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**Annekatriin Niebuhr
Silvia Stiller**

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Abstract

Border regions and border effects currently attract a lot of attention in political practice and economic research. Substantial interest in regions located along the frontiers of integrating countries is predominantly inspired by the presumption that their specific geographic position might cause peculiarities in economic adjustments to integration. This survey explores whether economic theory and empirical studies support the assessment that integration effects concentrate in border regions. Economic theory alone allows only very vague conclusions about the spatial effects of integration. Depending on specific circumstances, border regions might benefit, lose or not be affected by integration. Empirical research on border regions – undertaken so far - does not allow to draw clear-cut conclusions as well. At present, there is neither a direct test for integration effects in border regions, nor a comprehensive study on the development of border regions. To sum up, the survey suggests that rigorous theoretical and empirical analysis is needed to foster the understanding of integration effects in border regions.

Zusammenfassung

Grenzregionen und Grenzeffekte ziehen in der politischen Praxis und in der wirtschaftswissenschaftlichen Forschung gegenwärtig großes Interesse auf sich. Ursächlich hierfür ist die Vermutung, dass die besondere geografische Lage von Grenzregionen spezifische ökonomische Integrationseffekte bedingt. Dieser Überblick fasst die Ergebnisse der ökonomischen Theorie und empirischer Untersuchungen zu dieser Fragestellung zusammen. Es ist festzustellen, dass die ökonomische Theorie keine eindeutigen Schlussfolgerungen erlaubt. Ob Grenzregionen von Integration profitieren, negativ beeinflusst werden oder unberührt bleiben, hängt von den konkreten Gegebenheiten ab. Auch die vorliegenden empirischen Studien zu Grenzregionen gelangen zu keinen eindeutigen Resultaten. Bisher gibt es allerdings weder eine direkte Überprüfung der Integrationseffekte in Grenzregionen noch umfassende Untersuchungen der wirtschaftlichen Entwicklung von Grenzregionen. Insgesamt zeigt dieser Überblick, dass weitergehende theoretische und empirische Untersuchungen erforderlich sind, um fundierte Kenntnisse über Integrationseffekte in Grenzregionen zu erlangen.

JEL-Code: R 12, F 15, O 18

Keywords: regional development, border regions, integration effects

1 INTRODUCTION

Recently, border regions and border effects attract a lot of interest in political practice and economic research. Substantial interest in regions located along the frontiers of integrating countries is predominantly inspired by the opinion that their specific geographic position might cause peculiarities in economic adjustments to integration. 'Central' frontier regions located at the interface of a foreign and a domestic market are seen from a geographical perspective the focal point of integration. Hence, one could suppose that the most rapid and direct impact of the integration process should be felt there. Plenty of such internal border regions will emerge when EU Eastern enlargement becomes a reality. It is a controversially discussed question whether these regions will economically profit or lose by EU enlargement.

Indeed, studies by *Hanson* (1996, 1998b) and *Hanson/Krugman* (1993) suggest that trade liberalisation might strongly affect the economy of border regions. Those studies show that tariff reductions and resulting trade intensification among the United States and Mexico attracted numerous firms from Mexico City towards regions close to the border with the United States. *Krugman/Hanson* (1993) argue that, since Mexico is a comparatively small economy, free trade with the large US market effectively turned the Mexican economy inside out in the sense that firms shifted their focus from domestic markets towards export markets in a literal geographic sense.¹ Altogether, the economic upswing of Mexico's border regions results from the fact that the NAFTA gave Mexico access to the large US market.

This conclusion is highly interesting against the background of the forthcoming EU enlargement as there are some striking parallels to the NAFTA case. As the EU expands eastwards it will give the new member states access to the large EU market which currently comprises 376 million residents. Simultaneously the markets of the acceding countries gain importance for the EU. The large Polish market e.g. has a size of 10 % of the current EU population. Thus, large markets will integrate. In the course of such a process, strong spatial effects are likely as the US-Mexico experience suggests. This might raise fears that especially border regions along the present external border of the EU benefit from the eastern expansion while other regions lose economic activities. This paper investigates whether such economic developments in border regions are likely from the perspective of economic theory and existing empirical studies. More precise knowledge about the impact of integration on border regions is required, espe-

1 See *Krugman/Hanson* (1993), p. 171.

cially with regard to regional policy. Are there any reasons for a specific regional policy directed towards border regions along the opening eastern border of the EU?

The paper proceeds along the following lines. Section 2 explores what trade theory, traditional location theory and the new economic geography imply for integration effects in border regions. Section 3 provides an overview of selected empirical studies on this topic. In section 4 empirical and theoretical results are combined. Against this background it is considered whether it is possible to draw conclusions for the economic consequences as to border regions gaining a central geographical position within the EU.

2 BORDER REGIONS IN ECONOMIC THEORY

2.1 Trade Theory

A spatial impact of integration might be released by international factor movement or trade. Trade theory is an essential element of integration theory which focuses on the economic impact of trade liberalisation. Integration theory as a separate string of economic theory goes back to *Viner* (1950) and was originally based on the neo-classical trade model.² At the beginning of the 1980s, new trade theory has emerged and strongly influenced integration theory since that time. Unlike traditional models more recent trade models incorporate economies of scale and monopolistic competition. In trade models national borders constitute tariff or non-tariff hindrances to trade.

It is a basic result of traditional and recent trade models that integration, via the reduction of trade impediments, raises international trade which affects the international pattern of specialisation in production. The related economic adjustments are driven by an intra-country reallocation of production factors among sectors. Production factors are usually assumed to be perfectly mobile within countries and among sectors while they are completely immobile on an international scale.³ Thus countries have fixed factor endowments and trade serves as a substitute for factor mobility. Furthermore, transportation costs do neither exist on a national nor on an international level. Therefore, each country is effectively treated as a single geographic location.

2 For an overview of the developments in the Vinerian analysis see *Tovias* (1991), pp. 5-8.

3 The first time that free factor movement was considered as a separate analytical problem in integration theory was at the end of the 1980s and the early 1990s within the common market theory (*Wooton* (1988) and *Grinols* (1993)).

Since international trade models regard nations as dimensionless points in space, they are not suited for dealing with spatial effects of integration. The assumption that spatial distance is irrelevant for the intensity of trade relations strongly contrast the fact that empirical estimations of gravity models have proved distance to be a very important determinant of international bilateral trade volumes.⁴ Thus, for adding more realism to trade models it is self-evident to incorporate per-unit distance costs which requires to impose some spatial structure on the models. Furthermore, as long as trade models neglect international factor mobility they omit an inherent factor of integration.

An early attempt to overcome the non-spatial structure of trade models, by integrating theories of location and international trade, goes back to *Ohlin* (1967).⁵ He concludes that altogether essential results on international trade can be applied to interregional trade relations as well. A more recent and formal approach that integrates spatial aspects in trade models is *Rauch* (1991) who combines elements from urban economics and trade theory. In that model intra- and inter-country transportation costs determine the volume of trade within and between countries. In *Rauch's* model port cities attract economic activities since they have low access costs to foreign markets. In the equilibrium population size, wage rates and residential rental rates of cities should decline monotonically as one moves inland from a coastal port. It is relevant for our subject that a region's geographic position is important regarding regional adjustments to international trade, since location is decisive for access costs to foreign markets. Proximity to foreign markets is advantageous for firms which export goods to these markets and might encourage economic development. In reality trade does not only take place via ports, but goods are also directly transported across national borders from land to land. From this point of view border regions could also have a geographic advantage in attracting exporting firms due to their proximity to foreign markets.

Altogether, the relevance for a theoretical analysis of regional integration effects is limited within the trade models in the above-mentioned tradition. Yet those models are relevant for integration issues since they deal with the impact of trade liberalisation on national production patterns. But within the framework it is not analysed how changes in the macroeconomic production structure affect the regions within a country. There-

4 In fact, distance costs are a basic element of the new economic geography which we do not consider in this section but in section 2.3 since it is not primarily a trade theory.

5 E. g. *Ohlin* (1967), Chapter 12: Interregional Trade Theory and Location Theory. Altogether, *Ohlin's* contributions only receive little attention, which may be due to their lack of formalisation. Only recently *Krugman* (1999) dealt with the question whether *Ohlin's* work contained the essence of what later became the new trade theory and the new economic geography.

fore, conclusions cannot be drawn on how trade liberalisation affects border regions. It is very likely that the reallocation of production factors among sectors will have spatially differing effects within countries. This idea is captured by Rauch's model which explicitly deals with the location effects of trade. Based on that model one might argue that frontier regions with relatively low access costs to foreign markets are natural production sites.⁶ Furthermore it should be mentioned that new trade theory is an essential element of the new economic geography discussed in section 2.3.

2.2 Traditional Location Theory⁷

Trade and location theory have evolved distinct streams of economic theory, yet they deal with many similar issues. Ohlin referred to this by stating that "The theory of international trade is nothing but internationale Standortlehre."⁸ In contrast to trade theory, location theory is basically about location decisions whereby interregional trade flows emerge as the result of it. Usually, traditional location theory is not primarily treated as a part of integration theory. This is surprising since economic integration was already an issue for classical regional economists and economic geographers.⁹

Especially *Lösch* (1944) developed a consistent but rather unfamiliar model dealing with spatial effects of economic integration.¹⁰ In that model it is assumed that consumers and production factors are immobile and equally distributed in space. Like new trade theory *Lösch* considers economies of scale and imperfect competition. Firms settle down where spatially dispersed demand can be served best while profits are maximised. There are transportation costs for goods which are proportional to the distance between consumers and producers. Thus, the market area served from a certain location is spatially determined as illustrated by Figure 1.

P_I is the price at location I and consumers' demand is d with $\partial d / \partial P_I < 0$ and $d(P_F) = 0$. Suppose a firm is located in A where the consumer price is P_A . For consumers which live in F the price is P_F including transportation costs from A to F . Thus the firm does not sell any products in F and in locations more distant from A than location F . As a result the maximum market radius is given by the distance be-

6 See *Hanson* (1996).

7 For a more extensive overview on classical regional location theory see *Kopp* (1999).

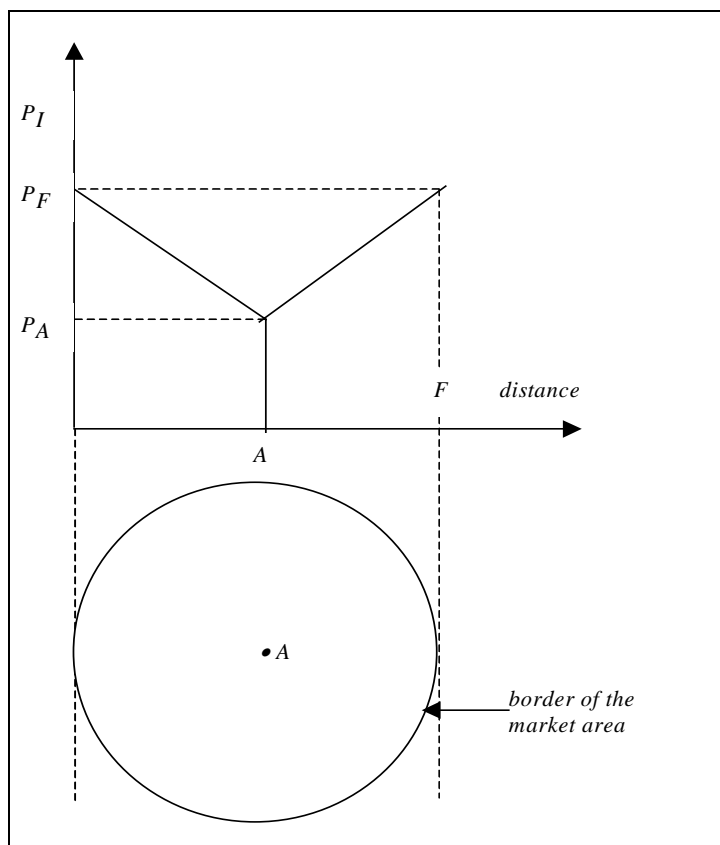
8 Cited according to *Krugman* (1993), p. 110

9 *Hoover* (1963), Part three: The locational significance of borders. See also *Hansen* (1977).

10 See *Bröcker* (1990), p. 50.

tween A and F . The same relation holds for all directions of the market area and hence the market area takes the form of a circle. The size of the market area and thus the accessible number of consumers, i. e. a firm's market potential, differs among products due to product specific supply and demand functions.

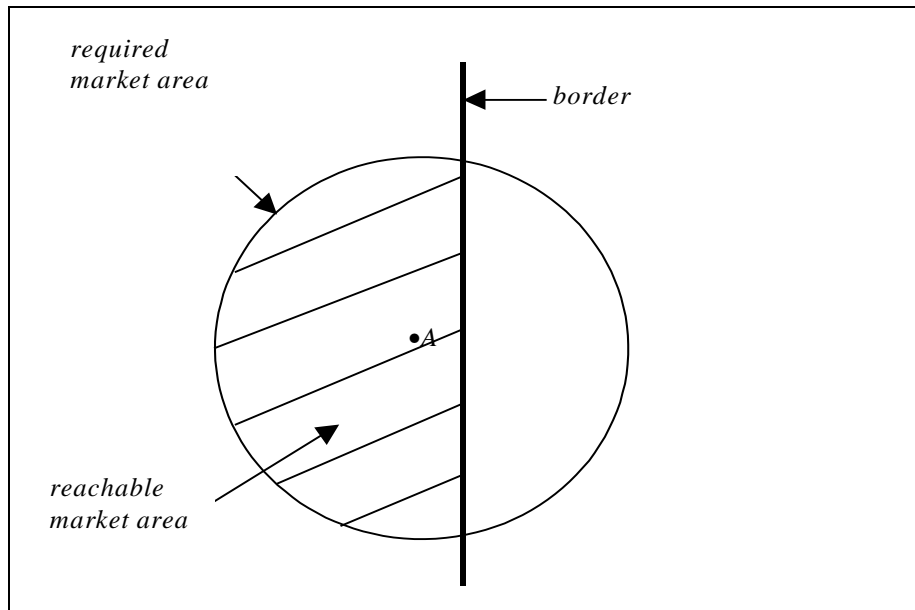
Figure 1: Spatial Demand



Central concern of *Lösch* (1944) has been the development of a theory of regional systems of market areas. He obtains regular hexagonal market areas for firms in the equilibrium since all points in space have to be supplied with goods. The economic landscape, i. e. a system of different spatial market areas, is affected by introducing national borders. Borders, if they are incompletely or completely impermeable, are distortions in the market networks, divide the market area and thus negatively affect a firm's market potential (see Figure 2). Lower sales force a firm A to withdraw from the market. Therefore the proximity to a border discourages a firm from locating in a border region. Furthermore, firms will be the more distant from the border and the nearer to a nation's geographical centre the larger their required market area is. Consequently, border re-

gions will have only little economic activities and will have only firms requiring a small market area. Subsuming his considerations on border effects, 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.¹¹

Figure 2: Border as a Distortion in a Market Area



Based on considerations similar to those of *Lösch* (1944), *Giersch* (1949/50), *Guo* (1996) and *Heigl* (1978) derive within location models, that border regions are disadvantaged areas since borders limit the physical flows of goods. *Hoover* (1963) summarises the significance of borders in traditional location theory in his influential study of the economics of location. He points out that tariffs and other restraints on international trade increase transportation costs, distort market areas and supply networks, and increase the costs of producers located near borders. Consequently, “producers are likely to shun the territory near a trade barrier which would curtail their market or supply area” and locate in an area that is more central relative to domestic markets.¹² Due to this ‘border effect’ firms orientate towards the interior of an area enclosed by borders. Hence the network of a firm’s demand and supply relations is denser in the geographical centre of a country than in its periphery.¹³

11 Cited according to *van Houtum* (1999), p. 113.

12 See *Hoover* (1963).

13 See *Giersch* (1949/50), p. 88.

Reversing Lösch's and similar arguments suggests that the opening of a border for trade may change the economic situation of border regions dramatically. Border regions gain attractiveness through the reduction of barriers to international trade and low-cost access to the foreign market. Opening the border for free trade rises the accessible market area of border regions, i. e. the market potential, possibly up to the critical market size. This fosters settlement of firms near the national border. New products for which the national market was too small can be supplied profitably in the integrated market area, in case a firm is located near the centre of the common market. If so, border regions at the interface of the domestic and the foreign market attract production within the process of integration.

While Lösch's consideration on spatial effects of integration are rather general *Giersch* (1949/50) explicitly deals with the spatial impact of an economic union, i. e. the abolition of barriers to trade and factor mobility among European countries. He expects a favourable evolution of central border regions within the European Community.

“The locational consequences of the formation of, for example, a Western European Union can now be described by the following general statement: The abolition of barriers to inter-European trade and to inter-European movement of factors will weaken the deglomeration effect of national agglomeration and will thus enforce international, or more precisely, inter-European, agglomeration. [...] Towns and regions with artificial advantages due to national agglomeration will become disadvantageous. On the other hand, particular regions, which have suffered under the depressing influence of national borders, will gain instead.” (*Giersch* (1949/50), p. 91, similar *Giersch* (1988)).

To sum up, traditional location theory implies that border regions are weakly developed within a closed economy. Concerning spatial effects of an economic union several location models imply a positive impact of integration in border regions close to foreign markets. Hence, location theory provides some valuable hypotheses on how central border regions might be affected by the reduction of border impediments.

2.3 New Economic Geography

The new economic geography (NEG) deals with the distribution of economic activities across space and explains regional disparities by entirely endogenous location decisions. The first new economic geography model, the so-called core-periphery model, was developed by *Krugman* (1991 a, b). In the course of time *Krugman* and other authors modified the seminal framework in various respects and developed a wide variety of

NEG models.¹⁴ These models have in common a combination of elements of traditional regional science and new trade theory. *Krugman* himself considers a NEG model as a location model that is meant to be comprehensible to trade theorists.¹⁵ Like traditional location models the NEG originated as a merely static theory. But NEG models, in contrast to location models in the line of *Lösch*, are general equilibrium models.

The characteristics of NEG models are an explicit spatial structure, interregional trade costs, economies of scale in production and monopolistic competition in the line of *Dixit-Stiglitz* (1977). Spatial equilibrium results from the location decisions of firms and workers (consumers). The balanced distribution of workers and firms across space depends on the relative strength of centripetal forces (which promote the geographic concentration of economic activities) and centrifugal forces (which promote the geographic dispersion of economic activities). If centripetal forces dominate workers and firms will be unevenly distributed across space. In this case there are agglomerations with a high density of economic activities as well as regions which have only a few firms or no industry at all.

Significant centrifugal effects can be based on a relative scarcity of immobile production factors and non-tradable goods (e. g. housing)¹⁶ in the agglomerations as well as on the existence of pure external diseconomies of agglomeration¹⁷. Centripetal forces, which attract firms and consumers to a region, arise from the fact that a relatively large home market has a positive impact on a firm's profit and a consumer's utility. This goes back to numerous backward and forward linkages related to production and consumption. Workers prefer relatively large markets due to the availability of a large number of locally produced consumption goods, which increases real income of workers (forward linkage). Near to a large market, firms have good access to buyers of intermediate and finished goods which positively affects profits (backward linkage). Furthermore, firms spatially agglomerate for having good access to suppliers of intermediate inputs which saves transportation and thus production costs (forward linkage).¹⁸

Backward and forward linkages might induce a self-reinforcing process of agglomeration because the larger market is where already an agglomeration of firms and workers exists. As a consequence possibly large disparities in terms of real wages and the den-

14 For a comprehensive summary see *Fujita et. al.* (1999).

15 See *Krugman* (1993), p. 118.

16 See *Helpman* (1995).

17 E. g. congestion costs in *Junius* (1999).

18 See *Venables* (1996) and *Puga* (1999).

sity of economic activities will rise among the industrial centre and the less developed hinterland. *Ceteris paribus* real wages are higher at locations close to large markets.

Whether industries spatially agglomerate is ambiguous since economic geography models generally exhibit multiple equilibria. The configuration of a spatial equilibrium depends on the variables included in the model and the chosen parameter. The level of interregional trade costs as well as the assumed mobility of firms and workers strongly influence the relation among centripetal and centrifugal forces. Since integration affects international transportation costs and eases cross-border factor movements, it might alter the spatial equilibrium. With regard to the spatial impact of integration two results of new economic geography models are highly relevant:

- (1) Reduction of international trade costs as well as liberalisation of cross-border labour movement affect the balance of centripetal and centrifugal forces on an international level. Thus integration might alter the distribution of population, production factors and firms **among countries**.¹⁹
- (2) Reduction of international trade costs affects the balance of centripetal and centrifugal forces on a national level since foreign markets gain importance for buyers and suppliers. Thus integration might alter the distribution of population, production factors and firms **within countries**.²⁰

Result (1) and (2) imply that integration might have spatial effects in terms of altering the allocation of economic activities across space. The spatial impact of integration subsumed by (1) results from the fact that decreasing trade costs and liberalisation of factor movement might induce labour migration among countries. The migration of labour alters the national factor endowments and as a consequence the international location of industrial activities.

Result (2) refers to intra-country location effects of integration. The corresponding models go back to *Elizondo/Krugman* (1996) and *Fujita et al.* (1999)²¹ which extend Krugman's pioneering NEG model. They show that the opening of goods markets might affect the economic geography within a country. They argue that while the location of economic activities within a closed economy is strongly inward-oriented, it partly

19 E.g. in the model outlined by *Ludema/Wooton* (1999).

20 See *Elizondo/Krugman* (1996) and *Fujita et al.* (1999).

21 *Fujita et. al* (1999), pp. 330-343 present a simplified version of *Elizondo/Krugman* (1996). Both approaches do not include cross-border factor mobility.

changes to an outward orientation in an open economy. The domestic market becomes less important and the relative (and absolute) attractiveness of the domestic centre decreases. This might cause a reallocation of economic resources within a country away from previous centres to new locations. The question whether the re-organisation of the internal geography is likely to attract economic activities towards border regions is not formally addressed by *Elizondo/Krugman* (1996) and *Fujita et al.* (1999). They assume identical external trade costs for all locations within a country such that no region has a cost advantage in trade. Nevertheless, the current literature on regional adjustments to external trade sometimes refers to this model as implying positive feed-backs of integration in border regions.²²

Indeed, market size considerations based on NEG models support the assessment that central border regions, border regions along the national frontier of an integration partner, should have a geographic advantage within an economic union. The relative geographical position of these regions is immensely altered by integration: It changes from a peripheral position on a national scale to a central one in the common market. Central border regions' market access, market potential and market size strongly improve.²³ The home market of border regions will increase if market areas at both sides of the border merge to one market. This will happen if cross-border backward and forward linkages evolve. This is very probable, at least at advanced stages of integration with almost meaningless international borders. Cross-border trade increases among integrating countries since firms sell a larger proportion of their output as exports, and consumers derive a higher proportion of their consumption from imports. Such developments might attract consumers and firms to regions with good access to foreign markets such as 'central' border regions. The attractiveness of border regions will be stronger if domestic and foreign firms industries are vertically linked.²⁴ In this case, cross-border related industries have an incentive to spatially agglomerate, probably in border regions. Supply and demand considerations taken together suggest that border regions at the core of the EU would be very favourable locations for exploiting the backward and forward linkages emphasised by the new economic geography.²⁵ Thus, integration might induce the rise of new economic centres in border regions.²⁶

22 Such for instance *Hanson* (1996).

23 Indeed, those conclusions are similar to those of traditional location theory whereby the NEG introduces additional aspects, e. g. vertical linkages among firms.

24 *Venables* (1996) explicitly considers his model as a framework for analysing the ways in which economic integration influences the geographical concentration of production.

25 See *European Commission* (2000), p. 68.

26 *Fujita/Mori* (1996) support the assessment that regions which have low cost access to foreign market, due to the availability of international transport facilities, have an advantage in production.

Altogether, the new economic geography suggests that a favourable economic development of central border regions could be initiated by integration due to an increase in their market potential. If border regions strongly gain attractiveness through integration the dominance of other production sites might decrease and new agglomeration centres will possibly arise along the border in order to exploit cross border supply side and demand side effects. Traditional industrial centres might lose economic activities because of high cost access to foreign markets. However, a positive impact of integration on border regions is not the only plausible outcome of NEG models. If transport costs are extremely low, firms will not care whether they are close to markets and suppliers. Furthermore, whether integration indeed affects the economic geography crucially depends on the strength of agglomeration forces which preserve the pre-integration pattern of industrial location.²⁷ Indeed, the above-mentioned models are merely static and the degree of economic activities is given. Thus integration effects in these models might solely affect the distribution of economic activities across space but not its total amount. This means that a border region might only gain economic activities if another region loses them. Ultimately it depends on the level of international trade costs, the degree of labour mobility and the mobility of firms whether integration might break up the spatial pattern within the EU.

Finally, some remarks will be made on dynamic elements in NEG models. Static NEG models are, like models of traditional location theory, only informative for the one-time allocation effects of integration. But most probably in the long-term dynamic integration effects are more important. First approaches to link growth and economic geography are *Martin* (1999) and *Martin/Ottaviano* (1999) who introduce Romer-type (*Romer* 1990) endogenous growth into an economic geography model in the line of *Krugman/Venables* (1995) and *Venables* (1996). *Baldwin/Forslid* (2000) combine endogenous Romerian growth with Krugman's core-periphery model. In dynamic NEG models the spatial outcome of integration is still inexplicit. Like their static versions, dynamic new economic geography models developed so far have no direct implications for the development of border regions. The same holds for traditional and recent growth models since they abstract from a spatial dimension. Those models are not informative for our issue since a region's geographical position in an integration area is supposed to be irrelevant for its growth path.

²⁷ See *Hanson* (1998), p. 420.

2.4 Implications of Economic Theory

We investigated from the perspective of economic theory how integration might affect border regions located along the border between integrating countries. Altogether, if economic models deal with the spatial impact of integration at all they will focus on regional adjustments to decreasing trade costs. The impact of international factor mobility on the spatial distribution of economic activities within countries is more or less ignored. Traditional location models and new economic geography models imply that external trade might alter the internal economic geography and that new industrial centres might arise. Causal for spatial changes is that outward orientation of economic activities partly replaces inward orientation since integration changes reference markets for buyers and suppliers. There are several arguments suggesting that related reallocations of resources might be for the benefit of border regions.

Due to spatial proximity to integration partners, central border regions might have cost advantages in trading with neighbouring countries. Based on considerations as to market access the new economic geography and traditional location theory provide several arguments suggesting that a reduction of border impediments could attract consumers, production factors and firms to central border regions. This originates from the fact that integration strongly raises the market potential of border regions. Therefore, within an economic union cross-border backward and forward linkages might initiate a self-reinforcing process of agglomeration in regions located along the frontiers among integration countries. Based on such considerations *Hanson* (1996) concludes that "... regional trade agreements in North America and Europe are likely to cause frontier regions to expand."²⁸.

But in a strict sense the above-mentioned theories do not allow that clear-cut conclusions on the economic perspective of border regions. Altogether, it is already uncertain from the theoretical premises whether integration at all alters the economic geography. It is even more vague to guess which regions might profit from a reallocation of resources within an economic union. Crucial for changes of the spatial pattern is the degree of factor mobility. Ultimately it is an issue of empirical research how integration affects the spatial allocation of resources and the economic development of border regions. Therefore, we review in the following selected empirical studies dealing with the economics of borders and border regions in the course of integration.

²⁸ See *Hanson* (1996), p. 942. Already *Giersch* (1949/50) drew a similar conclusion.

3 EMPIRICAL EVIDENCE ON BORDER REGIONS AND BORDER EFFECTS

Quite a few studies deal with the effects of European integration, e.g. *Cecchini* (1989), *Baldwin* (1989) or *Midelfart-Knarvik* et al. (2000) to name just a couple of them. Only some of these investigate the spatial impact of integration, focusing usually on the development of regional disparities, i.e. the development prospects of central and peripheral regions. However, the corresponding results do not allow to draw precise conclusions regarding the effects of European integration on border regions. Up to now, there is no comprehensive study on integration effects in European border regions.

Contrary, a vast number of very specialised studies analyses specific aspects of border regions, such as cross-border networks or the behaviour of individuals in cross-border interaction. Moreover, numerous case studies investigate the development of specific border regions. Considering all those various analyses is far beyond the scope of the present survey.²⁹ In the following, we, therefore, concentrate on three groups of studies on the economics of borders and border regions.

The first group of studies deals with the significance of border effects and their evolution in the course of integration (section 3.1). This is currently a subject of intense empirical research. The investigations focus on assumptions relevant within the theoretical approaches described in section 2.

A second group of analyses evaluates the spatial effects of economic integration by investigating changes in regional accessibility, i.e. in the market potential of regions (section 3.2). Some of these studies also provide a more or less direct test of new economic geography models, that can be applied to derive conclusions regarding the integration effects in border regions.

Finally, we consider investigations of selected border regions where due to considerable integration efforts significant effects of economic adjustment can be expected. The recent case studies presented in section 3.3 investigate integration effects in the U.S.-Mexico border area and the region along the German border with the EU candidate countries Poland and the Czech Republic.

²⁹ For an extensive survey of the literature on borders and border regions in Europe see *van Houtum* (2000).

3.1 Intensity of Border Impediments

The intensity of border effects is currently a subject of intense empirical research. The corresponding studies estimate the intensity of border effects by comparing the intensity of intra-national and international trade flows in the framework of a gravity model. The border effect measures the extent to which domestic regions interact more intensely than interacting with foreign regions. The analysis of *McCallum* (1995) is frequently mentioned as establishing the literature on border effects. However, already *Bröcker* (1984) analysed border effects in the EC applying a gravity model of interregional trade. His results point to significant trade impeding effects of borders. On the average crossing of a national border reduces trade flows to one sixth of the value of domestic flows. Using the concept of market access, *Bröcker* (1984) also estimates the spatial impact of integration. The resulting pattern supports the hypotheses of *Giersch* (1949/50), i.e. regions along intra-EC borders benefit from a European integration. Although quite a few studies have analysed the significance of border effects in the meanwhile, to our knowledge, only the study of *Bröcker* (1984) also deals with the spatial effects of integration.³⁰

Starting with the study of *McCallum* (1995), the literature on border effects rapidly increased in recent years. The analyses apply the gravity approach on Canada-U.S. trade (e.g. *McCallum* 1995, *Helliwell* 1998), OECD countries (*Wei* 1996) and the EU (*Bröcker* 1998, *Head and Mayer* 2000, *Nitsch* 2000). All investigations point to significant border effects. But the size of detected border impediments varies considerably with respect to the particular data and methodology. The results of *McCallum* (1995), *Helliwell* (1998) and *Bröcker* (1998) imply a reduction of international trade by a factor around 20 as compared to intranational trade flows.³¹ Contrary, *Wei* (1996) estimates a much smaller border effect of about 2.5 for OECD countries.³²

Whereas the evidence concerning the size of the border effect is rather mixed, all studies analysing the evolution of border impediments point to a more or less pronounced reduction in the course of integration. The results of *Nitsch* (2000) for EU countries suggest a significant decline of border impediments in the early 1980s and a gradual decrease thereafter. These results are confirmed by findings of *Head and Mayer* (2000)

30 However, *Bröcker* (1984) notes that, due to data restrictions, the results concerning the integration effects have a highly experimental character.

31 *Helliwell* (1998) also provides evidence of significant border effects on migration between the U.S. and Canada.

32 For a survey also covering recent empirical research on border effects and disintegration among the former CMEA (Council for Mutual Economic Assistance) countries see *Disdier and Mucchielli* (2001).

who also detect declining border effects in Europe. Moreover, their results suggest that the still high relevance of border impediments in Europe is due to consumers having a bias towards domestic goods rather than to non-tariff barriers. However, if border effects are first of all due to such “natural” factors, as e.g. differences in taste among European consumers or factors promoting local networks of demand and supply, a perfect integration with no border effects is unlikely ever to be achieved (see *Brenton and Vancauteran* 2001). Integration policy can hardly reduce border effects if the origins of border impediments are not policy related. According to a recent analysis by *Rose and van Wincoop* (2001), national currencies seem to be significant barriers to trade as well. Their estimates imply that joining a currency union halves the trade barriers associated with national borders.

When summarising, the presence of border effects is a rather robust result of empirical research. But the precise magnitude is still disputed. Moreover, even among highly integrated countries, as e.g. the EU countries, there are still significant border impediments to trade. Nevertheless, the intensity of border effects seems to decline in the course of integration. But findings of some recent studies suggest that remaining barriers to international trade might not be affected by measures of integration policy. So, border regions could still suffer from disadvantages caused by strong border effects that could not be reduced to insignificance in the course of integration. The results suggest that measuring the spatial effects of integration is rather a difficult task, taking into account that already the exact magnitude of border impediments is unknown.

3.2 Market Potential

Another group of studies deals with integration effects by analysing changes in market access that arises in the course of integration. These investigations apply the concept of the market potential as proposed by *Harris* (1954). Whereas early studies by *Clark et al.* (1969) or *Keeble et al.* (1982) do not have a rigorous theoretical foundation of the regional market potential, recent analyses, such as *Hanson* (1998b), provide a direct test of new economic geography models.

Clark et al. (1969) and *Keeble et al.* (1982) investigate the effects of European integration by analysing the change in regional accessibility and market potential induced by a reduction of tariff barriers. The market potential is a weighted sum of purchasing power across locations, with the weights depending inversely on distance between the areas or

on transport costs including tariff barriers (see *Keeble et al. 1982* or *Krugman 1998*). This combination of income and accessibility is used as a measure of different forms of distance costs and locational advantage. The analysis assumes that accessibility is important for investment decisions and, therefore, regional growth. A high market potential is rated as a decisive 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)*, Europe is marked by a wide disparity in regional accessibility and market potential. 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. The corresponding border regions in the core of Europe achieve an exceptionally high market potential as well. Moreover, the results point to a widening of regional disparities in accessibility and market potential between 1965 and 1977. Enlargement as well as faster growth of more accessible regions tended to favour the central areas in Europe.

Concerning the evidence with respect to border regions several issues have to be mentioned. Firstly, the market potential analysis of *Keeble et al. (1982)* only considers distance costs and tariff barriers. The effects of other border impediments, such as cultural differences, are not taken into account. Thus, a calculation including all effects arising from the existence of national borders, might result in a different pattern of regional accessibility. Secondly, assuming that the analysis provides reliable estimates of the market potential, the findings indicate that European border regions have not generally been characterised by a low accessibility and market potential in the past. 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. This suggests that border regions in the core of Europe already possessed a relatively high potential before integration started. Finally, the positive effect ascribed to the change of the market potential is not based on a well defined theoretical approach. As mentioned by *Peschel (1989)*, 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.³³ Whereas there is clearly a positive correlation between

³³ Corresponding empirical investigations provide no definite conclusions as well. According to *Cheshire (1994)* there is a significant positive association between the performance of urban regions

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 at least theoretical deficiencies concerning the market potential have been remedied by now. Moreover, some recent studies investigate the empirical significance of the market potential, based on tests of corresponding theoretical approaches. So, the market potential has again become an object of intense research. The new economic geography led to a revival of the concept since the approach allows to derive the market potential from formal models (see *Hanson* 1998b). According to these models, market access matters for the spatial distribution of economic activity because of increasing returns to scale in production and transport costs (see *Hanson* 1998b).

Corresponding empirical studies aim first of all at testing the relevance of new economic geography models. The analyses deal with the issue whether, consistent with theoretical models, wages decline with increasing distance from the centres of economic activity and, consequently, demand (see *Brakman et al.* 2000). A common approach is to use *Harris'* (1954) market potential function to approximate the nominal wage equation of the model by *Krugman* (1991), i.e. the relationship between regional wage and market potential. The starting point is the question whether the level of economic activity in a region is affected by that region's access to markets for its production (see *Hanson* 1998b).

To our knowledge, empirical evidence on the market potential function is only, up to now, provided for the U.S. and Germany. This line of research started with the work of *Hanson* (1998b) who analysed U.S. county data. The regression analysis provides support for the existence of a spatial wage structure, i.e. regions that are remote from markets are *ceteris paribus* characterised by lower nominal wages. According to the estimates, demand linkages between regions in the U.S. are strong, but rather limited in geographic scope. Thus, changes in consumer demand have considerable effects on neighbouring regions and minor effects on distant areas (see *Hanson* 1998b).

in Europe in the 1970s and the 1980s and the change in market potential. The results suggest that the process of European integration tended to reinforce the advantages of more central regions and to penalise peripheral regions in the South and West of Europe. In contrast, the findings of *Bröcker et al.* (1983) indicate that the market potential is not a crucial determinant of regional growth. The study on integration effects in Scandinavian countries and Germany detects a significant effect on growth only for a few industries. Moreover, there seem to be only small changes of the regional differences in market access due to integration.

The results of *Hanson* (1998b) are more or less confirmed by the findings of *Roos* (2001) and *Brakman* et al. (2000) who apply the same method to German county data.³⁴ Moreover, *Hanson* (1994) provides consistent with these results evidence for trade liberalisation in Mexico. He detects a negative, but declining correlation between relative wages in the Mexican textiles industry and distance from the capital Mexico City. This result points to the existence of a regional wage gradient that partially broke down in the course of economic integration with the U.S. (see also *Overman* et al. 2001).

The results of studies that analyse the significance of the market potential suggest that market access, a factor stressed by location theory and new economic geography, could indeed be a decisive factor of regional development. However, empirical evidence concerning the relevance of the market potential is still scarce since estimates exist only for a few countries. Moreover, some assumptions made in the regression analyses are highly unrealistic. *Roos* (2001) himself notes that it is unlikely that the estimated relationship provides a comprehensive explanation of regional wage differences. In order to control the effects of omitted explanatory variables, *Hanson* (1998b) and *Roos* (2001) rely on another unrealistic assumption, namely that these unconsidered variables are time invariant. Thus, it is still unclear whether the empirical evidence on the significance of the market potential is robust. The findings leave open the issue whether a rise of the market potential in border regions caused by economic integration can actually establish the starting point of a favourable development.

3.3 Selected Case Studies

As mentioned above, numerous studies deal with the development of selected border regions. First of all the studies on the U.S.-Mexico border region by *Hanson* (1996, 1998a) are well known. Based on recent theoretical literature on international trade and industry location like *Krugman* (1991) or *Venables* (1996), *Hanson* derives the hypothesis that border regions benefit from regional trade agreements. He analyses how the integration process between the U.S. and Mexico has affected the location of economic activity within the integrating countries. Since Mexico's trade liberalisation in the 1980s, the location of manufacturing activities has shifted northward towards the U.S.-

³⁴ *Hanson* (1998b) and *Roos* (2001) analyse the relationship between the change in regional wages and the change in the market potential, i.e. the correlation between the first differences. This is part of their strategy to account for other region-specific determinants of wages. They assume that these factors are time-invariant, so they cancel out and the regression analysis simplifies to investigating the relationship between the first differences.

Mexican border. As firms relocated to regions with a better access to the U.S. market, the importance of the manufacturing belt in Mexico City declined. This relocation of resources confirms the model results of *Elizondo* and *Krugman* (1996).³⁵ Trade between the United States and Mexico increased considerably and much of this trade is intraindustry trade. The intensified trade relations were associated with an expansion of export assembly plants in the Mexican border region. The empirical evidence provided by *Hanson* (1996) suggests that growth of export manufacturing in the Mexican border regions has also contributed to expansion of economic activity in the U.S. border area.

The findings of *Hanson* (1996, 1998a) are consistent with the idea that integration results in a relocation of economic activity towards the common border of the integrating countries. More precisely, the analyses confirm the presumption on the role of transport cost, i.e. firms tend to choose a location with relatively good access to foreign markets. Furthermore, the results point to the importance of backward-forward linkages among firms as emphasised e.g. by *Venables* (1996). Employment growth is higher in regional industries that locate in the proximity of buyers and suppliers.³⁶ According to the results, the North American Free Trade Agreement (NAFTA) is a decisive force regarding the process of relocation towards the U.S.-Mexico border.

The studies of *Hanson* (1996, 1998a) point to mechanisms and relationships that might also mark the spatial impact of EU enlargement. In the course of enlargement the external borders with Eastern European countries will become internal borders of the EU. As *Barjak* and *Heimpold* (1999) and *Heimpold* (2000) note, the effects of integration presumably concentrate in the regions along these borders. However, the question whether these effects will be positive or negative is still subject of a controversial discussion (see also *Sander* and *Schmidt* 1998). On one hand, benefits for border regions accruing from an increased international division of labour are emphasised. On the other hand, there is fear that especially border regions of present EU member countries will suffer from a relocation of jobs and inflow of cheap labour. Consequently, quite a few recent empirical studies investigate the development of corresponding border regions.

35 *Ades* and *Glaeser* (1995) use the model of *Krugman* and *Livas* (1996) to analyse the effects of increasing international trade on the spatial structure of economic activity. Their findings suggest that integration, i.e. intensified trade relations, might encourage a spreading of economic activity.

36 However, *Venables* (1996) does not consider the effects of integration on employment growth. The model rather deals with the impact of declining transport costs on agglomeration. See also section 2.3.

Barjak and *Heimpold* (1999) and *Heimpold* (2000) focus on the German-Polish border area. They analyse the significance of the German-Polish border and consequences of a gradual removal of the border for investment activity and foreign trade in border regions. The proximity of the foreign market is presumably a locational advantage affecting existing firms in the regions and, moreover, increasing the attractiveness of the border area as a location for investment. The results of *Barjak* and *Heimpold* (1999) point to a poor performance of the German border regions regarding export activities. Taking into account that probably foreign regions belong to the market area of East German border regions, we could, *ceteris paribus*, rather expect an above average export rate. However, in the mid of the 1990s, most of the border regions were marked by export rates below the East German average, possibly indicating still significant trade impeding effects of the border.

Concerning investment, *Barjak* and *Heimpold* (1999) conclude that, despite the proceeding integration, the East German border regions have not become a preferred location for investment.³⁷ According to *Heimpold* (2000) the modest development of investment in the East German border area is partly due to locational disadvantages that persist despite the removal of border impediments. *Barjak* and *Heimpold* (1999) argue that the unfavourable development of most East German border regions is not primarily caused by border location but rather by the transformation process. Structural change induced by transformation and infrastructure deficits mark especially the regions at the German-Polish border. In contrast, the Polish border regions show a quite favourable development of investment. The empirical evidence suggests that the Polish border regions could improve their position regarding the regional competition for investment due to opening the border. This is not the case for the corresponding German regions.

A study of *Engel* (1999) focuses on the impact of the border respectively of decreasing border impediments on firm foundations in East German border regions. Based on the location model by *Guo* (1996)³⁸, *Engel* investigates the hypothesis that the opening of a border increases the attractiveness of locations in border regions. More precisely, the study analyses the question whether the declining significance of the border increases

37 *Heimpold* (2000) notes that the above average investment characterising some of the German border regions is probably rather caused by policy measures aiming at the preservation of industrial cores than by the opening of the border. A recent study by the *Ifo-Institut* (2001) also points to rather mixed development prospects of the border regions. On the one hand, the expansion of the regional demand potential is expected to have a positive impact. On the other hand, especially sparsely populated areas might not benefit as investment activity could be concentrated on agglomerations located outside the border area.

38 See also section 2.2.

the rate of firm start-ups in East German districts close to the borders with the candidate countries Poland and the Czech Republic. The empirical evidence is rather mixed. Whereas the decreasing border impediments seem to affect the number of firm foundations in the regions along the German-Polish border, no significant effect on firm start-ups can be detected in districts along the Czech-German border.

The findings of an analysis by *Sander* and *Schmidt* (1998) confirm the results of the above mentioned studies on East German border regions. They conclude that the East German regions along the German-Polish border could up to now not realise the growth potential of an integration process. Corresponding locational advantages are outweighed by a number of deficits characterising border regions. Cooperation across the German-Polish border is rather an exception than the rule. The economic potential of the border area is weak, traffic and communication infrastructure is insufficient, trust among the agents on both sides of the border appear to be deficient, and there seem to be political and administrative deficits.

Summarising, the evidence provided by these selected case studies allows no clear cut conclusions regarding the effects of integration in border regions. The results of *Hanson* (1996, 1998a) on the U.S.-Mexico border region stresses the effectiveness of mechanisms in border regions that are discussed in traditional location theory and the new economic geography. But the findings concerning the development along the German border with EU candidate countries shows that the effects described by Hanson are far from being systematic processes in integration areas. Border regions within an integration area form a quite heterogeneous group with respect to their economic development.

3.4 Results of Empirical Studies

Up to now, there is no systematic and comprehensive analysis of the evolution of border regions in the course of integration. Studies on border effects and on the significance of the market potential point to elements of processes that might result in an above average development of border regions. Significant border effects decline in the course of integration and this decline should be associated with an increase of the market potential of border regions. This rise of the market potential in border regions might be the starting point of a favourable development.

However, even the small number of case studies surveyed above reveals the heterogeneity of border regions and their development. As the example of the East German border regions shows, removing border impediments alone is no guarantee for economic growth in border regions. *Sander and Schmidt (1998)* argue that there are a number of preconditions for a favourable economic development of border regions, such as a sufficient potential for an intensified division of labour, traffic and communication infrastructure or trust among the agents on both sides of the border. Corresponding deficits may prevent the realisation of integration benefits in border regions. Altogether, empirical research on border regions is far from providing clear and consistent evidence on the integration effects in border regions.

4 CONCLUSIONS

Are there any specific effects of integration in central border regions? To address this question is definitely indicated in view of the prospective developments of the EU. It is a current question of utmost importance since plenty of border regions will emerge in the course of EU enlargement. The paper investigates whether economic theory and empirical research on border regions offer clear-cut answers regarding integration effects in border regions.

It is an important result of economic theory that integration might alter the allocation of resources within a country as well as between countries. Moreover, there are theory-based arguments suggesting that border regions might have an advantage in attracting resources due to their specific location in the centre of the integration area. Spatial proximity of border regions to the foreign market improves their location conditions. Integration has a positive impact on their access to foreign demand, their market potential and the development of cross-border backward and forward linkages. But these developments in favour of an economic upswing of border regions are countered by forces which tend to preserve pre-integration geography of economic activities. The relative weight of these counteracting forces is ambiguous from the theoretical perspective, and, thus, remains a task of empirical research. Hence, economic theory alone allows only very vague conclusions about the spatial effects of integration. Depending on specific circumstances, border regions might benefit, lose or not be affected by integration.

Empirical research on border regions – undertaken so far - does not allow to draw clear-cut conclusions as well. At present, there is neither a direct test for integration effects in

border regions, nor a comprehensive study on the development of border regions. However, a number of analyses provides evidence on specific aspects of relevant theoretical approaches. Firstly, the estimates of border effects point to still significant, but declining border impediments among highly integrated countries. These findings show that national borders are indeed important barriers for interregional economic relationships as traditional location theory assumes. Furthermore, we might expect increasing trade and factor mobility between foreign regions since the magnitude of border impediments seems to decline. Secondly, recent empirical research on new economic geography stresses the importance of the market potential for regional development. The findings of *Hanson* (1998b) suggest that an increase in the market potential positively affects regional wages and employment. This implies that regions which achieve a relatively high improvement in the market potential due to integration should realise *ceteris paribus* above average increases of wages and employment. As some theoretical approaches suggest, especially the market potential of border regions should rise when national borders lose significance. Combining theoretical presumptions and empirical evidence, one could conclude that border regions realise above-average benefits from integration.

However, numerous case studies on border regions point to a rather diverse development of these areas. On the one hand, the studies of *Hanson* (1996, 1998a) present the U.S.-Mexico border region as a perfect example for positive integration effects in border areas, as suggested already by *Lösch* (1944) and *Giersch* (1949/50). On the other hand, no corresponding evidence can be provided for one of the most recent cases of economic integration – the regions along the German-Polish and the Czech-German border. The findings of these empirical investigations do not point to a uniform development pattern of border regions. When evaluating those results we should keep in mind that border regions are far from being a homogenous group. For example, European border regions include both rural peripheral regions such as Galicia and capital regions like København.

To sum up, the survey suggests that rigorous theoretical and empirical analysis is needed to foster understanding of integration effects in border regions and to design an adequate regional policy, if necessary. Up to now, neither theoretical research nor empirical studies provide comprehensive and consistent results on the impact of integration on border regions. Consequently, one should be very careful in drawing general conclusions on the economic perspective of border regions merely based on the theoretical approaches and empirical studies considered in our survey. Thus, it remains to be analysed how the forthcoming enlargement of the EU will alter the EU's present economic geog-

raphy. Indeed, we should attentively observe what is going on in the border regions along the present external EU border. That area offers an excellent opportunity for studying how integration might affect the economy of border regions.

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