only a poor fit and is very sensitive with respect to the inclusion of a constant term. The coefficients α_1 and α_2 will loose significance if the equation is augmented by a constant. This applies to the model in column 4 as well. Moreover, estimates of α_1, exceeding the value 1, are not consistent with theory.

[Table 3 around here]

6. Conclusions

The results of the present analysis confirm evidence on the relationship between regional wage and market potential provided by other studies. Regional wages in Europe tend to rise with increasing market potential of the location. However, the significance of market access for the wage level as well as the distance decay seem to decline over time. This is in contrast to the findings of *Hanson* (2000) who detects growing demand linkages over time. The declining effects of distance, i.e. slightly rising geographical scope of demand linkages, identified in the present analysis are in line with an economy marked by falling communications and transport costs. But distance obviously still matters for explaining the intensity of interaction between European regions. Compared with the evidence provided by *Roos* (2001) and *Brakman* et al. (2000a, b), the estimated geographical scope of demand linkages is rather large in the present analysis. Moreover, there is only weak evidence of a positive correlation between wage increases and changes in market potential. Thus, it remains to be investigated in more detail whether changes in market access due to economic integration have important effects on regional development and disparities in Europe. Finally, there is no indication for important border impediments affecting the spatial wage structure in 2000.

Evidence of a spatial wages structure for European regions might be even more meaningful than the results provided by *Hanson* (2000). *Roos* (2001) notes that the regression model might not be an ideal description of the spatial structure of economic activity in Europe for several reasons. Wage setting tends to be more centralized in Europe working against a spatial wage structure. Furthermore, low wage flexibility and limited labour mobility in European countries involve persistent unemployment differentials across regions. However, assumptions of the regression approach involve a high degree of labour mobility. Nevertheless, we discover a spatial wage structure in the EU. This underlines the relevance of mechanisms of regional development described in new economic geography models.

Altogether, regarding the significance of the market potential for disparities and regional development a number of issues remain to be investigated. These open issues mainly concern the robustness of the results. Additional control variables should be included in further analyses, especially the educational level of employees is highly relevant in this respect. Moreover, the sensitivity of the coefficients regarding different levels of spatial aggregation has to be considered in future research.

References

Brakman, St., Garretsen, H.; Schramm, M. (2002): New Economic Geography in Germany: Testing the Helpman-Hanson Model, HWWA Discussion Paper No. 172, Hamburg.

Brakman, St., Garretsen, H.; Schramm, M. (2000a): The empirical relevance of the new economic geography: Testing for a spatial wage structure in Germany, CESifo Working Paper No. 395, Munich.

Brakman, St., Garretsen, H.; van Marrewijk, C.; Schramm, M. (2000b): Empirical Research in Geographical Economics, Paper prepared for the Conference "The monopolistic competition revolution after twenty-five years", University of Groningen.

Bröcker, J. (1999): Wie wirken sich neue Verkehrstechnologien und die Entwicklung transeuropäischer Netze auf die Europäische Standortverteilung aus?, Forschungsbericht, TU Dresden.

Bröcker, J. (1998): How would an EU-membership of the Visegrád-countries affect Europe's economic geography? Annals of Regional Science, 32, 91-114.

Bröcker, J. (1990): Räumliche Wirkungen der europäischen Integration – ein Survey, Jahrbuch für Regionalwissenschaft 11, 43-63.

Clark, C., Wilson, F.; Bradley, J. (1969): Industrial Location and Economic Potential in Western Europe, Regional Studies 3, 197-212.

Commission of the European Communities (2001a): Second Report on Economic and Social Cohesion, Brussels.

Commission of the European Communities (2001b): On the impact of enlargement on Regions bordering Candidate Countries. Community action for border regions, Brussels.

Commission of the European Communities (2002): First Progress Report. On the impact of enlargement on regions bordering Candidate Countries. Community action for border regions, Brussels.

Crozet, M. (2000): Do migrants believe in market potential, TEAM – Paris 1 Panthéon-Sorbonne University, CNRS.

Giersch, H. (1949/50): Economic Union between Nations and the Location of Industries, The Review of Economic Studies, 17, 87-97.

Hanson, G.H. (1998): Market Potential, Increasing Returns, and Geographic Concentration, NBER Working Paper No. 6429, Cambridge Massachusetts.

Hanson, G.H. (2000): Market Potential, Increasing Returns, and Geographic Concentration, University of Michigan and NBER.

Harris, C. (1954): The Market as a Factor in the Localization of industry in the United States, Annals of the Association of American Geographers, 44, 315-348.

Head, K.; Mayer, T. (2000): Non-Europe: The Magnitude and Causes of Market Fragmentation in the EU, Weltwirtschaftliches Archiv, 136, 284-314.

Helpman, E. (1998): The Size of Regions, in: Pines, D.; Sadka, E.; Zilcha I. (eds.), Topics in Public Economics, Cambridge University Press, pp. 33-54.

Keeble, D.; Owens, P.L.; Thompson, Ch. (1982): Regional Accessibility and Economic Potential in the European Community, Regional Studies, 16, 419-432.

Krugman, P. (1991a): Geography and Trade, MIT Press.

Krugman, P. (1991b): Increasing Returns and Economic Geography, Journal of Political Economy 99, 483-499.

Krugman, P., Venables, A. J. (1993): Integration, specialization, and adjustment, NBER Working Paper No. 4559, Cambridge Massachusetts.

Krugman, P., Venables, A. J. (1990): Integration and the competitiveness of peripheral industry, in: Bliss, C. (ed.), Unity with diversity in the European economy: the Community's southern frontier, Cambridge University Press, pp. 56-77.

Lösch, A. (1944): Die räumliche Ordnung der Wirtschaft, 2. Auflage, Stuttgart.

Mc Callum, J. (1995): National Borders Matter: Canada – U.S. Regional Trade Patterns, American Economic Review, 85, 615-623.

Niebuhr, A.; Stiller, S. (2002): Integration Effects in Border Regions - A Survey of Economic Theory and Empirical Studies, HWWA, Discussion Paper No. 179, Hamburg.

Nitsch, V. (2000): National borders and international trade: evidence from the European Union, Canadian Journal of Economics, 22, 1091-1105.

Roos, M. (2001): Wages and Market Potential in Germany, Jahrbuch für Regionalwissenschaft 21, 171-195.

Schürmann, C.; Talaat, A. (2000): Towards a European Peripherality Index: Final Report, Berichte aus dem Institut für Raumplanung, No. 53, Dortmund.

Wei, S.-J. (1996): Intra-National versus International Trade: How Stubborn are Nations in Global Integration?, NBER Working Paper No. 5531, Cambridge Massachusetts.

Appendix

Two cross sections have to be distinguished: a smaller cross section that concerns the dependent variable and a larger one that consists of all regions which income is included in the market potential (in total 205 European regions). The regional system largely corresponds with the Nuts II level. Exceptions concern in particular Denmark (3 former Nuts regions) Belgium, Germany (Nuts I level) and Sweden (Nuts III level). The following regions are not considered because of data restrictions: Berlin and all Nuts II in East Germany, Départements d'outre-Mer (France), Açores, Madeira (Portugal), Ceuta y Melilla, Canarias (Spain). Moreover, Norway (19 Fylke) and the Switzerland (7 Grossregionen) are included in the larger cross section.

In the cross section for the dependent variable 158 EU regions are included. Sweden, Norway and the Switzerland are not considered in this cross section because of data restrictions. The 158 regions used in the sample are:

Belgium (3):	Bruxelles, Vlaams Gewest, Région Wallonne
Denmark (3):	Hovedstadsregionen, Ost for Storebaelt, ex.Hovedst, Vest for Storebaelt
Finland (6):	Uusimaa, Etelä-Suomi, Åland, Itä-Suomi, Väli-Suomi, Pohjois-Suomi

Germany (10): Schleswig-Holstein, Hamburg, Bremen, Niedersachsen, Nordrhein-Westfalen, Hessen, Rheinland-Pfalz, Saarland, Baden-Württemberg, Bayern

Greece (13): Sterea Ellada, Peloponnisos, Ionia Nisia, Thessalia, Dytiki Makedonia, Kentriki Makedonia, Anatoliki Makedonia, Thraki, Ipeiros, Kriti, Voreio Aigaio, Notio Aigaio, Attiki, Dytiki Ellada

Spain (16): Galicia, Principado de Asturias, Cantabria, Pais Vasco, La Rioja, Comunidad Foral de Navarra, Castilla y León, Comunidad de Madrid, Castilla-la Mancha, Extremadura, Aragón, Cataluña, Islas Baleares, Comunidad Valenciana, Región de Murcia, Andalucia

France (22): Rhône-Alpes, Picardie, Auvergne, Provence-Alpes-Côte d'Azur, Champagne-Ardenne, Midi-Pyrénées, Languedoc-Roussillon, Basse-Normandie, Poitou-Charentes, Centre, Limousin, Bourgogne, Bretagne, Aquitaine, Franche-Comté, Haute-Normandie, Pays de la Loire, Lorraine, Nord - Pas-de-Calais, Alsace, Île de France, Corse

Ireland (2): Border, Midland and Western, Southern and Eastern

Italy (20): Valle d'Aosta, Piemonte, Liguria, Lombardia, Emilia-Romagna, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, Toscana, Marche, Umbria, Lazio, Abruzzo, Molise, Puglia, Campania, Basilicata, Calabria, Sicilia, Sardegna

Luxembourg (1)

Netherlands (12): Groningen, Friesland, Drenthe, Overijssel, Gelderland, Flevoland, Utrecht, Noord-Holland, Zuid-Holland, Zeeland, Noord-Brabant, Limburg (NL)

Portugal (5): Norte, Centro, Lisboa e Vale do Tejo, Alentejo, Algarve

Austria (9): Burgenland, Niederösterreich, Wien, Kärnten, Steiermark, Oberösterreich, Salzburg, Tirol, Vorarlberg

United Kingdom (36): Tees Valley and Durham, Cumbria, Northumberland and Tyne and Wear, East Riding and North Lincolnshire, North Yorkshire, South Yorkshire, West Yorkshire, Derbyshire and Nottinghamshire, Leicestershire, Rutland and Northamptonshire, Lincolnshire, East Anglia, Bedfordshire and Herefordshire, Berkshire, Buckinghamshire and Oxfordshire, Surrey, East and West Sussex, Essex, London, Hampshire and Isle of Wight, Kent, Gloucestershire, Wiltshire and North Somerset, Cornwall and Isles of Scilly, Devon, Dorset and Somerset, Herefordshire, Worcestershire and Warwickshire, Shropshire and Staffordshire, West Midlands, Cheshire, Greater Manchester, Lancashire, Merseyside, East Wales, West Wales and The Valleys, Eastern Scotland, South Western Scotland, North Eastern Scotland, Highlands and Islands, Northern Ireland

Table 1: Regression results for European market potential 2000

	Dependent variable: Compensation per employee 2000			
	Non-Linear Least Squares			
	(1)	(2)	(3)	(4)
α_1	0.17** (8.27)	0.13** (4.68)	0.11** (3.89)	0.13** (5.84)
α_2	0.0035** (3.20)	0.0034* (2.58)	0.0027* (2.58)	0.0028** (2.83)
Pop_dens_{2000}		-0.09** (3.16)	-0.07* (2.44)	-0.07** (2.71)
$Agriculture_{2000}$		-0.12** (2.99)	-0.13** (4.70)	-0.14** (5.56)
$Construction_{2000}$		-0.13 (1.73)	-0.12* (2.14)	-0.11* (1.96)
$Manufacturing_{2000}$		0.06 (0.72)	0.12 (1.53)	
$Market\ Services_{2000}$		0.24 (1.66)	0.27* (2.39)	0.13* (1.99)
$Non\text{-}Market\ Services_{2000}$		-0.03 (0.31)	0.04 (0.71)	
Dummy Portugal			-0.55** (7.98)	-0.51** (7.78)
Dummy Finland			0.23* (2.40)	0.27** (2.79)
Dummy Brussels			-1.18** (13.73)	-1.20** (14.55)
Adj. R^2	0.48	0.57	0.73	0.73

Notes: *t*-statistics are based upon White's heteroscedasticity-adjusted standard errors.
** significant at the 0.01 level,
* significant at the 0.05 level.

Table 2: Sensitivity of results – estimates for 1985, 1990, 1995 and 2000

	Non-Linear Least Squares			
	(1) $\log(w_{i,\,1985})$	(2) $\log(w_{i,\,1990})$	(3) $\log(w_{i,\,1995})$	(4) $\log(w_{i,\,2000})$
α_1	0.31** (7.64)	0.27** (8.12)	0.19** (8.24)	0.13** (5.84)
α_2	0.0030** (3.38)	0.0029** (3.15)	0.0029** (3.51)	0.0028** (2.83)
Pop_dens_t	-0.15** (3.59)	-0.15** (4.18)	-0.10** (3.35)	-0.07** (2.71)
$Agriculture_t$	-0.22** (5.58)	-0.21** (6.03)	-0.16** (5.70)	-0.14** (5.56)
$Construction_t$	-0.03 (0.34)	-0.06 (1.02)	-0.09 (1.42)	-0.11* (1.96)
$Market\ Services_t$	0.20* (2.18)	0.32** (3.74)	0.25** (3.65)	0.13* (1.99)
Dummy Portugal	-0.62** (6.38)	-0.61** (7.61)	-0.52** (7.95)	-0.51** (7.78)
Dummy Finland	0.72** (4.94)	0.78** (6.44)	0.45** (4.64)	0.27** (2.79)
Dummy Brussels	-1.46** (11.39)	-1.56** (11.83)	-1.19** (11.59)	-1.20** (14.55)
Adj. R^2	0.82	0.82	0.76	0.73

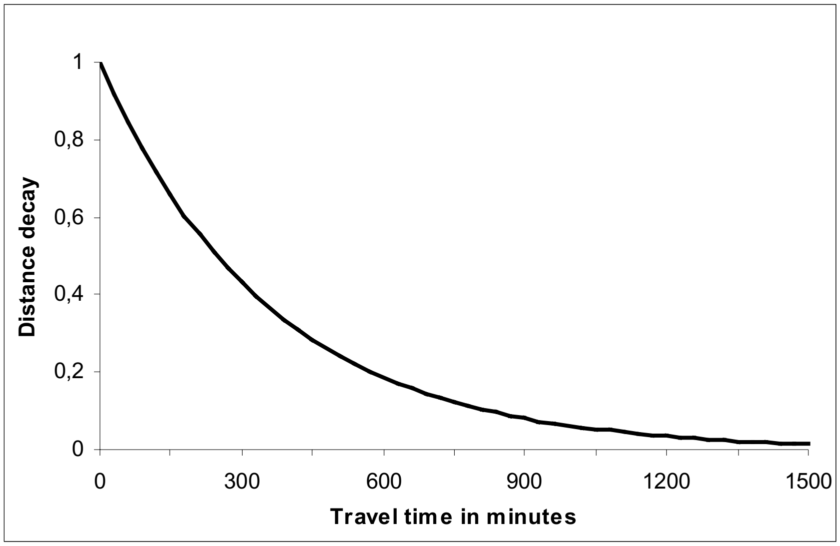
Notes: *t*-statistics are based upon White's heteroscedasticity-adjusted standard errors.
** significant at the 0.01 level,
* significant at the 0.05 level.

Table 3: Sensitivity of results – border effects and first differences

	Non-Linear Least Squares			
	(1) $\log(w_{i,\,2000})$	(2) $\log(w_{i,\,2000})$	(3) $\log(w_{i,\,1985\text{-}2000})$	(4) $\log(w_{i,\,1985\text{-}2000})$
α_1	0.16** (7.66)	0.11** (4.44)	1.46** (23.45)	16.74** (6.54)
α_2	0.0039** (3.20)	0.0040** (3.02)	0.0015 (1.01)	0.0002 (1.85)
α_3	-0.017 (1.09)	-0.05** (2.76)		
Pop_dens		-0.06* (2.18)		0.06* (2.28)
Agriculture		-0.13** (5.20)		0.03* (1.26)
Construction		-0.16** (2.80)		0.02 (0.19)
Manufacturing				-0.50** (7.04)
Market Services		0.11 (1.57)		-0.78** (7.10)
Non-Market Services				-0.55** (6.70)
Dummy Portugal		-0.60** (8.62)		
Dummy Finland		0.29** (2.75)		
Dummy Brussels		-1.18** (15.53)		
Adj. R^2	0.49	0.77	0.03	0.61

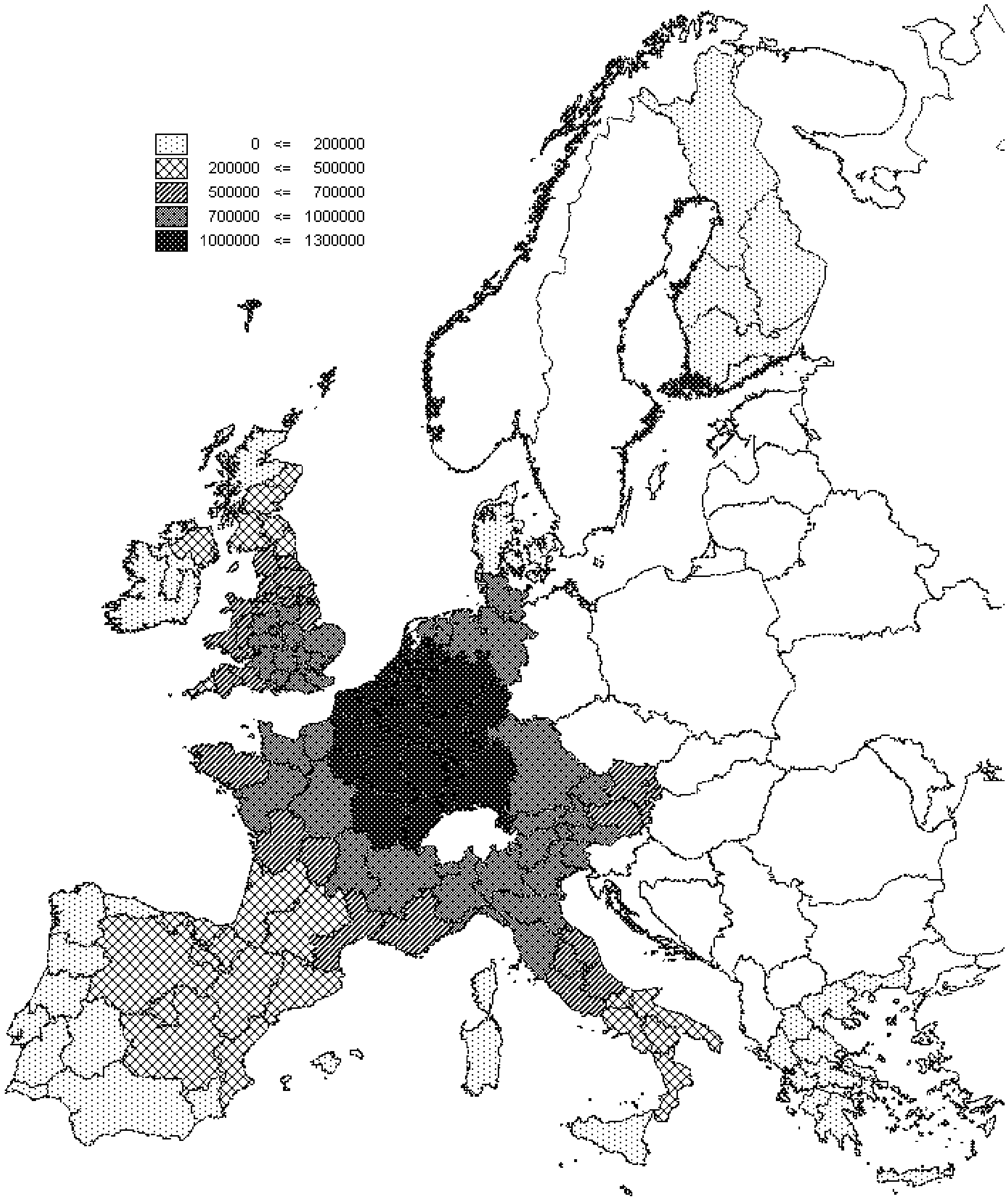
Notes: *t*-statistics are based upon White's heteroscedasticity-adjusted standard errors.
** significant at the 0.01 level,
* significant at the 0.05 level.

Figure 1: Estimated distance decay function



Source: Cambridge Econometrics' European regional databank, own calculation

Figure 2: Estimated Market Potential 1990



Source: Cambridge Econometrics' European regional databank, own calculation